Collaboration in TVET

PROCEEDINGS OF THE 2ND UPI INTERNATIONAL CONFERENCE ON TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

Bandung, West Java, Indonesia
4 – 5 December 2012

EDITORS
Joachim Dittrich
Ade Gafar Abdullah

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Preface

The 2nd UPI International Conference on Technical and Vocational Education and Training, dedicated to the topic of “Collaboration in TVET” attracted about 55 speakers and poster presenters and was attended by roughly 300 participants from all over the world.

Included in the conference was a special session of the Regional Cooperation Platform on Vocational Teacher Training and Education in Asia (RCP), a network of mainly universities from east and southeast Asian countries, which is supported by the German Agency for International Cooperation (GIZ). RCP members presented about their ongoing collaborative research projects.

Also included in the conference were several special, thematic sessions. A session organized by colleagues from Australia dealt with the question, which type of vocational teachers is needed for assuring that technical and vocational education and training (TVET) benefits the students, the national economies, and the respective societies at large. This special session which had a pronounced interactive workshop character without lengthy presentations culminated in the “Bandung Manifesto on Vocational Teachers” which is printed in these proceedings. The special session on "Assessment in TVET", organized by Mr. Gerald Thiel, revealed the importance of assessment strategies and concepts when it comes to creating awareness of the proper TVET philosophy and mutual understanding of the quality of TVET across borders. Another special session discussed the possibilities to organize vocational teacher education programs in a collaborative manner between, universities, companies, and schools.

In this publication a selection of the papers presented during the conference is presented to the wider interested public in a form, so that they can be cited. Additional material such as presentation slides and draft papers are available on the conference website at http://tvetrc.upi.edu/tvetconference2012.

The editors

Dr. Joachim Dittrich    Dr. Ade Gafar Abdullah
Message from Rector of Universitas Pendidikan Indonesia

Your excellency, Director General of Higher Education (DGHE), Ministry of Education and Culture of Republic of Indonesia.

Invited speakers, Presenters and Participants of the TVET Conference.

Distinguished guests, Ladies and Gentlemen.

It is my great honour and pleasure that I can welcome you here to our University, Universitas Pendidikan Indonesia (UPI) in Bandung, in connection with the conduct of the very important events, 2nd UPI International Conference on TVET. This conference takes theme Collaboration in Technical and Vocational Education and Training.

This TVET Conference is intended to be the second of a series of biannual TVET conferences that bring together all level actors of the global TVET sector for exchange of knowledge and of examples of good practice of collaboration in TVET at all levels, and in order to start mapping the global landscape of collaboration in TVET, especially in Asia.

The conference is organised by Faculty of Technology and Vocational Education, Universitas Pendidikan Indonesia, in cooperation with Regional Cooperation Platform (RCP) for Vocational Teacher Training and Education in Asia and Universiti Tun Hussein Onn Malaysia.

Recently, TVET has found its way back on national and international development agendas. In the light of the immense importance of TVET for social and economic development, collaboration of all stakeholders at all levels is the critical issue for TVET development, starting from local cooperation between TVET institutions and the corporate sector for improving the quality and relevance of TVET, via regional cooperation in the framework of Free Trade Agreements (FTA) and mobility of labour in order to make TVET qualifications transparent and transferable over national boarders, up to international cooperation in TVET research and development for developing national knowledge bases for TVET system and TVET quality development.

Under the main theme "Collaboration in TVET", the conference will be organized along the sub-themes: (1) Cooperation between TVET institutions and the corporate sector for improving the quality and relevance of TVET, (2) Transparency and comparability of TVET qualifications, (3) TVET research and development as a contribution to the knowledge base for TVET system and TVET quality development, and (4) Special themes introduced by organizers of special workshop sessions.

I recognize that the sessions are principally designed to enhance the development and cooperation of TVET. This conference enables the building of a productive discussion, also provides an invaluable opportunity for networking and fruitful contacts between countries.

I realize that you are fully dedicated to the sessions that will follow but I do hope you will also take time to enjoy fascinating Bandung City with its tropical setting, friendly people and multi-cultural delicious cuisine.

Finally, I would like to express our heartfelt thanks to the Scientific and Organizing Committee for enabling this to take place, to all sponsors and to everybody who come to this conference, I wish we will have a very productive and successful conference.

Thank you.

Rector of UPI
Prof. Dr. Sunaryo Kartadinata, M.Pd.
Message from the Chair of the Scientific Committee

The wish for collaboration, knowledge exchange, and sharing of experiences is what drives researchers, practitioners and policymakers to participate in this conference, and collaboration in technical and vocational education and training (TVET) at the same time is the topic of this conference. The papers submitted to this conference and also the keynote speeches reflect what the current concerns of TVET stakeholders in that respect are.

The contributions show, that collaboration not only is an issue in the framework of the delivery of TVET, where schools and companies have to work together in providing theoretical knowledge and practical experiences to learners and in keeping vocational teachers up to date with the developments in the world of work. It is also an issue when it comes to labor market relevant certification of occupational competences, the organization of labor mobility across borders of any kind, and even in developing the quality of the education and training of vocational teachers.

Most likely, participants will notice from all the presented examples and considerations, that there are a number of overarching principles for successful collaboration in TVET. Three of the most important principles are the following, and they should not be underestimated, even though or precisely because they sound trivial. First, collaboration requires the will of each partner to collaborate. Second, partners have to be curious about their counterparts’ situation and his needs, and make all efforts to fully understand them. And third, collaboration will only work when each partner sees a benefit for himself in the collaboration, i.e. when a win-win situation can be generated for all parties.

TVET requires collaboration between stakeholders at all levels. No one party alone will be able to provide the TVET system structures and resources or the services to students that are needed to equip young people with the type of education need for participating in societal life in a self-confident manner as well as with the knowledge, skills, and experiences required to find a decent job in order to earn their livings, notwithstanding to provide the society with individuals, who are able and willing to contribute to and drive societal, technical, and economic innovation.

This event is the second of a bi-annual conference series set-up by Fakultas Pendidikan Teknologi dan Kejuruan (FPTK) of Universitas Pendidikan Indonesia (UPI). It is organized by FPTK UPI in co-operation with the Regional Co-operation Platform on Vocational Teacher Training and Education in Asia (RCP) and Universiti Tun Hussein Onn Malaysia (UTHM). UTHM is a long years’ co-operation partner of FPTK UPI and has recently joined RCP. RCP is a good example for international, regional collaboration between higher education institutions in the field of TVET with the focus on the development of TVET teacher education and of TVET research, and meanwhile exists for roughly 4 years. Cooperation between the partner institutions has significantly increased over time, and also the output in terms of research findings and development concepts has been growing.

In this sense, I wish all of us, participants, presenters and organizers, that this conference will shed some scientifically justified light on problems and solutions with respect to collaboration in TVET, and that it will also be an event for initiating and developing cooperation between people and Institutions.

Chair of the Scientific Committee
Dr. Joachim Dittrich
Manifesto on vocational teachers

This conference affirms that a strong TVET sector is a major educational need for all nations in the 21st century

International research has shown that the quality of teachers is the best predictor of successful student learning outcomes, therefore,

1. The quality of TVET teaching needs to be addressed and developed internationally, including potential for cross-national collaborations
2. Developing skilled men and women in vocational and technical areas requires expert teachers who are also skilled in their industry areas.
3. TVET teachers need to be Lifelong Learners who keep up to date in their industry area with current industrial experiences as well as their pedagogical expertise.
4. TVET teachers need recent ongoing industry knowledge, advanced content knowledge and strong pedagogical knowledge to be effective educators who facilitate learning and move beyond narrow “training” approaches.
5. TVET teachers should have professional teacher education pathways at high levels as well as at experiential levels.
6. A TVET teacher education must maintain strong and close links with the industries that the TVET teachers will be preparing students to join.
7. TVET teacher education should be based on tripartite collaboration between teacher education institutions, vocational centres and companies.
8. TVET teacher education institutions should practice trans-national cooperation for developing and facilitating future vocational teachers’ and vocational students’ regional mobility.

This meeting of TVET educators, administrators and researchers calls on all nations and governments to see TVET as a key to the social and economic future and TVET teachers as true professionals who are engaged in making this aim a reality.

The Role of VET Provider in Training Partnerships with Industry in East Java, Indonesia

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Abstract

In order to remain competitive in the world market, corporations should have highly skilled employees who can keep the enterprise economically viable in a global economy. Partnerships between VET provider and industry corporations can be a useful strategy in providing workforce training and maintaining knowledgeable employees.

The purpose of this paper is to explore existing VET provider - industry training partnerships and uncover the impacting factors under three headings of the partnership framework that contributed to their longevity. A comprehensive partnership construct based on three factors (environmental influences upon partnerships, process, the role of people and relationships) were raised in this paper.

This paper suggests identified that factors and conditions which lead to the maintenance of long term partnership between VET provider and industry partner included: (a) open, continuous communication between partners; (b) flexibility in course delivery i.e. scheduling, course structure, and location; (c) delivery of quality training services and products; (d) timely responses to concerns and inquiries; (e) employing qualified and experienced trainers/instructors; (f) mutual trust; and (g) acknowledgement of the strengths, limitations, and needs of the academic and business worlds.

The paper describes that while partnership between VET provider and industry partner differ in their complexity and breath, there are certain commonalities that emerge. In collaborating with a corporation in global economy, the academic partner must remain flexible and resilient to the changes that may occur in the partnership.

1 Introduction

A partnership can exist in many forms: formal and informal, public or private, large or small, individual or organisational. The Merriam-Webster dictionary defines a partnership as “a relationship resembling a legal partnership and usually involving close cooperation between parties having specified and joint rights and responsibilities”. The key words in the aforementioned definition are “cooperation” and “joint rights and responsibilities”. In order for a partnership to be successful, both parties have to cooperate with one another and they have to share the successes and the challenges that occur over the course of the partnership.

Since technology advances in today’s workplace, there is an increasing demand for well trained entry level workers. Increasing numbers of companies are establishing partnership training agreements in order to ensure their continued success in the business world, to be competitive, and to improve productivity. The reasons many educational and training institutions such as polytechnics are moving towards these types of training agreements include overcoming financial barriers in upgrading equipment, enhancing
instructors skills and offsetting enrolment declines in programs that are viewed as obsolete or in need of improvement.

The phenomenon of reduced finances, whether modest or considerable, obviously serves to challenge institutions of higher education to fulfil the needs of their components (Roueche & Roueche 1999). As funding linked with governmental sources wanes, universities, polytechnics and vocational education schools should seek alternative modes of funding in order to increase existing revenue as well as to deal with increasing complex needs (Ulrich & Barney 1984). Many of those institutions will survive, however, only through fostering collaborative and innovative partnerships which enable them to transform in this high speed information age. The developments in the past decade “highlight the reality that we are living in a time of truly historic transformation—one that is planted in the rise of a knowledge society based largely on the collaborative generation and use of information” (American Council on Education. Business-Higher Education 2001).

For several years universities and vocational education institutions i.e. polytechnics have depended on government funding for their financial plan support. The days when those institutions can assume that it is an independent entity and that it does not require contact with the outside world are past. The ivory towers require assistance from the private sector. The fostering of partnerships to meet the fiscal needs will become more and more ordinary in academe (Rogers et al. 1999). Glover (1999) added that the decision to collaborate is often one of necessity, since institutions need to obtain resources from alternative sources to survive.

Since then, the paring of companies and higher education to gratify new mutual needs is growing. Companies are viewing collaborations with universities and vocational education institutions as a means for employee training in addition to enabling recruitment and retention. On the other hand, higher education including vocational education and training institutions, recognising the growing segment working adult students, is look at the potential for increased enrolment and associated revenue streams. The combination of external forces and internal pressures has created a rich opportunity to explore the dynamics of employment development partnerships involving traditional academic institutions (Bok 2003; Karen 2004; Meisler 2004; Meister 2003).

Some industry—higher education institution partnerships have been mutually beneficial while others have not. The question is becoming not whether partnerships are good, but how to make them work (McLaughlin 2004).

1.1 Problem statement

Forming a partnership between two entities that may have different goals can be a challenging process. The company and the vocational educational institution have to work together to define the relationship, determine methods of collaboration, and establish shared goals, so both organisations can reap the benefits from the partnership.

In an era when economic supremacy and financial control have been increasingly assumed by globalisation in capital interests, education and training is one of the few areas in which governments are still able to put forth a relatively strong influence. notes that ‘As governments lose control over various levers on their national economies … they frequently turn to education and training as two areas where they do still maintain control’ (Green 1999, p. 56). Anderson (2006) argues that as globalization erodes the traditional powers of nation-states, governments have increasingly relied on education and training to strengthen national comparative economic advantage.

Indonesia in common with many other countries has put in place major education and training developments and improvements over the past 20 to 30 years to meet rapidly changing sets of economic and social needs (Robinson 1999). The development and provision of quality vocational education and training is essential to support Indonesia in meeting increased regional and global competition. There is also a need to build up an
Indonesian system of vocational education and training to meet the needs of industry. The system needs both quality supports and responsiveness to community and industry needs to best meet these economic objectives. To this end, training should be integrated with initiatives designed to advance and demonstrate quality processes and management. There has already been significant growth in the amount and variety of industry–provider training partnerships in the vocational education and training (VET) sector in Indonesia (Robinson 1999).

The state authority for vocational education and training is shared by the Ministry of National Education and the Ministry of Manpower of Indonesia, while the planning council, BAPPENAS (National Development Planning Agency), is responsible for the co-ordination of development planning (Alto et al. 2000). Vocational education, which is the responsibility of the Ministry of National Education, aims both to prepare students to continue their study at a higher institute of formal learning, such as a polytechnic institution, and also to prepare students (upon graduation) to directly enter the workforce. The Ministry of Education and Culture in 1993 introduced the “Link and Match” policy which intended to ‘link the education system to the “world of work”, and match the quantity and quality requirements of manpower in productive sectors’ (Djojonegoro 1994).

The Indonesian authority is interested in Australian approaches to the industry-led and competency based elements of Australian VET system as well as the Australian national framework (Cox 2007). Australia moved away from an education based VET system, towards the creation of an enterprise-based system: ‘the emerging vocational education and training system aims to be “business-led” and “enterprise-focused”, with local workplaces being able to determine “what training they receive, from who and when, where and how” (Mawer 1999). Therefore, the national training system is now dedicated to consistency in results assessed against industry and enterprise benchmark rather than consistency in curricula.

This agenda for the development of VET was reinforced by the Australian Embassy’s Counsellor for Education, Science and Training speaking in Indonesia, ‘vocational education and training symbolized a crucial element of the current workplace and was essential in underlying potential economic development. Furthermore, all countries are reaching a new stage in the improvement of their vocational education and training institutions and systems’ (Shannon 2007).

The focus of this research is upon VET and industry partnerships, an initiative which the Indonesian government embarked upon in 1997 (Ministry of Education and Culture of The Republic of Indonesia 1997). As part of the agenda of modernisation of the vocational education and training system in order to achieve economic competitiveness and meet industry needs, Indonesia has set about developing partnerships between industry and the training sector. Mitchell and Young (2001) argue that successful partnering is related to the ability to respond to the needs of change, continuous learning and innovation. In describing the formation and nature of partnerships, there is typically a mix of inter-organisational (for example, environment, structure, level of competition and change) and interpersonal factors (for example trust, friendships, senior executive support) at work. As also noted by Callan and Ashworth (2004), successful VET industry-provider training partnerships include the effective management of an extensive scale of environmental, training and people issues.

Various issues form the improvement of partnering result. Lendrum (2003) stated that training partnerships are formed by a scope of environmental factors, and readiness to adjust and alter the training approach. He also argues that principal to the success of all collaborations are the attitudes of people and the interactions amongst them, which as a result are researched upon three domains:

- Environmental influences upon partnerships
- Changes to the training model (Process)
- The role of people and relationships
This qualitative research investigates an existing VET provider – industry partnerships, the development and implementation of partnerships between the VET system and industry, a focus of national and international significance.

1.2 Research questions

To accomplish the purpose of the study, the following research questions under the three headings of partnership framework were investigated:

What are the common environmental factors impacting upon the establishment of the partnership and the participants’ readiness to partner; what types of partnerships have appeared; how do these factors adjust according to the size and location of the VET and industry partner; how are reputational effects operating; what are the relational and organisational cultural issues at work?

What are the key drivers for training; to what degree do training models vary in their levels of flexibility, customisation, administrative arrangements and the formality of the training liaison; what is the perceived return on investment for the industry partner; can successful training models be identified in these partnerships?

What skills being required by VET providers to develop and maintain partnerships?

1.3 Research aims

The purpose of this research is to investigate and document the role of partnerships in VET delivery, with a specific focus on the characteristics of the partners, and the benefits of the partnerships. The project also aims to examine the capability of existing training institutions and vocational education and training (VET) providers including polytechnics and vocational training centres to respond to industry needs through adjustments in their approach to training partnerships in East Java Indonesia presently.

1.4 Conceptual framework and Methodology

This is a qualitative and descriptive study which utilised relevant literature and questionnaires to gain information regarding characteristics and relationships and primary beneficiaries of VET provider – industry that has been created in partnership training agreements.

The theoretical framework for this research is informed by constructivist paradigm, and employs a qualitative research methodology to gain knowledge of the perceptions of case study participants implementing VET partnerships in Indonesia (Mertens 2010). This study supported by considering what we know about the notion of “partnering” and how collaboration amongst stakeholders can produce positive outcomes. The existing literature about partnerships and how it has evolved over previous decades is essential to understanding how today’s VET providers and industry might meet the needs of a complex, global work environment.

The multiple case study method is used in this research. A multiple case study enables the researcher to investigate differences inside and between cases with the aim of replicate finding across cases. Since comparisons will be depicted, it is necessary that the cases are selected cautiously that researcher can foresee similar result across cases, or predict contrasting result based on theory (Yin 2003).

1.5 Significance of the research

The results of this study provide an understanding of great import to campus official, educators in higher education, educational fund-raiser, education policy maker and industry,
of the descriptive and qualitative methodology that reveals how different entities cooperate, thus yielding profound understanding of educational partnerships including VET – industry partnerships.

The vocational education sector has a significant social and economic role in the development of emerging nations. From a social service point of view, demand for VET stems from a need by individuals to attain their full potential and contribute to their own social and cultural improvement while demand motivated by economic goals stems from the income that accrues to individuals, communities, enterprises and nations that possess superior skills and knowledge (Ferrier & Anderson 1998). For Indonesia, training partnerships with industries are an historical characteristic of Indonesian vocational education and training system, allowing for development of useful research findings in areas of VET, partnerships and community and national development.

1.6 Contribution to knowledge

Firstly, this study contributes to knowledge by offering an analysis of the VET – industry partnerships, secondly by making recommendations for improved practice, and lastly through the development of resources to be used by the VET sector and industry partners in staff development for employees. It is intended that these resources will allow staff better insights into their organisation’s mission, values, standards, policies and strategies as a result of being involved in a training program; supporting development of staff skills, knowledge and self-confidence, as well as enhancing career paths and providing access to a culture in the workplace that better encourages learning and innovation to advance work.

This study has significance for VET and the wider education agenda in Indonesia in the first instance and makes a contribution to international understandings and knowledge of VET and partnerships.

2 Findings

The cases provide a rich opportunity to explore common themes and emerging patterns regarding the partnering process and the issues of successful VET partners. This research suggests that there is not a unilateral approach or set of steps to ensure such partnerships between VET providers and industry will be sustained. While the cases involve similar partnerships, they reflect nuances in their creation and implementation. In each case, challenges emerged on the VET providers and partners, created by the unique expectations and situations.

This study reveals essential impacting factors of partnering shared by the cases emerge to contribute to partnership longevity. Figure 1 below shows the framework enhanced with the findings from the analysis, recognising impacting factors in the partnership’s lifecycles.

2.1 Environmental factors

The training partnerships

- in the VET sector were established or managed by business development managers/partnership management coordinators or persons of similar title
- included a central group of provider and industry staff who managed the partnership or multiple partnerships
- involved one industry partner and one provider in almost all cases, however, multiple players were involved, sometimes as consortia
in general there was a ‘break-even’ outlook around many partnerships, in that the financial profits were being seen in contrast to a range of non-financial returns which made continuing the associations meaningful.

- involved mainly a local industry partner and provider situated within close geographic proximity to each other, although some partnerships were interprovincial
- were ongoing relationships, often involving more than just direct delivery of training and, as a result, often had no defined end date.

There are three main drivers for establishing training partnerships in relation to VET providers: to create extra income; to provide staff with stronger connections with industry; and to develop further skills in their staff. For corporations and employers, the gains included an enhanced industry capacity to focus on their core business, and to deal with a skills shortage.

Most operated partnerships under some form of formal partnership agreement. VET providers wanted to expand into more partnerships involving joint ventures with various industry bodies and organisations. They believed that joint ventures allowed them to demonstrate their ability to work with a variety of partners in a commercial environment.

![Figure 1: Partnership Impacting Factors Framework Applied to Analysis](image)

### Partnership Impacting Factors

#### Environmental factors:
- Types of partnership
- Size and location of partnerships
- Track record and reputation
- Levels of formality
- Cultural issues at work
- Impact of globalisation

#### Training / Process factors:
- Key drivers for training
- Flexibility and customisation
- Return of investment

#### People factors:

![SUCCESSFUL PARTNERSHIPS](image)

2.2 Training factors

The research examined the capability of VET providers to respond to industry needs through adjustments in their approach to training. The findings demonstrated that:

- There were substantial level of flexibility and a variety of models of delivery been used in training process including the use of in-class material, self-paced material, and ‘chalk and talk’ classroom teaching.
- High levels of customisation were a key feature of these larger training partnerships. Business wanted the training to be highly customised and contextualised to meet their requirements.
Partners used a variety of administrative mechanisms to maximise the levels of communication within the partnership and, in turn, to build upon levels of trust. As a result of the flexibility of the training, industry respondents rated the level of training as high class training.

### 2.3 People factors

Either VET providers or industry spotlighted the meaning of having high levels of mutual trust within the partnership, with mutual trust being a main driver for expanding the partnership. Accordingly, industry partners especially believed that the strong point of their individual interactions with training managers and the instructors from VET provider was predominant to establishing a sustainable and progressing partnership.

Successful partnerships were sustainable from a financial standpoint, however, partnerships were not expected to be highly profitable; rather, employers and VET providers talked about a ‘break-even’ outcome initially being the primary goal, whereby a mix of financial and non financial outcomes was realised from the training partnership.

Employers wanted a long-term relationship where possible. As far as they concerned, the best partnerships grew over time, were dynamic and evolving, and often operated mostly on a three year cycle.

The most successful partnerships were characterised by high levels of cooperation between the two organisations which basically relied on the good relationships and communication between several key people from both sides. Both VET provider and industry partner were interested in supporting each other and in meeting their existing and emergent business objectives. They were using each other's contacts to increase business opportunities.

### 3 Challenges

Challenges existed for both VET provider and industry partner. The uppermost ranking challenges for VET provider were timelines of scheme work completion, timelines of consultation, and resource availability. The main challenges for the industry corporation were timelines of project work completion, lack of transparency of mutually agreed upon goals, and differing partnership goals. VET provider respondents stated that adjustment were made as the partnership progressed and that challenges were worked out eventually but it took along time. Industry corporation respondents reported that steady communication was required between the two partners and that lots of meetings and multiple conversations helped resolve the challenges.

### 4 Conclusions

There are four conclusions derived from the findings of the study:

1. Industry/employers underscored that, to become an effective training providers, VET providers should recognize a number of realities about businesses in Indonesia today. Business is in a state of constant change in highly competitive marketplace. Industry required the services of VET providers who understood this, and who were willing to keep up with them.

Training is a considerable cost to any enterprise. The costs are largely financial; include lost staff time, lower production and difficult administrative arrangements to cover for staff in training. In fact, some companies see training as a cost rather than as an investment.

VET providers were making the attempt to respond to industry needs so that teaching staff were less inhibited by their institutional cultures, policies and procedures. The training
systems and bureaucracy were clearly being pushed and squeezed to enable more flexible and customised training.

All VET providers surveyed and interviewed wanted their teachers and trainers to be more up to date with the industry best practice, and latest developments. VET providers were strongly encouraging training staff to visit and talk to employers regularly, especially in relation to the management of various training partnerships and other forms of training. A number of staff had taken secondments to industry. Many used opportunities for on-the-job training and assessment to enable them to remain in touch with their industries.

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Industry Linkages of TVET Programs in Bangladesh
UCEP Programs – A Successful Model

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Abstract

The Technical and Vocational Education and Training (TVET) programs in Bangladesh play a significant role in providing the skilled work force required for the development of the country. These programs are mainly implemented at four different levels namely short courses of 3 to 12 months duration (education level up to grade VIII), 2 year Secondary School Certificate (SSC) vocational course after grade VIII, 2-year Higher Secondary Certificate (HSC) vocational course after SSC and 4year Diploma course after HSC.

The government as well as non-government institutions design the technical training courses as per the skills demand of the job market. But with the fast changing requirements and demand for manpower on newer trades and higher levels of skills a large number of industries are unable to recruit appropriately trained skilled workforce required in the industries. This results in many of the training school graduates remaining unemployed.

The major reason of this employability gap is the inability of the TVET Institutions to adapt or update their curricula and training programs according to the need and demand of the job markets. Various studies have revealed that this gap is primarily due to lack of linkages with the industries and understanding of their requirements. To improve upon the situation, the TVET Institutes need to establish strong linkages and partnerships with the Industry sectors to know their requirements and design the training curricula accordingly. Such linkages are also very important to seek support from the industry sector for sustainable development of the TVET programs in Bangladesh. The training providers are now giving much attention on this aspect and some of the non-government organizations (NGO) have made significant progress on establishing linkages with industries. One such NGO is Underprivileged Children's Educational Programs (UCEP).

UCEP-Bangladesh is an ISO 9001:2008 certified leading national NGO which is implementing a unique program encompassing education, vocational skills training and industry job placement to the poor urban working children and adolescents since 1972. This program promotes youth employment, income generation, poverty reduction and the elimination of child labor for the economic development of Bangladesh. The most significant part of the program is the technical training provided to the students which is based on the requirements of the job market. The curricula of the technical training are reviewed and updated on a regular basis in partnership with the industries for which the employment rate of the job seekers is almost 100 percent. This is possible because of the strong linkages that UCEP maintains with the industries and other stakeholders.

The UCEP education model includes Integrated General and Vocational Education (IGVE) up to grade VIII with pre-tech course and Technical Education (TE) in 21 different trades followed by job placement in collaboration with various industries. The program thus contributes to improving the economic and social condition of the poor and supports the country's industrial development by developing skilled workforces. UCEP programs at
present, has an enrolment of 45,000 children in its 63 institutions around the country and is providing skilled workers to the industries.

A systematic approach is followed by UCEP to establish and develop linkages with industries and obtain their feedback to design and update course curricula, establish training facilities and ensure the quality of skills training being imparted. UCEP has formed ‘Employers Committees’ comprised of representatives from different industries and Advisory Councils composed of TVET experts, corporate sector leaders, local elites, and academia to provide necessary advice and guidance for the development of UCEP training programs. These institutional arrangements of maintaining linkages with relevant stakeholders have made UCEP TVET programs unique in Bangladesh and one of the major reasons for its success.

The UCEP model of TVET has been widely recognized as one of the best solution for skills training, productivity improvement in industries and poverty alleviation in Bangladesh. To have a meaningful impact, this model needs to be replicated throughout the country to produce larger numbers of skilled workers for a faster pace of development of the country and sustainability of the programs.

1 Introduction

Technical and Vocational Education and Training (TVET) refers to education and training that prepares persons for gainful employment (Finch and Crunkilton 1999). In other words, TVET refers to deliberate interventions to bring about learning which would make people more productive in designated areas of economic activity and related occupations.

The Technical and Vocational Education and Training (TVET) programs in Bangladesh are mainly implemented at four different levels namely:

- Trade based short courses – Up to 360 hours with duration of 3 -12 months as per need of the job markets.
- Secondary School Certificate (SSC) vocational – 2 years
- Higher Secondary Certificate (HSC) vocational – 2 years and
- Diploma – 4 years

The 360 hours Basic Trade training programs mainly focus on the development of practical skills with some theoretical knowledge. Its course duration ranges from three to twelve months. The Basic Trade training is offered mainly at technical training centers, technical schools and colleges, by some non-governmental organizations. The training programs cover about 61 trade areas aiming to meet the needs of both the domestic and overseas job markets.

The Certificate Training programs are the SSC (vocational) and HSC (vocational) courses, which are imparted to students at the secondary level of education. Many students prefer Certificate Vocational courses because it has equivalency to the general education system and provides opportunity for higher mainstream education. After completion of SSC (Vocational) program, students may proceed to HSC (vocational) program. After completion of the HSC vocational course, a student may enroll for the 4 year Diploma Course.

Each level of TVET in Bangladesh has been designed for a distinct level of education qualification and skill standards for acquiring certificates, diploma or degrees. The existing qualifications framework of National Skills Standards (NSS) is as follows:

Basic Skill : Routine work under 100 percent supervision
NSS III : Routine job under minimum supervision
NSS II : Routine job without supervision
NSS I : Coordination and supervision of group works
Master Craftsman : Evaluation and control of quality of works
The existing National Skills Standards however has many inadequacies to meet the present day requirements. To improve, harmonize and strengthen the TVET system, the Ministry of Education has undertaken a project to modify the existing technical education qualification framework under a newly adopted Bangladesh Skills Development Policy. The new National Technical and Vocational Qualification Framework (NTVQF) will be introduced in the TVET system soon.

In Bangladesh TVET providers may be broadly classified into four categories: (i) public, (ii) private (commercial), (iii) non-governmental organization (NGO), and (iv) industry. Each of these categories offers a wide variety of formal and non-formal training programs for various target groups.

In the Public sector skills training for 19 ministries and their various departments for all levels of TVET are provided through government operated technical schools, colleges, polytechnic and mono-technic institutions. The Bangladesh Technical Education Board (BTEB) is the sole Government agency, responsible for developing formal TVET programs, certifying private trainers and conducting examinations for TVET qualifications.

Besides the public sector training institutes, hundreds of private training providers run TVET programs for various qualification levels in Bangladesh. These private providers run their institutes on a commercial basis. There are however few NGOs who run the TVET programs mainly for the underprivileged children and the poor. The trainings are mostly free of cost and supported by national and international donors.

According to the BTEB, around 500,000 students are enrolled in formal TVET programs in both public and private institutes but on graduation, a large number of them remain unemployed in spite of there being a huge demand for skilled work force. The main reason for this failure is the inability of the TVET Institutes to adapt their curricula and structure their training programs according to the needs of the job markets due to lack of flexibility and linkages with the industries. This result in a mismatch between the training being imparted and the actual skills need of the industries. This observation was validated by a World Bank assessment of TVET programs in Bangladesh in 2006.

### 2 Industry Linkages of TVET Programs in Bangladesh

The TVET institutes both public and private in Bangladesh in general do not have institutionalized linkages with the industry. The main cause of TVET market irrelevance is insufficient linkages between supply and demand, i.e. between training institutions and employers. A major component is conspicuously missing and that is the involvement of private sector representatives in existing institutional arrangements. The absence of strong links and interaction between TVET institutions and employers result in slow and inadequate responses to market developments.

Regarding the training being imparted in the public sector training institutes, the employers of the training school graduates have no scope for participating in policy development, developing curricula or providing trainers. The Directorate of technical Education (DTE) does not involve industry representatives in decisions on training. The BTEB also does not involve the industry in setting standards, development of instructional materials and in testing and certification, except occasionally for comment and inputs. On the other hand, at the institutional level, insufficient links with employers result in slow and inadequate response to labor market demands and new developments. The training institutions also do not carry out occupational analysis of skills in demand in their localities.

Various studies shows that labor market information is not collected systematically (World Bank 2006, 14). Insufficient feedback mechanisms exist to change and adapt course offerings (ADB 1995, 129). Courses tend to be offered in response to social demands, not based on labor market surveys and analysis. Mechanisms like labor market analysis and comprehensive tracer studies are not used for improving the TVET system. There is no
mechanism for assessing either domestic or global labor market needs and aligning curricula. As a result, curricula do not reflect adequately up-to-date core technical skills, specific sector skills and soft skills.

The TVET institutes need to establish strong linkages and partnerships with the industry sectors to meet their requirements and seek support for sustainable development of the TVET programs in Bangladesh. The assessment of the Vocational Education and Training in Bangladesh by the World Bank (2007,15) has found that few Bangladeshi NGOs are successful in designing and delivering market responsive training programs through establishing linkages with industry sectors. Among the leading NGOs in Bangladesh engaged in innovative and quality vocational education and training, Underprivileged Children’s Educational Programs (UCEP), Dhaka Ahsania Mission (DAM) and Mirpur Agricultural Workshop and Training School (MAWTS) have uniquely designed and delivered programs.

3 UCEP – Linkages with Corporate Sector Industries

Underprivileged Children's Educational Programs (UCEP) is an ISO 9001:2008 certified leading NGO in Bangladesh, which is implementing a unique model of education, vocational skills training and industry job placement to poor urban working children and adolescents. The program promotes youth employment, income generation, reduction of poverty and the elimination of child labor for the economic development of Bangladesh. The technical training provided to UCEP students are based on the requirements of the job market, continually assessed through UCEP’s strong industry linkages. UCEP programs which were started with only 60 children in 1972 now have an enrolment of 45,000 children in 63 institutions around the country, successfully providing skilled workforce to the industries.

The main objective of UCEP programs is to ensure human rights and good governance with a view to improve the socio-economic status of the urban poor and support industrial growth by generating skilled work force. UCEP has global reputation for its unique model of human resource development. UCEP's success has enabled it to be listed twice in the UN ESCAP's "Compendium of Centers of Excellence in HRD Research and Training".

The UCEP model includes Integrated General and Vocational Education (IGVE) up to grade VIII and Technical Education (TE) in 21 different trades followed by job placement in collaboration with various industries of Bangladesh. UCEP operates 53 Integrated General & Vocational (IGV) Schools and 10 Technical Schools in Dhaka, Chittagong, Khulna, Rajshahi, Barisal, Rangpur, Sylhet Metropolitan Cities and in Gazipur District. The UCEP model of education and training is well recognized at home and abroad and producing skilled work force. The model of UCEP is shown below.

![UCEP Model of Education](image)

Figure 1: UCEP Model of Education
3.1 Target Group

The target group of UCEP consists of urban slum children without access to normal schooling, who are engaged in hazardous jobs and labouring on an average 48 hours per week. They are generally dropouts from formal education and earning less than US$ 10 per month.

3.2 Integrated General & Vocational (IGV) Education

UCEP IGV schools follow the national curriculum in an abridged form along with basics of technical education and complete each grade in 6 months instead of 1 year the usual time required in a formal school. UCEP schools use the textbooks prescribed by the National Curriculum and Text Book Board (NCTB) along with its own additional books up to grade VIII. The IGV education also includes 6 months of pre-tech course as a preparation of entering into the Technical schools.

3.3 Technical Education (TE)

Upon completion of IGV education, UCEP students pursue skills training in the technical schools. UCEP provides technical education in 21 trades through 10 technical schools. The trades of technical schools are based on the demand of the labour market. UCEP has also launched Diploma in Engineering Sponsorship program for its graduates who successfully complete SSC (Vocational) and are willing to go for higher studies. The trades of UCEP technical education programs are given below.

<table>
<thead>
<tr>
<th>Name of trade</th>
<th>Duration</th>
<th>Intake capacity in a session (06 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto Mechanics</td>
<td>12 months</td>
<td>250</td>
</tr>
<tr>
<td>Motorcycle Service Mechanics</td>
<td>10 months</td>
<td>30</td>
</tr>
<tr>
<td>Welding &amp; Fabrication</td>
<td>12 months</td>
<td>245</td>
</tr>
<tr>
<td>Machinist</td>
<td>12 months</td>
<td>155</td>
</tr>
<tr>
<td>Advanced Welding</td>
<td>06 months</td>
<td>40</td>
</tr>
<tr>
<td>Industrial Electrical &amp; Electronic Control</td>
<td>12 months</td>
<td>450</td>
</tr>
<tr>
<td>Electronics Technology</td>
<td>12 months</td>
<td>180</td>
</tr>
<tr>
<td>Refrigeration &amp; Air Conditioning</td>
<td>12 months</td>
<td>170</td>
</tr>
<tr>
<td>Plumbing &amp; Pipe Fitting</td>
<td>12 months</td>
<td>60</td>
</tr>
<tr>
<td>Textile Spinning Mechanics</td>
<td>12 months</td>
<td>30</td>
</tr>
<tr>
<td>Textile Weaving Mechanics</td>
<td>12 months</td>
<td>20</td>
</tr>
<tr>
<td>Textile Knitting Mechanics</td>
<td>06 months</td>
<td>25</td>
</tr>
<tr>
<td>Industrial Sewing Operation</td>
<td>12 months</td>
<td>505</td>
</tr>
<tr>
<td>Garments Finishing &amp; Quality Control</td>
<td>06 months</td>
<td>60</td>
</tr>
<tr>
<td>Industrial Garments Machine Mechanics</td>
<td>12 months</td>
<td>60</td>
</tr>
<tr>
<td>Industrial Wool Knitting Operation</td>
<td>06 months</td>
<td>185</td>
</tr>
<tr>
<td>Industrial woodworking</td>
<td>12 months</td>
<td>45</td>
</tr>
<tr>
<td>Offset Printing Technology</td>
<td>12 months</td>
<td>10</td>
</tr>
<tr>
<td>Aide to Nurse</td>
<td>12 months</td>
<td>110</td>
</tr>
<tr>
<td>Screen Printing</td>
<td>12 months</td>
<td>40</td>
</tr>
<tr>
<td>Apartment House Management</td>
<td>06 months</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>2690</strong></td>
</tr>
</tbody>
</table>

3.4 Information technology (IT) in UCEP

UCEP has introduced computer courses its programs to prepare the students to cope up with job markets. It has 63 IT Centres equipped with computer labs in each school.
3.5 Employment Support Service

One of the unique features of UCEP programs is to provide employment to the technical school graduates through maintaining regular linkages with employers. The Employment Support Service of UCEP operates through labor market survey and maintains linkage with employers. The cell observes Employer's Day, calls for meetings with the employers, observance of job hunting days and follow-up visits to the employers and employed graduates. The students are prepared for the employment market through training and proper guidance. The employment cell of UCEP also arranges jobs for the technical school graduates within six months after graduation.

UCEP has established regional units, which focuses on the local and regional labour market. The search for potential employment opportunities are not limited to the geographical areas of the region or be confined within the national borders, but to explore opportunities for skilled employment overseas.

To keep up with the changing trends and shifting demands of specific skills, the employment cell regularly updates and upgrades itself through training, workshops and seminars, and liaises, in close collaboration with the private sector and employers.

3.6 Linkages with Industries

UCEP programs follows a systematic approach to establish and develop linkages with industries and obtain their feedback to design/ improve course curricula, establish training facilities and ensure quality of skills training being imparted. UCEP has formed 'Employers Committees' comprised of representatives from different industries and Advisory Councils composed of TVET experts, corporate sector leaders, local elites, and academia to provide necessary advice and guidance for the updating and development of UCEP training programs. These institutional arrangements of maintaining linkages with relevant stakeholders have made UCEP TVET programs unique in Bangladesh.

4 Significance of UCEP Approach

UCEP TVET program imparts skills training to its students that meet the demand of various industrial sectors, including mechanical, electrical, electronics, garments, textile, pharmaceutical, transport, power and energy, health (aide to nurse) etc.

Through its strong industry linkages and partnerships, UCEP's employment cell facilitate approximately 5000 TVET graduates in a year with industry-based employment, with over 95% of these graduates are employed within 6 months. The graduates employed contribute significantly to the improvement in quality and productivity of the industries by meeting the shortage of skilled workers in Bangladesh.

One of the most significant approaches of the UCEP model is its building of linkages with employers to support the transformation of underprivileged youths into productive skilled human resources. The cooperation, understanding and participation of the corporate sector industries with UCEP are the key factors for its success.

5 The UCEP Model - Its Implications for TVET Programs

The UCEP model of TVET has proved to be the solution for skills training, productivity improvement in industries and poverty alleviation in Bangladesh. The program though very effective addresses only 0.5% of the total estimated working children in the country. To have a meaningful impact, the model needs to be replicated throughout the country to produce
larger numbers of skilled hands for a faster pace of development and sustainability of the UCEP programs.

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Indian Experience of Internal and International Collaboration in TVET and Prospects of Regional Cooperation

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Abstract

Appropriately educated and skilled Human Resource (HR) is such an asset for a country which can be instrumental in accruing several other assets such as a sound, sustained economy; social development and cohesion; international leadership and such others. What can be considered ‘appropriate’ education and training is a question which is constantly in the centre of local and global debates and discussions. It is also a dynamic phenomenon as what is suitable and desirable today may not be appropriate tomorrow. For example, earlier, education and training prepared a person for a career for lifetime but now the trend is towards frequent and multiple career changes, part-time and causal work. To remain relevant and meaningful, the process of education has to undergo various transitions, reforms and adaptations which are even more frequent in the current context. The fast pace of development is driving even the ‘established’ set-ups to a continuous review and reforms. With respect to Technical and Vocational Education and Training (TVET), throughout the world, the countries are constantly trying to adapt to a new economic and social order. No country today can prosper in isolation. All are part of a global landscape. Changes, challenges and growth of one affect the other. The latest example is the crisis in Greece. The whole European Union is working to pull the country out of it. Another example is the reported global shortage of skills (HR) in times to come while Asia is being seen as a potential hub for development of competent and competitive HR. At the same time if the much talked about demographic dividend of this region is not suitably cashed, it would be a global disaster. Thus, ‘growing together’ is the key to global peace and prosperity wherein internal, regional and international cooperation is going to play a determinant role. These collaborations must address the issues of skill requirements, international benchmarking of skill standards and competency assessment, comparability of qualifications and such others. Moreover, it is necessary that such initiatives must rise above the paperwork and declarations become functional, responsive and effective. The paper discusses in detail the Indian experience and experiments with internal cooperation and various international collaborations. The regional prospects are also identified.

1 Introduction to the Indian System of TVET

In India, in olden times, the education was wholesome, undemarcated into levels (primary, middle, secondary or higher) or forms (academic, religious, moral, career oriented). It included knowledge, character building and skill training. The students were taught to develop qualities of self-reliance and respect mutual equality. This system also gradually had spread to small villages and continued for thousands of years. Some world famous universities of India, such as, Nalanda, Taxshila (now in Pakistan), Vikramshila were based
on this system of education. Besides this, the two age old methods of learning on the job (apprenticeship) and learning in family tradition existed in ancient cultures, including India. As the cultures progressed, demands of development necessitated formalization of education imparted outside homes in schools and colleges [Agrawal 2009 p.191].

Traditionally, history, culture, political and sociological features affected the TVET systems in a country, later pace of urbanization and industrialization, technological revolution and labour demands set the pace of expansion and reforms. However, in the last one to two decades, globalization, emergence of knowledge society, liberalization and employment equations in free economies have necessitated rethinking on the policies and long-existing structures of education and training. Concerns for gender equity, social equilibrium and justice exercise demands on policies and programmes for specific social groups. The mandate has been reaching all and building human resource for all areas of need within emerging global society [Agrawal 2009, p.44].

1.1 Vocational Education (VE)

The integrated system of imparting knowledge with manual work (skills) gave way to two distinct systems of General and Vocational (or Technical) education. The general education, even today, aims to enhance the general proficiency, is mostly knowledge based and does not prepare the learner for any specific job or occupation. VE on the other hand, happened to be designed to develop competencies specially suited to identified occupation(s). As is the case in many other countries, in India also general education and VE were conceptually and operationally severed from each other. Vocational education is usually offered at secondary or senior secondary level (10 or 12 years of school education, respectively) and terminates there, leading to a certificate. Some options of continuing VE exist leading to diploma, but it still remains at the sub-university level without articulation with academic education. VE and vocational training were also distinctly differentiated from each other by their relative contents of knowledge and skills. The VE Programmes were designed to develop considerable knowledge base along with skill development while in case of training, often there has been very little, if any, theoretical content. The target groups, mode of delivery and management also differed. At present, the programme of VE in India is under the aegis of Ministry of Human Resource Development (MHRD). Under the Constitution of India, education is a concurrent subject of State and Central Government. While the Central Government has the responsibility of developing policy, training standards and procedures, etc., the actual implementation is largely up to the State Government. The implementation, being the state’s responsibility, has, however, not been uniform throughout India.

The school education in India offers the learners opportunity of vocational exposure, orientation, exploration and training in different ways, i.e. Work Education from classes I to VIII, prevocational education in classes IX and X and vocational education as a distinct stream in XI and XII. The work oriented education offered at elementary level under various nomenclatures, is meant to prepare children to face life with proper attitude, knowledge and skills in relation to work. This is expected to promote socio-personal and vocational development and ultimately lead to smooth transition to the world of work [Agrawal 2000, p.31]. The need to extend the scope and outreach of vocational training was recognized by the Planning Commission in the Tenth FYP, 2002-2007 and several reforms have been introduced.

1.2 Technical Education (TE)

All India Council for Technical Education (AICTE) is a statutory body entrusted with the task of planning, co-coordinated development, quality assurance, monitoring and evaluation of (TE) in India. Its mandate extends to technical and managerial education, training and research at various levels (diploma, undergraduate, post graduate). It covers a wide
spectrum of areas such as Engineering and Technology, Computer Applications, Information Technology, Architecture and Town Planning, Management, Pharmacy, Applied Arts and Crafts, Hotel Management and Catering Technology, Vocational Education etc. The Council is also responsible for industry linkage. The entry requirement for Diploma in engineering and technology is a secondary, i.e. 10th pass certificate (age of entry 15/16 years) and the duration is not less than 3 years, unless otherwise specified by the AICTE. The duration of new programmes in emerging technologies as well as those based on flexible modular structures with multiple entry are of different durations.

1.3 Technical and Vocational Training

Development and Co-ordination of the vocational training in different sectors is the responsibility of the Ministry of Labour and Employment (MOLE). Under the Ministry, the Director General of Employment and Training (DGE&T) covers training services for all categories of jobs through its country wide network of Industrial Training Institutes/ Centres (ITIs/ ITCs). DGE&T is training over one million persons every year. Besides these initiatives of the MOLE and MHRD, there are several other programmes and activities under the purview of seventeen different Departments/ Ministries. These include Ministry of Rural Development, Development of Women and Child Development, Ministry of Industries, Khadi & Village Industry Commission, National Institute of Open Schooling (NIOS), Department of Small Scale Industries, Department of Tourism (Food Craft Institutes) etc. All these programmes, with a capacity of about 1.3 million largely cater to the needs of the informal sector in a limited manner.

1.4 The Lessons Learnt and the Reasons for Reforms in TVET

There has been an intense need to coordinate and establish internal cooperation among these Ministries and Departments offering TVET at various levels to a variety of clientele. The bottleneck was that the courses were of fixed duration of 2 years, were often not need based and vertical linkage was not built-in into the system. These issues are recently addressed by creation of a suitable management structure and launch of National Vocational Education Qualification Framework (NVEQF), which will be discussed in appropriate section.

The 10th Five Year Plan (FYP) 2002-07, reflected that the growing problem of unemployment among the youth requires a recasting of the entire vocational education scheme. For future policies on vocational courses it emphasised that the vocational courses should be demand and need-based, keeping in mind the constantly changing requirements of technologies/industries and must have an in-built flexibility to allow students to switch courses with changes in demand patterns. The existing scheme should be strengthened by involving industries through MoUs in the designing and certification of courses and training of students and faculty. In view of the exploding opportunities in the services sector, vocational courses should concentrate more on this sector. The apex industry associations like the Federation of Indian Chambers of Commerce and Industry (FICCI), Associated Chambers of Commerce and Industry (ASSOCHAM) and Confederation of Indian Industry (CII) need to be involved to a greater extent in the implementation of vocational education programmes and imparting of skills. Among the suggested measures for improvement of effectiveness, efficiency and relevance of training are: strengthen interaction between industry and ITIs, introduce modular training and multi-skilling, introduce competency-based certification for workers without formal training.
2 Some Initiatives for Reforms

2.1 National Curriculum Framework (NCF), 2005

It proposes that work-centred pedagogy be a central organizing theme for reconstruction of the present education system from the pre-school stage up to Class XII. Work needs to be interwoven in the curriculum for the purpose of acquiring knowledge, building values and promoting multiple skill formation within the framework of generic competencies. Systemic competencies need to be paid attention to, which relate to the overall understanding and capacity for working in changing contexts. These include the ability to comprehend the whole system, develop a holistic perspective, alter parts and design new systems; capacity to work with transfer of learning; capacity to appreciate a paradigm change and re-define one’s role; courage to take initiative and chart new paths; and others. The assessment must be based on such evaluation parameters as will test the multi-dimensional attributes and capacities (including generic competencies) that are expected to develop in the cognitive, affective and psycho-motor domains in a holistic manner [NCF 2005, p.116].

2.2 New Policies

A National Policy on Skill Development has been introduced in 2009 with the objective to create a workforce empowered with improved skills, knowledge and internationally recognized qualifications to ensure India’s global competitiveness in HR. The salient features include creating a system to deliver ‘competencies’ in line with nationally and internationally recognized standards and provide greater space for Public Private Partnership (PPP).

The MHRD has brought a revised scheme of Vocationalisation of Higher Secondary Education in 2011. The revised scheme has greater provisions for partnerships and involvement of industry. The states are announcing their own measures to cope up with the demands of the growing economy.

2.3 National Vocational Education Qualification Framework (NVEQF)

The students offering general courses – like science, arts or commerce at the +2 level and later in tertiary sector of education constitute the bulk of the 60 million educated unemployed youth in the country. These youth and those who are under employed or those looking for a change of job can be immensely benefited by suitable training opportunities. Even for those already employed, training for upgradation of skills is important to maintain productivity and remaining useful to the employer. Further, Tenth FYP envisaged that vocationalization of curriculum is necessary to ensure that a disjunction does not take place between the educational system and the workplace. The need was also felt to integrate various qualifications, right from secondary level to Ph.D. level, interweaving academic education, vocational education, technical education and skill training for vertical mobility and career growth. This is now being realized with the introduction of NVEQF. Framework is market driven. The salient features include competency based, modular, flexible courses with provision of recognition of prior learning, flexibility in delivery mode, training design and diversity in range of courses and training options, covering both the organized and un-organized sector. Each module will lead to certificate of attainment.

2.4 Creation of New Management Structure

In order to make the much talked about ‘demographic dividend’ a dividend in reality, the XI Five Year Plan proposed a comprehensive National Skill Development Mission. Consequently, in 2008, a three tier institutional structure has been created: (i) National
Council on Skill Development (NCSD) chaired by the Prime Minister - its Charter includes vision setting and laying down core strategies, (ii) National Skill Development Coordination Board (NSDCB) chaired by the Deputy Chairperson, Planning Commission which will coordinate action for skill development both in the public and the private sector. As mentioned earlier, as many as 17 Ministries and Departments are associated with skill development. This body will bring in much needed linkages amongst these. (iii) National Skill Development Corporation (NSDC) which is to promote private sector involvement. The NSDC is a unique PPP Enterprise which has been mandated to skill 30% of the overall target of 500 million people by the year 2022.

The National Policy on Skill Development envisages creation of Sector Skill Councils (SSCs), through the NSDC, for performing a wide range of functions, the most important of which are determination of competency standards and qualifications, and accreditation.

3 Indian Experience of Internal Collaboration

The models of TVET, although delivered and managed separately, were based on a collaborative approach. A close collaboration with the industry was envisaged. Vocational schools were not established separately, barring a few exceptions, but vocational wings were started in regular higher secondary schools so as to keep link between academic and vocational education.

3.1 Linkage with the Industries

For vocational courses, industry representatives were involved for curriculum development at national level. Provision was made to involve the experts from local industry as guest faculty to conduct practical classes. The extent and nature of collaboration with the industry, however, was not uniform all over the country as implementation lies with the states. Some places do not have industries around and for such cases a novel concept of Production cum Training Centres was introduced. It also varied with the nature of vocational course, e.g. for x-ray technician course, association with a hospital or nursing home is a must. An interesting experience has been that usually industry participation in events such as a National Seminar or Workshop was not very exciting. At Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), National Council of Educational Research and Training (NCERT), we used to conduct vocation specific National Conferences with the industry but the presence used to be limited. The industry representatives didn’t seem interested in travelling long distances to participate in such events in which they probably didn’t see an immediate outcome of interest. Hence, we planned a different approach for industry linkage for Food Processing vocational course in Gujarat. We conducted meeting at schools where the course was being run, involving local industries and bank managers (for financing entrepreneurial ventures of vocational graduates) along with one representative from state level industry, the Gujarat Agro Industries and one representative from a national level Association, the All India Food Processors’ Association. While the representative from the Association was helpful in mobilising state level representation and the local industry participation, the local industries got interested as they didn’t need to spend much time in travel and the prospect of a trained, skilled HR for their venture was handy. These meetings proved to be very useful as the branch managers agreed to give soft loans to vocational graduates at the recommendation of the Principal of the school and the local industries agreed to give chance of employment to the students as they could interview some of the students then and there and were satisfied with the education and training received by the students. The Managing Director of one leading beverage industry in the state offered to conduct campus interviews in the school he visited and employ two top students from each
batch. The success of such efforts, however, depends on sustained efforts and monitoring, besides maintaining the quality.

Some of the courses were planned and organised in collaboration with industry. These were need based and tailor made according to their requirements, hence, absorption in the employment was cent per cent. Some examples are a course on insurance with the Life Insurance Company (LIC) of India and a course for Indian Railways.

3.2 Internal Academic Cooperation

Vocational students can directly join the second year of the three year Diploma programme under Lateral Entry System in all Polytechnics. Their intake is restricted to 10% of the sanctioned intake of the Diploma courses. There is a possibility of lateral entry of meritorious Diploma students to the Degree level, provided they have secured at least 60% marks in aggregate in diploma. Such students are considered academically equivalent to the student who has passed first year of the 4 year degree programme and thus, are allowed entry into the second year (third semester) directly. An additional 10% seats are reserved for such students and the admission is on the basis of merit in the entrance test and once admitted there is also provision of remedial courses as per need. The entry requirement for degree programmes in engineering and technology is a senior secondary, i.e.12th pass certificate (age of entry 17/18 years) and the duration is 4 years. The pass certificate of vocational students in areas of engineering and technology also makes them eligible to compete for the entrance into the Indian Institute of Technology (IITs).

Such eligibility is also given for degree level courses in respective vocations, such as for Bachelor degrees in Commerce, Home Science, Agriculture, Dairy Science etc., however, there are state level differences in such matters and as universities have their own regulations for admission, it may also differ with the universities. Ironically, when University Grants Commission (UGC) started degree level vocational courses, the vocational graduates of higher secondary stage were not considered eligible.

Some state level initiatives have brought rich dividends for vocational students, such as in Chandigarh, students of X-ray technician course were eligible for a course in radiology at the prestigious Post Graduate Institute of Medical Education and Research (PGI), Chandigarh. This opportunity opened good options for employment of students of this course and the course got a considerable popularity on this account. There are many such examples with different courses in different states but there is no uniform pattern.

3.3 Some Recent Initiatives of Internal Cooperation

In the XII FYP, education and skill development have been given exceptionally high priority. Presently, the MHRD has taken up with the Department of Economic Affairs in the Ministry of Finance, the issue of nationalised banks and finance companies for providing soft loans to help those who have completed vocational education to set up their own enterprises. The Labour Ministry launched a scheme on skill development initiative through Public Private Partnership under which short term training courses on modular pattern are conducted [PIB Dec., 2006, p.1]. For producing multi-skilled work force of international standard and targeting 10-million employment opportunities per year, up gradation of 500 existing ITIs into Centres of Excellence has been taken up. Introduction of multiskilling courses in the first year followed by advanced/ specialized modular courses in the second year; adoption of industry wise cluster approach, multi entry-multi exit provisions; Public Private partnership in the form of Institute Managing Committee to ensure greater and active involvement of the industry are the specific features of the scheme (Ministry of Labour and Employment, 2006-07).

DGE&T under the Ministry of Labour and Employment, in 2006-07, has started a new scheme of ‘Testing and Certification of Skills’ acquired through informal means. Initially 8000
construction workers were tested and certified involving Construction Industry Development Council. For 46 skill areas, competency standards have been developed, while for several others the process is in progress. About 17 states have given their assent to implement the scheme at state level [Ministry of Labour and Employment 2006-07].

The prominent industry associations in India, namely, FICCI, CII and PHD Chamber of Commerce and Industry, are now taking keen interest in skill development. It is being realised that an Industry-Academia Collaboration is the need of the hour to generate opportunities for development of skilled human resource that will give India a global edge. These chambers have taken steps in creating training opportunities in various sectors with concerned industries, organising national and international level discussions, conferences and studies.

However, these till recently have been 'stand alone' kind of efforts rather than real collaborations among various education and training providers, industries and employers, financing bodies, policy planners and academic institutions. The system will become effective to meet the challenge only when collaborations become functional amongst these.

This issue is being addressed with the creation of new management structures, launch of NVEQF etc. as described above. The NSDC, one of the new management structures created, through the SSCs funded by it, has been coordinating with the MHRD and MOLE on evolving a Skills Qualification Framework that would allow for a seamless transfer from vocational education and training to academic education. In partnership with MHRD and NSDC, a pilot is being run in one of the states in India. Working towards realising a vision of making India the skill capital of the world, a number of skill gap studies have been conducted/ coordinated for important sectors in the economy, task of specifying national skill standards for different occupations has been undertaken. NSDC has also reported reaching out to government bodies, institutions and organisations internationally to import expertise and know-how, wherever necessary, in certain sectors, e.g. food processing, retail, automobile, construction etc. Steps are also being taken to bridge the skill gaps identified through studies. For example, a study shows that auto and auto ancillary segment will face a shortage of 35 m by 2022. To meet the challenge, TVS Motor Co. Ltd. is tying up with NSDC to create the trained workforce pool [NSDC Annual Report 2012, p. 6-7,16].

4 Indian Experience with International Collaboration

India has cultural agreements with 118 countries. Education component forms a part of most of the Cultural Exchange Programmes (CEPs). Since 2002, the MHRD has entered into exclusive Educational Exchange Programmes (EEP, in some cases called MOUs) with many countries including Australia, New Zealand, Sri Lanka, Brazil, Afghanistan, South Africa, China, France etc.(MHRD,2012, p.1) With respect to TVET, the policies and programmes have been particularly inspired from the TVET systems in Germany, Australia, New Zealand and U.K. In April 2002, the UK India Skills Forum (UKISF) was established to provide a platform for organizations across the technical and vocational education sectors in UK and India, to tap the business opportunities in the sector by exchanging ideas for delivery of skills training by collaborations between the two countries. The UK India Business Council (UKBIC) acts as the point of contact for the UK skills providers, while the FICCI acts as the main point of contact for Indian skills providers. Germany has been providing both financial and technical assistance to India since 1958. Institutes like Foremen Training Institute (FTI), Bangalore; National Instructional Media Institute, Chennai or the Central Staff Training and Research Institute (CSTARI), Kolkata were set up with assistance from Germany. A meeting of the Indo-German Joint Working Group on Vocational Education and Training saw a consensus on creating a PPP on the pattern of the German Dual system. The Indo-German Joint Commission on Industrial and Economic Cooperation has emphasized on more investment by the German Companies in India to take advantage of the business
opportunities available in India. Recently, a leading German Automobile, Volkswagen, started an apprenticeship program in India based on the dual system of vocational education and training in Germany. Australia is also collaborating with India in various skill development initiatives so as to share expertise and experiences. This is also facilitated through the new bilateral Australia India Education Links website. The website is an information portal which supports education and training collaborations between Australian and Indian education and training institutions, business and industry. A Bureau for Vocational Education and Training Collaboration (BVETC) was established by Australia and India in 2010 to facilitate linkages in the skills areas. The BVETC meets regularly to consider collaboration proposals from the vocational education and training sector and provide advice on the best ways to achieve successful partnerships between the countries. India and U.K also have together undertaken several collaborations and initiatives on skill development. The UK India Education and Research Initiative aims to work with a range of different skills and training bodies to enable participation and facilitation of skill development requirements in both these countries [FICCI 2012, p. 12-13]. The New Zealand Open Polytechnic and National Institute of Open Schooling have also signed an agreement for skill development through distance learning. A India-New Zealand Education Council has been constituted to draw up a framework and devise mechanisms of co-operation and set the agenda for improving educational relations between the two countries. During its first meeting held in October 2012, both sides expressed their commitment to earmark US$ 1 million annually to enhance the co-operative activities through specific programmes designed by the Council. The programmes will include joint research, student mobility, qualifications framework and vocational education and training, among others. The members of the council recognized skill development, especially catering to the needs of the industry and keeping pace with the exponential growth in global mobility of workforce, as one of the major challenges facing the two countries and pledged further collaboration [Digital Learning 2012, p.1]. In addition MOUs for mutual recognition and equivalence of degrees, diplomas and other educational qualifications with many countries are also under consideration. My organisation, the NCERT, has exchange programmes with a number of countries. In past, it has held training programmes for Sri Lanka, Maldives, Afghanistan, Indonesia etc. More recently, in pursuance of the developments in Indo-Afghanistan Collaboration, a 20 month diploma course in English and English Language Teaching was organized for Afghan youth in 2010-11. For UNESCO/APEID i.e Asian Programmes of Educational Innovations for Development, NCERT acts as its secretariat and as an Associated Centre and thus has been active in the designing, development and implementation of APEID activities in the region. PSSCIVE, NCERT is also a UNESCO/UNEVOC centre. A number of visitors/delgations continue to come in NCERT from across the globe as well as many faculty went abroad for various programmes. NCERT keeps contributing in JWGs and MOUs with various countries.

5 Future Priorities

The competition is no more local but a global phenomenon. The people have to compete with others around the world. Therefore, HR policies and skill standards in other countries become important and benchmarking needs to be done against international standards. One has to keep an eye on the best practices in other countries and learn from the success and failures of initiatives in global scenario. Bilateral and multilateral partnerships, with high potential to remain functional need to be established. In view of fast changes in technologies and financial markets; emergence of global economies, products and services; growing international competition and new forms of business and management practices, such partnerships become even more crucial if we want to give a competitive advantage to our work force.

Some priorities for the future in international collaboration could be:
International benchmarking of and recognition to
  - National Qualification Systems
  - Standards of skills / competencies
  - Prior learning / Credit accumulation
  - Joint Certification
  - Documentation of Best Practices/ Innovations
  - Exchange of
    - Officials
    - Trainers/ Teachers
    - Learner

However, in case of bilateral partnerships, specifics would have to be worked out. For example, in case of Indo-Australian collaboration, during a meeting in the MHRD in Feb.'2010, Australian counterparts expressed that Australian Council for Educational Research (ACER) is keen to work with India on aspects of vocational skills, especially in the service sector, implementation of NQF and international recognition of skill standards. For India, it would be interesting to study and learn from the Australian experience in continuing education in TVET and acknowledgement of previous learning. It would be worthwhile to study the decentralization and school management practices in New Zealand while South Korea has gone far ahead with respect to TVET in the age group of 10-18 years. However, a recent delegation to NCERT mentioned that a problem of decreasing interest of youth in TVET is being faced by them also. They don’t have a qualification framework and were planning to design it now. India just having launched a NVEQF can share material and experience with them. Indonesia can be another country which is of interest for collaboration for Indians because this is one of the E-9 countries and it shares various similarities with India. Thus, specific elements of collaboration are to be worked out in case of bilateral cooperation.

6 Regional Perspective

About a quarter of the world’s population (24%) resides in South Asia, a large percentage of which is of the productive age and youth. The projections of the United Nations reveal a 40% increase in the population of this region by 2050 and that of 35% increase in the working age population by 2030 which is expected to grow up to 50% by 2050. Thus South Asia will contribute to the majority of the growth in the world’s working age population over the next several decades. At the same time an estimate reveals a global shortage in the skilled HR to the tune of 56 million by 2020. By extending regional cooperation in TVET, the SAARC countries can become a zone for potentially employable skilled competitive HR. International division of FICCI has also felt a need to create a regional Skills Development Forum (SDF) amongst SAARC countries and has conceived some areas for which SDF can be useful (Taneja 2012, p. 9-10).

In India, in 2004-05, the total employment in the country was estimated at 459.1 million out of which 56.8 percent of workforce belonged to self employment, 28.9 percent to casual labour, and 14.3 percent to regular wages. About 8 percent of the total work force in India is employed in the organized sector, while the remaining 92 percent are in the non-formal sector. The quality of employment in organized sector is generally high though the scope of additional employment generation in this sector is rather limited. Significant employment generation is taking place in tertiary sector, particularly, in services industries. Self-employment and small business continue to play a vital role in this regard. It is, therefore, necessary to promote main employment generation activities like (a) agriculture, (b) labour intensive manufacturing sector such as food processing, leather products, textiles (c) services sectors: trade, restaurants and hotels, tourism, construction and information technology and (d) small and medium enterprises.
Similar is the case with other countries in the region. SAARC economies are primarily agrarian, now attempting to diversify and industrialising their economies. The service sector is coming up as the major contributor in the GDPs. For example, Bangladesh, having the second largest workforce amongst SAARC countries after India, has 19% contribution to GDP from agriculture, 29% from industries and 53% from service sector. In Sri Lanka, 58% contribution is from service sector. Agriculture, forestry and fisheries are important sectors in Bangladesh, agriculture and forestry in Bhutan, tourism and fisheries in Maldives, agriculture and textiles in Nepal, textiles and construction in Pakistan and textiles, tourism, IT, gems and jewellery etc. in Sri Lanka (Joint ADB-FPCCI Report 2010). In India, 20 sectors have been identified as sunrise sectors which include all most all of these. Thus, we see that the SAARC countries can gain a lot with regional cooperation.

6.1 Some prospects of regional cooperation

- Policy research on TVET: policies on TVET in different countries and their implications on HR development, utilisation of research findings in introducing appropriate changes in education and training systems, curricula etc., thus making them more responsive and relevant
- Establishing Sector wise Regional Vocational Qualification Frameworks in sectors of common interest, such as, agriculture, fisheries, tourism, textiles, gems and jewellery, health, medicinal plants etc.
- Sector wise research on market trends for HR requirements and skill gaps
- Identification of skill standards and their international benchmarking
- Ensuring quality standards at various levels
- Identifying strength areas for skill development in each SAARC country and designing suitable exchange programmes to learn from each other
- Designing standards and processes for competency evaluation and ensuring comparability and transferability.
- Working on the possibility of joint certification

7 Epilogue

The Asian countries look forward to seeking an edge in the global HR market through TVET as a prominent strategy. In Asian region, there is a common realization of the importance of skills in the socio-economic development as reflected in the conference report on case studies on TVE in Asia and the Pacific in 1996 – “The future international competitiveness in trade and increases in national productivity will only occur by having a skilled work force capable of meeting the technological changes of the 1990s and beyond”. However, designing education and training is a continuous endeavour of exploration, experimentation, invention and reinvention; with a pace that the society demands [Agrawal 2009 p.201]. Much needs to be constantly done in Human Resource Development. India has a young population eager to learn and work. It requires suitable and timely education, training and retraining. Efforts are on but appear inadequate at present in view of the growing domestic demand and international openings available. The encouraging signs are the appreciation of the issues concerning TVET at every level and willingness of the policy formulators to find solutions. India is on the march and has the experience to ensure that skilled, competent and committed workforce supports it. All the countries in the region and most of the countries in the world are giving high priority to TVET and are believing in the policy that ‘together we achieve more’ thus paving way for vibrant functional collaborations.
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Keeping Current: The Industry Knowledge and Skills of Australian TVET Teachers

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Abstract

Of all education sectors, Technical and Vocational Education and Training [TVET] is the most closely tied to Australia’s economy due to industry’s reliance on the training the sector provides. Teachers in TVET institutions play a crucial role in ensuring new and existing workers have the skills required to meet industry needs. It is critical, therefore, that TVET teachers are themselves highly skilled and industry savvy. Industry wants to be confident that teachers possess the current skills and knowledge of industry essential for effective training [Guthrie 2010]. Individual employers expect any training to be relevant and specific to their workplace. They do not want staff trained in outdated and inappropriate practices [Toze and Tierney 2009].

With the ageing of the TVET teaching workforce and limited access to industry-focused professional development there is growing concern about the capacity of teachers to deliver the skills required by the economy. Many teachers constantly refresh their industry skills and knowledge and operate with great effectiveness in industry. Others, however, do not. Quality standards for TVET institutions demand teachers have industry current skills, but many have struggled to find effective ways to support and resource the continuing professional development essential for keeping people up-to-date.

Given these circumstances, this research was designed to explore the issue of industry currency in the TVET sector, particularly from the viewpoint of industry. The study used a qualitative methodology involving semi-structured interviews with learning and development managers in nine knowledge-leading organisations and twenty-two semi-structured interviews with employers in small to medium enterprises, industry auditors and representatives of Industry Skills Councils and industry associations. The industry areas examined included science, engineering, human resources, health [nursing], plumbing, printing and hairdressing.

The research found that while employers would like teachers to keep current, they did not think it feasible especially where industry trends and technological changes were constantly impacting on workplaces. Strategies that were considered useful in keeping teachers current were strong management support for ongoing training, collaborative learning in the workplace, targeted professional development activities and networking with industry. The research also identified the need to establish and maintain an organisational climate that supports updating of industry skills while offering continuing professional development that encompasses the full range of updating approaches. Also highlighted was the need to adopt a strategic approach to the maintenance of industry currency, particularly where technology and technical knowledge were constantly being superseded. As new knowledge emerges and skill requirements change, TVET teachers in the areas of change need to be provided with specific training to keep them abreast of the changes. Importantly the research also highlights the need to introduce innovative approaches to upskilling that
not only offer formal and structured learning but also informal and incidental collaborative learning opportunities that inevitably arise during the conduct of day-to-day work.

1 Introduction

Over the last decade, successive Australian governments have used the three issues of population, participation and productivity as the policy drivers to underpin the nation’s current and future growth. Workforce participation and productivity are directly linked to the Council of Australian Governments’ targets for the increased educational attainment of the population. The Technical and Vocational Education and Training [TVET] sector is responsible for providing the training needed to meet increasing demands from industry for more highly skilled Australian workers. A key measure of the quality of this training is the work-readiness or competence of the individuals being trained. Achievement of work-readiness by learner-workers is largely dependent upon the teaching expertise and vocational competency of TVET teachers. This means that TVET teachers must have an industry qualification and a broad understanding of the industry in which they are training. In addition they are required to have relevant current experience in that industry. Industry currency therefore is a crucial aspect of TVET teacher capability.

Although it has been identified as one of the most significant requirements for TVET teachers, there is limited research in Australia that focuses explicitly on industry currency [Productivity Commission 2011; Toze and Tierney 2010; University of Ballarat 2009]. Much of the research into TVET practitioner capability focuses on pedagogical capability and refers to industry currency as one aspect in a wider review of the capability requirements affecting the quality of teaching, learning and assessment [Callan 2006; Guthrie, Perkins and Nguyen 2006; Mitchell 2010; Wheelahan 2010]. Further, there is evidence that stakeholder understanding varies over what constitutes industry currency and how an industry currency strategy should be planned, measured and benchmarked [Toze and Tierney 2010]. For example, Toze and Tierney found that industry currency was often confused with industry placement, resulting in a very narrow concept of the range of activities and experiences that can be used to maintain currency. They suggest there needs to be greater recognition that the currency requirements of individual practitioners often mean a much more complex combination of activities appropriate to the contexts in which they are delivering.

The National VET Regulator Standards for Registered Training Organisations [the quality standards for TVET institutions delivering nationally-recognised training] make clear exactly what competencies and knowledge are required by TVET teachers. Training and assessment must be delivered by individuals who have the necessary training and assessment competencies and the relevant vocational competencies. They must also be able to demonstrate current industry skills and knowledge relevant to the training and assessment they are undertaking. In addition they must continue to develop TVET knowledge as well as relevant industry skills and knowledge. What is less clearly defined is what currency looks like in practice and how best to support its development and maintenance. This issue is well documented from the TVET teacher perspective [Wheelahan 2010; Guthrie 2010] however, little is known about how industry views currency [Toze and Tierney 2010; Precision Consulting 2008; Productivity Commission 2011].

From an organisational perspective, keeping current with constantly shifting trends and technological advancements is undoubtedly a challenge for all workers. Organisations, whose core business is the generation and operation of new knowledge, are confronted with maintaining the currency of their professional workforce. The approaches that these organisations adopt to avoid working skills and knowledge becoming obsolete or fading in the face of constant change could potentially provide important insights for TVET institutions and for the TVET teachers building the skills of the broader Australian workforce.
2  Research purpose and method

Given the lack of research in the area, the purpose of this National VET Research and Evaluation Program funded study was to explore employer, auditor and industry representative views on industry currency and how TVET teachers might develop and demonstrate it. A further objective was to examine how knowledge-based organisations managed skills obsolescence amongst professionals in their employ in order to develop a greater understanding of industry currency and how it might best be managed by TVET institutions. The four questions addressed by the research were:

1. What do key industry stakeholders, primarily employers, auditors and industry representatives think about industry currency and what TVET teachers need to do to stay current?
2. In what ways do knowledge-based organisations manage skills obsolescence in their professional workforce?
3. In what ways can approaches to these problems be drawn from industry and the professions be applied strategically in TVET institutions?
4. In what ways might individual TVET teachers and TVET institutions use this knowledge to better maintain industry currency effectively and efficiently?

Information was gathered through semi-structured interviews guided by a review of the literature. For the industry currency focus, 22 interviews were undertaken with key stakeholders, 14 of whom were employers in small to medium enterprises. Two auditors, the individuals responsible for auditing TVET institution compliance with the national standards, were also interviewed as were three industry/professional association representatives and three Industry Skills Councils representatives. Informants were drawn from plumbing, hairdressing and printing industries – all sectors in which technological or regulatory change was seen to be a significant issue. The auditors worked nationally across a range of industries including those under investigation and the industry representatives were directly involved in supporting enterprises in the target industries.

For the focus on skills obsolescence, learning and development managers from nine medium to large enterprises operating in the science, engineering, human resources and health (nursing) industry sectors participated. The nine organisations selected actively engaged in knowledge generation and knowledge sharing and considered the application of new knowledge core business and crucial to business survival. As a consequence, they met the descriptor for a knowledge-based organisation established by Zack [2003 p.4] in that each “...holds a knowledge-oriented image of itself...It uses knowledge and learning as its primary criteria for evaluating how it organizes, what it makes, where it locates, who it hires, how it relates to customers, the images it projects, and the nature of its competition”.

Semi-structured interviews and a questionnaire were used to gather data from informants in the knowledge-based organisations.

3  Key findings and discussion

From both a trade and professional viewpoint, industry currency was not a term with which informants were familiar. Learning and development managers used the term ‘professional competence’ which they described as encompassing the concepts of currency, updating and upskilling. Employers in the hairdressing, plumbing and printing trades preferred the term industry relevance, defining it as a sound grounding in the industry gained from being trained and employed in the relevant industry. They considered industry relevance was much more critical than currency particularly given the technical fundamentals within the majority of industries basically remained stable.
3.1 Is currency possible?

Employers, auditors and industry representatives all acknowledged the difficulties associated with keeping up with constantly-emerging technological innovations, regulatory and legislative change and shifts in client demands. The plumbing, hairdressing and printing employers generally considered that it was not possible for TVET teachers and assessors to keep up-to-date with every change in the industry and confirmed that they struggled to keep current themselves. This view is exemplified by one of the employers who noted “...it’s difficult to keep pace even if you are in the industry. You can’t know everything. You just need to know where to go to get the up-to-date information if you understand the industry. New trends and knowledge can be picked up and applied quickly on a client to client basis”.

Another printing industry employer commented that it was “hard to read the knowledge demands for the future because there were too many factors – which makes it difficult to predict what training will be needed and what trainers need to know”.

Interestingly the employers trusted the TVET institutions to employ people with industry relevant skills and suggested that the industry currency of TVET teachers and assessors was not something that they worried unduly about. This is in marked contrast from the views expressed by industry representatives in other research [Precision Consulting 2008; University of Ballarat 2009].

3.2 Strategies for keeping current

The employers in the hairdressing, plumbing and printing trades did suggest, however, that the strategies they used themselves to keep current were equally appropriate for TVET trainers and assessors. The most favourably rated ways of updating skills and knowledge were attending events put on specifically for tradesmen, reading industry-specific magazines and newsletters, undertaking online research and engaging in industry networks in the areas of their expertise. Significantly, product manufacturer/vendor training was identified as being available in most industry sectors. This training was rated highly by employers and industry representatives as it provided people with exposure to new equipment, relevant resources, technical specifications and targeted training to support the introduction of various new ideas and techniques into workplaces. Within the nine knowledge-based organisations, national and international industry-specific conferences, technical seminars, industry events and professional/discipline-based networking were all highly rated as was tailored training in new technology as it emerged [particularly ICT training]. As high-performing organisations, each considered connecting with acknowledged experts and exchanging new knowledge were core ingredients to them sustaining their leading-edge in the field.

In a similar vein, both science organisations in the study had reward and recognition policies with annual award ceremonies at which high achievement was acknowledged. Overseas conferences and industry visits were also used as a means of rewarding those who stayed professionally current. Peer review was perceived as a powerful mechanism for recognition, particularly as it was accepted practice in the sciences and embedded in the scientific culture. The concept of peer review and collaborative learning, however, are not necessarily common approaches practices within many TVET institutions.

Regardless of the approaches adopted to build new skills and knowledge, employers in the trades wanted to see TVET teachers attending industry-specific events, engaging actively in the various industry networks and meeting with employers on a regular basis. Industry Skills Council representatives and industry/professional association personnel provided very similar views and commented that the organisations for whom they worked were also a major source of current information about what was happening in industry.
3.3 Some divergent views

The auditors’ views, in contrast, did not align with those of employers and the representatives from industry. They particularly questioned the value of attending industry events and searching for information online, suggesting that neither ‘attending’ nor ‘searching’ necessarily involved ‘learning’. In light of this concern, auditors were much more concerned to see evidence of TVET institutions planning for improved industry currency and evidence of application by TVET teachers of the learning they gained through updating activities. In effect, it was not about strategies that could be used to maintain industry current, but rather about how learning from updating activities was taken up and used to inform and improve the quality and relevance of teaching practice.

The two auditors also noted that there was a degree of confusion around industry currency and vocational competence in the Standards for NVR Standards Registered Training Organisations [the quality standards for TVET institutions delivering nationally-recognised training]. Both were of the view that there needed to be clarification of the terms and greater consideration of the evidence requirements needed by TVET teachers to demonstrate currency. They also determined there was insufficient information within Training Packages [the national industry-specific curricula] to be useful to either TVET teachers or auditors monitoring compliance against the standards even though these documents are deemed to be the source of guidance on the matter.

Importantly, there were distinct differences and preferences from industry to industry evidenced in the updating approaches described by employers. With such diversity, a ‘one-size-fits-all’ method of evaluating evidence of currency on the part of auditors would seem to be inappropriate. Therefore it would seem that audit processes involving the assessment of industry currency need to take into account the varying influences of industry context, institutional location and type of work in which TVET teachers are engaged.

3.4 Factors impacting on successful updating

From the perspective of learning and development managers in the knowledge-based organisations effective updating was dependent on a healthy organisational climate that sent the message that keeping current was a critical and expected activity for all employees. This confirmed the findings of a number of similar research studies conducted in the fields of engineering and ICT [Kreiner 2006; Tsai, Compeau and Haggerty 2007]. Every learning and development manager in these national and global companies stressed the criticality of a technically current workforce to the success of their businesses. For example, one nurse educator who was responsible for the management of learning and development in a large hospital suggested “it’s absolutely imperative not only for our patient outcomes but also for our integrity, our reputation and staff satisfaction. They perform better if they feel like they’re up-to-date with current trends in treatment”.

Across both the technical trades and the professions employers were supportive of ongoing training and all had set in place processes for ensuring it occurred. In the big organisations, updating was strategically planned, collaboratively undertaken, monitored and reviewed on a regular basis. There was sufficient flexibility in the way work was done to allow for ‘just-in-time’ training to meet emergent needs. In addition, skills profiles were regularly reassessed to in order to guarantee technological, regulatory and knowledge advancements could be addressed in a timely way. The employees who consistently updated their skills and knowledge were rewarded through bonuses and promotions, while those who did not were sometimes faced with sanctions. In the knowledge-based organisations in particular, organisational values and goals stressed the importance of employees keeping current. Supporting this viewpoint, the learning and development manager in global human resources company suggested “technical excellence is embedded
throughout the culture of our organisation. There’s no question about that. It’s one of the bedrocks of this organisation, so it is absolutely critical to the way we do business”.

3.5 Learning at work through work

Significantly, the workplace was identified by all interviewees as the most useful location for workers to learn and keep up-to-date with technical changes in the industry. And while formal learning undertaken in classrooms off-the-job was seen to be valuable, much greater emphasis was placed on structuring work in a way that allowed people to learn on the job. Informal, peer-to-peer and collaborative learning were used in each of the hairdressing, plumbing and printing businesses. In the large science, engineering, human resource and health organisations at least seventy per cent of all training undertaken took place in the workplace. The importance of this was further emphasised by an informant in one of the nationally important science organisations. She stated “When you are a learner you are open to asking more questions, you are open to more feedback. These are the great benefits of being a learner on the job. You are also more likely to collaborate when you are learning on the job”.

The training in the workplace was generally supported by time to learn, a space in which to learn as well as mentoring or coaching from appropriately experienced colleagues. Rubbing shoulders with experts was viewed as a valuable learning strategy and one that was encouraged by all participants in the study. In the small to medium trade enterprises, learning by necessity was a collaborative activity in which employers together with employees learned about new ways of working. Similar views are presented in the updating literature where emphasis is placed on collaborative learning, knowledge sharing and ensuring that updating activities focus on the employees’ current job and are ‘embedded in the rhythms of daily work’ [Knight 1998,p.254].

3.6 Keeping current: approaches for individual teachers

Employers and industry representatives participating in this research commented that they could be called on to assist in keeping TVET teachers and assessors abreast of changes in industry. And although some of them were able to produce evidence of this having occurred in some way previously, most informants agreed that they had never been approached by TVET teachers seeking assistance to keep current. This is a particularly interesting finding as the literature suggests there are issues surrounding accessibility and placement opportunities in local industries, and uncertainty about the capacity of the industry to provide access to up-to-date technology, equipment and processes [Toze & Tierney 2010]. It should be acknowledged, however, that such support would by necessity be an outcome of personal networking and individual initiative.

By way of contrast, a number of employers in the hairdressing, plumbing and printing industries suggested that they had often learnt about industry innovations from TVET teachers whom they considered were more up-to-date in specialist areas of industry than they were themselves. This highlights just how important it is for TVET teachers and assessors to develop personal networks with employers and representatives of Industry Skills Councils and professional/industry associations. It also highlights the importance of individual TVET teachers and assessors acknowledging personal responsibility for ensuring they stay current with what is happening in their industry area. In both large and small organisations in this study, there was ready acceptance that maintaining currency was a responsibility to be shared by the individual and the organisation. Without this joint commitment updating strategies were more than likely to be unsuccessful.
4 Conclusions

This study on industry perspectives on the industry currency of TVET teachers and assessors suggests a number of ways that this complex problem might be addressed. The research provides a number of clear messages for the TVET system, the institutions that deliver the training to meet the essential skill needs of the economy and teachers and assessors that have the responsibility of developing a skilled Australian workforce. From a system point of view, it is evident that there needs to be greater clarity in defining the terms ‘industry currency’ and ‘vocational competence’ as well as in determining the evidence required of individuals to be assessed as up-to-date. Further, as there appear to be divergent views across industries about appropriate updating approaches, this diversity does need to be taken into account in the auditing TVET institutions against the Standards for NVR Registered Training Organisations. Also critical is the lack of funding targeted at addressing currency issues amongst teachers and assessors in areas where regulatory change has demanded rigorous upskilling. Without some form of meaningful and accessible professional development tailored to suit the industry-specific needs of individuals, skills obsolescence amongst TVET teachers is likely to continue to be a major concern.

For TVET institutions, industry currency requires strategic thinking, effective planning and ongoing monitoring. Not all TVET teachers or assessors are impacted by the need to constantly refresh their knowledge and skills. Changes in regulation, technology and client demand ultimately impact on training and Training Packages [national training curricula]. When these changes occur, individuals who are responsible for implementing such innovations in their daily teaching practice must be encouraged and supported to update their skills and knowledge. This research suggests that some updating can be achieved within TVET institutions. Collaborative, informal or incidental learning in the workplace can provide the platform for such updating to occur.

Equally critical to the maintenance of currency are industry engagement and networking. While these activities may apply to individual TVET teachers, their value to the TVET institution cannot be understated, particularly as employers view these updating activities so favourably. It is important, therefore, that annual performance management discussions between TVET teachers and supervisors take activities such as these into consideration thus ensuring that learning opportunities can be identified and accessed. Finally, it is important to acknowledge that client demands and technological and regulatory change will continue to impact on the TVET sector and the training it provides. As a consequence, the industry currency of teachers will remain a constant challenge for individuals, institutions and the Australian TVET system. Strategies such as continuing professional development and close engagement with industry are highly valuable and valued, but they require consistent and ongoing funding to support and sustain them. Innovative thinking by organisations and individual teachers is also required to determine how best updating might more effectively occur in the workplace. Importantly, this demands that institutions and individual teachers alike view industry currency as the key to the ongoing credibility of the sector.

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Post Study Pre-Service Practical Training Program for TVET Teacher Students

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Abstract

Teachers’ quality is determining the quality of education outcomes in general and occupational competence in specific. There is an urgent need to establish programs supporting the improvement of teacher’s professionalism. One possible program is a post-study, pre-service training for prospective TVET teachers (PTP). This program can be implemented for graduates of TVET teacher training programs after the completion of their study, constitutes a post-study education and training program, implemented during the transition period before prospective teachers carry out their duties in vocational schools independently. This study aims to explore a variety of aspects related to teacher training in Indonesia, Vietnam, China, and Germany, including the basic conditions, outcome of the existing teacher training programs, up to concepts of PTP which already exist or which are, like in the case of Indonesia, still in the planning stage. Collaboration among stakeholders of the pre-service training for prospective TVET teacher is among the aspects to be discussed in this paper. This empirical research in the field coupled with content analysis from various sources of written documents has resulted in various conclusions, which indicate the need for a variety of steps to improve some aspects of the PTP implementation.

1 Introduction

1.1 Problem Statement

The era of globalization, where national boundaries within various sectors barely exist anymore, confronts all nations with the fact of dichotomous phenomena in the labor market. On the one side the globalization induces a wider occupational spectrum providing individuals with broader opportunities for selecting jobs. On the other side it boosts a fierce competition in acquiring matching job opportunities. For job seekers, this competition means that they need to equip themselves with better qualifications. Indeed, the qualifications already obtained should be updated, in a sense of their congruence with the demand of the labor market. For educational politics, this poses a big challenge to establish an education system, which meets the needs of the labor market, and can cope with the rapid development of technology and work organization. The changes are occurring in the organization of work, the management of human resources, the relationship between technology and skill requirements, and employment and work arrangements (self-employment, part-time work etc). Industries have seen the need for a more flexible, adaptable workforce than before (Prihadi, 2004 in Lasambouw 2012, p. 1).

Technical and vocational education and training (TVET) is among the sectors of education to give answers to the challenges mentioned above. In many developing countries TVET is becoming a prominent issue considering its importance in (1) preparing the young
generation to enter their working life and in (2) responding to the indispensable demand of the development process, which is to provide the economy with quality work force in accord with the needs of the goods and services industries. Hence, the organization of vocational education - in a narrow sense - aims at developing the occupational capacity of its participants, comprising occupational, social and methodical competences. Competences as such at the end constitute employability of the participants.

One of the deciding factors in the development of occupational capacity in TVET is the availability of competent teachers. The TVET teacher plays a very important role in determining the quality of TVET outcomes. In this study, vocational education teachers will be highlighted, with a focus on vocational education at the level of formal education on upper secondary level. As far as reported by a variety of formal bodies such as The World Bank and UNESCO-UNEVOC, we can find that VET teachers in developing countries, especially those in the Southeast-Asian region, often do not meet the demands of the world of work. Poor pedagogical skills of teachers make the process of know-how transfer to the students less effective. Thus, student learning usually is dominated by passive learning processes, which little support the development of professional competence. Furthermore, the aspect of teachers’ industrial skills remains a critical weakness as well.

In many developing countries, e.g. Indonesia, this condition is inherent to the university based structure or/and model of TVET teachers’ development. The system firstly does not require the student to have industrial experiences neither prior to entering the study program nor after graduation from the study. During the study process the share of practical training often is negligible. Hence, the training is dominated by the intermediation of theories, which in many cases are already out of date due to the lack of research activities and to poor programs of continuing professional development for teacher educators in the institutions. Thus, the knowledge and skill deficit of teacher candidates with respect to up-to-date developments in the world of industry seems to be inevitable. The logical question proposed by this weakness is “how TVET participants can be updated if the capacity of their teachers is out of date?”

Given the key role of teacher quality in determining the quality of education outcomes in general and occupational competence in specific, there exists an urgent need to establish programs supporting the improvement of teacher’s professionalism. One of the programs in question is a pre-service training for prospective TVET teachers (PTP). This program can be implemented for graduates of TVET teacher training programs after the completion of their study. In other words, such a program constitutes a post-study education and training program, implemented during the transition period, before prospective teachers carry out their duties in vocational schools independently.

This study aims to explore a variety of aspects related to teacher training in Indonesia, Vietnam, China, and Germany, including the basic conditions, outcome of the existing teacher training programs, up to concepts of PTP which already exist or which is, in case of Indonesia, still in the planning stage.

1.2 Specific Objective of the Study

The study intends to map the schemes of pre-service practical training programs (PTP) for TVET teachers existing or under development in the countries in question in order to contribute to the development of pre-service practical training programs for TVET teachers.

The study is intended to give an overview of the respective existing or planned concepts in Indonesia, Vietnam and China, as well as in Germany, and to draw up recommendations for the development and implementation of models of post-study, pre-service practical training programs for TVET teachers in Indonesia and in Vietnam. Addressees of the recommendations will be the institutions responsible for providing the respective training, but also policy makers in the respective countries will be free to use the
findings of the project for setting the legal and/or administrative framework for such programs.

1.3 Methodology

The research was conducted based on a qualitative method. Within this method there are three fundamental techniques of data collecting: non-standard or semi-structured interviews, observations, and non-reactive methods (Bortz & Döring, 2002, p. 307). Two of the techniques are applied in the research:

1. Interview. This method was used to obtain descriptive information from stakeholders of PTP. The survey took the form of semi-standardized, personal "face-to-face" and problem-centered interviews, organized both on an individual basis and in groups. For the individual interviews the technique of guide lines interviews was used, while for group interviews, the technique of group discussion was applied. Both interview methods were conducted according to developed guidelines.
2. As a non-reactive method, content analysis was used. Content analysis was carried out by analyzing existing documents containing regulation, descriptions, and research findings related to TVET teacher training programs.

2 Methodology

2.1 Research Approach

As noted in the introduction, this field research was undertaken based on a qualitative approach. This approach was chosen for its exploratory character (see Flick, 1998, p 28). Qualitative methods are suitable for research subjects, which are not far explored yet (ibid). Qualitative methods for example can be applied in pilot studies, which among others aim to start exploring the subject and then intend to prepare it for further study (see Mayring 2003, S 28, in degree, 2003, p.41). In general, they are also used for problem areas that are not yet adequately researched or to areas for which mostly descriptive studies are available (Bock, 1992, S. 90).

The work is intended primarily to provide a descriptive representation about the issues and problems of the implementation of PTP in the partner countries involved in the Regional Cooperation Platform for Vocational Teacher Training and Education in Asia (RCP) under the scheme of the P3 project. The objective of this work is to draw up a comparative description of strengths and weaknesses of the respective PTP concepts and their implementation based on defined analysis criteria (see 3.3.). According to the objective, the study does not try to measure quantitative significance of the data, but emphasizes relevance and usefulness.

2.2 Data Sources

The data for this study was collected from two main sources:

- The first source is literature, documents and articles, which contain various information regarding the laws and regulations with respect to PTP, including concepts, curriculum, models, up to the implementation and development of PTP. The sources provided an abundance of information to be analyzed and gave some insight in PTP implementations.
- Narrative information from PTP stakeholders is the second source. The stakeholders are representatives of governments, training institutions, vocational schools and companies. By interviewing them, the results from the document
analyses were confronted and compared with their subjective opinions. The data collected provides a comparative view about the extent of the real implementation of the concepts and regulations of PTP in the field.

The field research was conducted by the partners in the respective partner country; among those are Indonesia, China, and Vietnam. The implementation of PTP in Germany was described as well, but exclusively based on document analysis. Furthermore, the state of the art of PTP implementation was compared between countries.

2.3 Analysis Framework

The results of the field research conducted by the partners in the respective partner countries were bundled in country reports. Afterwards the collected reports were comparatively analyzed. Based on the common discourse conducted in a workshop discussion with all country partners, the following components were determined to be the analysis criteria:

1. TVET philosophy
2. Objectives of PTP
3. Policy and Regulations (including the financing aspect)
4. Curriculum Structure
5. Parties Involved in PTP
6. Assessment and Evaluation
7. Problems and Difficulties

3 Comparison

Table 1 represents part of the comparison\(^1\) of PTP systems implemented in the countries as a result of the analysis of the compiled reports of partner countries and the discussion in the workshop.

4 Results

This section interprets the results of the comparative analysis of the country reports and complements the analytical part of the study. Several aspects constituting weaknesses of the PTP implementation in the partner countries are highlighted with the purpose to provide general insight in issues which should be improved or re-oriented.

4.1 Basic (Mis)-Conception of TVET

The vocational education systems in developing countries like Indonesia and Vietnam still indicate a wide philosophical gap between their basic objectives as skill developers and the demand of the world of work as venue where the skills are supposed to be operational and productive. Given the fact that vocational education explicitly aims, among other things, to assure access to continuing education, this can be considered to be both, positive and negative. The positive view includes that the TVET system offers its participants the choice between two options for their future carrier, namely whether they want to enter the world of work directly and cash in on their working skills or whether they continue to higher education. The negative view emphasizes that the system on the one hand does not put enough emphasis on developing work skills, and on the other hand does not guarantee the utilization

\(^1\) Due to space limitation not all parts of the comparison table can be display in this paper.
of the graduates’ skills in the economic sector. The second perspective seems to be more plausible than the first one, given the fact that the graduates of, especially, formal vocational schooling in developing countries are still marginalized, in the sense that their qualifications are still poorly recognized by the society.

Table 1: Comparison of PTP System in Respective Countries

<table>
<thead>
<tr>
<th>No</th>
<th>VARIABLES</th>
<th>INDONESIA</th>
<th>CHINA</th>
<th>VIETNAM</th>
<th>GERMANY</th>
<th>GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TVET Philosophy</td>
<td>To prepare the individuals which can contribute to the world of work and the society equipped with the knowledge, attitude and skill</td>
<td>to train labor forces required by the labor market</td>
<td>To train a technical force in direct production and service, who have practical capabilities into their qualifications.</td>
<td>holistic acting competence in the occupation (Beruf) – dual system as the predominant mode</td>
<td>Remarks Range from development of skilled labor, up to holistic educational objectives.</td>
</tr>
<tr>
<td>2</td>
<td>Objectives of PTP</td>
<td>General: to produce teacher candidates who possess the ability to contribute to the objectives of National Education goals. Specific: to produce teacher candidates who possess the pedagogical and professional skills.</td>
<td>Getting practical skills, integration into the teacher service. Practice orientation: the programs are both designed to introduce the (potential) teachers to the world of work,</td>
<td>To produce TVET teachers, meet the standard of professional competence (professional knowledge and occupational skills) and vocational pedagogy competence.</td>
<td>Putting theory into practice. Introduce novice teacher to teacher community of practice. Conditioning of civil servants</td>
<td>Training of industry related skills, training of pedagogic competence</td>
</tr>
<tr>
<td>3</td>
<td>Concept of PTP</td>
<td>Apprentice in schools and theoretical training in university</td>
<td>Apprenticeship as major form, separated in to 2 phases.</td>
<td>In-service training programs for vocational training pedagogy (6 months) and for occupational skills (480 training hours, and 960 training hours)</td>
<td>1,5 - 2 years run in teacher seminars in close cooperation of vocational schools (not the same as university).</td>
<td>apprenticeship, in-service training and teacher seminar</td>
</tr>
<tr>
<td>4</td>
<td>Model of PTP</td>
<td>PTP 1 during the study at 7th semester</td>
<td>One that exists outside the study program and the service period, the other one that is embedded in the existing program of study and service, PTP 1: internship for university students who will become tvet teachers, during the study for 10-week internship</td>
<td>Parallel and continuing (6 months) in general there are 7 scheme of PTP in Vietnam. 5 of them are compulsory PTP 1: technical education/vocational pedagogy (6 months) for non-edu. Student</td>
<td>1. PTP for Vocational teacher student. 2. PTP for post-study pre-service training program. 3. PTP for novice teacher. 4. PTP for In service training program.</td>
<td></td>
</tr>
</tbody>
</table>

The integration of education continuation in the basic purpose of vocational education implies that the curriculum has to be designed so that the vocational students are exposed to a broader range of learning content. The students have to be equipped with working skills, but also with academic skills, which allows them to compete with their peers from general schools, when they try to enter higher education. Consequently, the learning capacity of the participants is overloaded. According to an example of vocational education in Indonesia, during 3 years education in vocational school, participants have to accomplish a learning load of up to 5,800 hours. This is higher than the work load for a polytechnic student for the same duration of 3 years. At the end the students tend to lose the learning focus on both domains which leads to neither mastering the occupational competence nor the academic contents of the curriculum. Hence, many of them are becoming the loosers of the competition both in the industry and the higher education sector. TVET graduates have no significant participation rate in higher education. In the labor market, most of them do not experience privileges, in the sense that they are employed in the same job position as their peers from general schools and both, regardless of the difference in working competences, earn the same salary.

4.2 General Shortcomings of current PTP Concept

Implementing post study pre-service training program (PTP) for vocational teacher, which aims at the improvement of teacher professionalism, is among the strategic steps to be taken to improve the situation of TVET outcome since the availability of qualified teacher is very decisive for the development of the competences of vocational education outcome. The content and mode of implementation, and hence apparently the specific objective, however, differs from one country to another.

The comparison between China and Vietnam shows a pronounced difference in PTP implementation. With the duration of six months, the Vietnamese PTP seems to poorly consider the importance of the practical part of the program. The whole program is intended to impart the theoretical knowledge of pedagogy to its participants, who obviously do not possess any pedagogical background, since the target group of the program is graduates from general universities or colleges. A PTP designed for educational universities graduates at the moment is not in vision.

In contrary to Vietnam, the Chinese PTP is very practice-oriented. In terms of training duration the two years seem to be pretty sufficient to develop the skills of its participants. However, the PTP in China is less formal, in the sense that it has no clear curricular structure and thus it is not evident, whether the focus lies on imparting teaching practice or practical occupational competence, or both.

Indonesia's one year program is under development, but the current discussion focuses on providing additional pedagogical (theoretical) knowledge and teaching practice, and so there is a concern, that the development of (practical) vocational knowledge, skills and experiences is neglected.

The German well structured 18 months programs focuses on generating practical experiences in applying (theoretical) pedagogical and didactical knowledge to vocational learning. A not so pronounced emphasis on vocational knowledge and skills is less problematic, since most of the German future teachers already have comprehensive work experiences before entering a TVET teacher study program.

With the comparison of the models this section tries to stress the necessity of the development of practical teacher skills and the need of clear structured curriculum of the teacher training program. Without any or with poor practice the expediency and the effectiveness of a training program would be questionable. Practice is the best inquiry method of learning. Along with cognitive competences the practical competences shape the professionalism of a vocational teacher as a whole.
4.3 Lack of Industry Involvement in PTP

The PTP concept in most countries is solely designed to develop pedagogical competences of prospective teachers. The given concepts do not take the need for industrial skills into consideration. Since vocational teachers deal with the evolvement of working skills of their students, which are supposed to meet the standards and the demands of the industry, insight into industrial development and industrial skills are imperative for teachers. This means that teachers should at least have good and up-to-date knowledge about the current technology and its applications as well as about work processes and the work organization in companies. For this reason there is a real need to include and use learning opportunities provided by companies in the PTP.

Cooperation with this sector could be developed in various forms. China is the only country to explicitly involve the industry so far. Selected companies are involved in the program by sending their expert to vocational schools where novice teachers undertake their training and give lectures or seminars with distinctive topics regarding their industrial expertise. But still, like in other countries, the PTP in China does not include companies as a venue of the training process. So far, there are mainly vocational schools and universities or colleges as institutions involved in the training process.

4.4 Lack of Regulation

The organization of teacher education including PTP is apparently complex, since several institutions, for the sake of quality assurance, should be involved with synergy in the training process. Government, educational institutions, vocational schools and companies should work together and cooperate collaboratively to reach the goal. The ideal constellation among those parties is impossible to be set, if there is no rule regulating the role, functions, responsibilities, rights and obligations of the respective parties.

According to the analysis, the lack of holistic regulations like they are mentioned above is among the constraints for the implementation of PTP to realize the targeted goal of enhancing teacher professionalism. Except in Germany, all other partner countries tend to not enact such regulations. Without standard regulations, many aspects of the PTP implementation, such as the training duration, content, models and curriculum can differ from one training institution to another. Thereupon, the lack of standards is bred to the absence of standard quality and therewith to the poor mobility of the trained teachers.

4.5 Training Assessment and poor Program Evaluation

There exists a variety of schemes and methods that are used to assess the pre-service training program. The methods cover the assessment in the initial phase up to the end of the program. However, to what extent the applied methods are effective in improving the output quality remains open. Further research seems to be necessary in that respect.

One thing which apparently is common to all Asian countries is the fact, that there are no procedures of external assessment of the training output. All training is undertaken internally or by the training institutions itself, and also assessed internally. Theoretically, this setting suggests that the subjectivity grade of the assessment might be high, due to some emotional proximity between participants and assessors or even a culture of corruption and bribing in some countries, and that way compromise the quality of learning outcome.

In addition it appears to be common in Asian countries that there are no provisions for the evaluation of program implementation. The quality and effectiveness of several aspects concerning the design, duration, content and infrastructure of the program as well as the personal in charge are not or have not been evaluated. In developing countries the lack of program evaluation is not considered to be critical, since in these countries the educational program development policies are usually stipulated in top-down management, which means
from the government to the implementing institution. Periodical evaluation procedures mean extra expenditures, which in many cases is not considered as investment in progress. Due to this perception it is not easy to carry out evaluation. No evaluation means no transparency of quality and effectiveness, and often no systematic quality development.

4.6 Conclusions

Based on the comparative analysis of the country reports and the results described above some conclusion can be drawn as follows:

− The existence of PTP programs which purpose is to improve the professionalism of vocational teachers is very important for preparing prospective teachers before they deliver service in vocational schools.
− The development of practical skills should be the main objective of the PTP, by which prospective teacher can put their pedagogical theory into practice and get introduced to their world of work.
− PTP is implemented in most of the partner countries in different modes in terms of duration, addressees, model, curriculum structure and institutions. In terms of theory-practice ratio, the Vietnamese PTP shows a practice deficiency, whereas in the Chinese model the practice part is much more emphasized. However, the Chinese training is unclearly structured.
− In most countries except China, the industry sector is excluded from the implementation of PTP, even though this sector is among the most important stake holders of TVET outcome.
− None of the Asian partner countries has specific laws on the national level governing this type of teacher training. Hence the assurance of a quality standard becomes questionable.
− There is a need for the implemented PTP to be regularly evaluated. As stated in all reports, none of the countries currently is applying a mechanism of program evaluation, which is suitable for measuring the usefulness and appropriateness of the PTP.
− Due to differences in several factors, the implementations of PTP in the partner countries show different characters and problems, and in each country the problematic issues have to be tackled individually.

5 Recommendations

This empirical research in the field coupled with content analysis from various sources of written documents has resulted in various conclusions which indicate the need for a variety of steps to improve some aspects of the PTP implementation.

1. Empirical research as a basis for program development

The first aspect is related to policy measures regarding teacher training provision which in most developing countries is largely dominated by the government in setting the rules for professional teacher formation programs. It often happens, especially in developing countries, that teacher professional development programs are created and implemented “politically”. This means that programs or policies often are made without regard to the real needs in the field, so that the applied strategies in the end do not appropriately and/or sufficiently support the improvement of teacher professionalism.

Based on the findings the study recommends conducting empirical studies on the training demand of novice teachers. Field research should be able to identify various facts regarding the actual state of teachers’ professionalism, including its strengths and weaknesses, and then to highlight the issues that really need to be improved. By means of
the evidence of professionalization needs the development of PTP can be better targeted, more effective and more efficient.

2. **Emphasis on the complete job profile**

The second point highlights the problem of teacher professionalism with respect to their occupational skills. Since teachers in vocational schools have distinctive and broad professional profiles, which includes the task to prepare youth to enter the world of work and which means that they have to work on developing working skills of their students, the mastery of the occupational skills of their respective teaching field cannot be separated from their professionalism. The skills mentioned here are such skills that, indeed, suit the industries’ needs with respect to production and technological development. Nevertheless the focus on the development of occupational skills should not lead to neglecting the development of pedagogic skills. Occupational competence without being coupled with pedagogical and didactical competence is not sufficient for appropriately shaping processes of knowledge transfer. Hence, both these skills should be developed in a parallel way, both in theory and in practice.

To meet this kind of demands it is imperative that the implementation of PTP conceptually does not only emphasize the enhancement of pedagogical skills, but also integrates aspects of the development of occupational skills into the curriculum.

3. **Emphasis on cooperation between stakeholders**

Such demands usually cannot be met by the institution organizing the PTP alone as a single player, but requires the synergy of cooperation with the industry sector as user of the vocational education outcome. The industry should be included and actively engage in development of some phases of the program, related to the capacity of the industry; an example here could be the development of a collaboration model which facilitates the development of occupational skill in the framework of the PTP.

The partnership with the industry should be carried out intensively and simultaneously. This means, the industry does not only play a role in delivering working expertise during learning processes in class, but they provide access to their world of work as well. Hence, vocational teachers could always have the opportunity to keep their technical know-how updated.

In many developing countries the development of partnerships with the industry sector in an active way faces a common impediment. Most companies are still of the view that cooperation with educational institutions constitutes a burden for companies due to the expectation, that the company partner should provide extra service for the know-how transfer process to the trainees. To overcome this situation, companies could be offered attractive incentives or the PTP concept could be designed in a way that they receive good return from the partnership with their educational counterparts. For this purpose the institution implementing the PTP, like universities should actively approach the companies and attract them by e.g. proposing certain schemes of cooperation, which are beneficial for both parties. Exchange of expertise, joint research or specific services in human resource development would be feasible examples for the purpose.

Furthermore, since governments are the main actors and regulators of the implementation of PTP, it is recommended that they also actively act to facilitate the cooperation between the parties. This for example could be done by enacting certain regulations to boost the development of partnerships between enterprises and PTP Institutions. Tax deduction or/and financial support for industrial experts involved in the PTP (like implemented in China) might be affective tools as well.

4. **Independent institution for the implementation of PTP**

Next point to be highlighted in this section is the institutional aspect of PTP implementation. According to the results of the study presented in the previous section, universities play a
dominant role in the delivery of PTP in Asia. For a big part of prospective teachers this domination seems to be a repetition of their earlier learning process. They attend both their academic study program in the educational field and their teacher training as a preparation prior to their service in vocational schools in the same institution, often under the same lecturers. This means that a number of aspects, such as the organizational style, the training personal in charge, up to the learning content, tend to remain the same.

The centralized implementation of PTP as such by universities would not be a problematic matter as long as certain mechanisms of quality assurance are in place. But the reality in the field seems to be different. Findings for instance in Indonesia have shown that such dominance cannot yield significant improvement of the quality of training output, since universities tend to apply the same learning models and content, which they already imparted to their students during university studies. To fix this, it is recommended that the PTP is undertaken by independent institutions outside the university environment.

Compared to university entities, which have to follow university rules and regulations, independent teacher training institutions could be more flexible, since they have their independent management and therefore have more leeway for different innovations. In terms of human resources they could be more open for experts with different institutional backgrounds, i.e. experts from higher education, from the industry and vocational schools to join and to run the program. But still, it should be assured that these kind of independent training institutions are really for innovation and change. The system should offer a mechanism, which is able to accommodate new potentials and has the capacity and capability to provide more professional trainers within the framework of continuing quality assurance procedures.

5. Implement practical elements already in the first phase of TVET teacher education

The following recommendation refers to the PTP curriculum. PTP should be integrated into the curriculum of teacher education as early as possible. In the early stages of teacher education, for instance, at the bachelor level in universities, some kind of PTP can be implemented in a complementary way, maybe even in parallel. This is important, given the purpose of the PTP, which is to develop the students’ working competence in the field of teaching. Thus, the implementation of PTP with emphasis on teaching practice allows to introduce students to the world of work much earlier. Hence, at the end of the study program the students would be better prepared and able to cope with the job tasks at their work place. As the implementation of PTP curriculum would be oriented towards practice, the development of teaching skills of the participants would be better supported.

6. Quality development culture and formative program evaluation

Given the importance of PTP in developing participants’ competence, PTP should be designed to be dynamic and progressive; dynamic in the sense of the openness of the program for any constructive changes and progressive in the sense of continuous quality improvement of PTP and its ability to accommodate innovations. Program monitoring and quality assurance procedures should be included permanently in the PTP development agenda. For this purpose a comprehensive and continuing formative evaluation mechanism is required. The evaluation should not solely be undertaken when needed to fulfill any formal purposes, such as to meet an accreditation requirement. Instead, internal and external evaluation efforts should become an integral part of institutional culture of quality development.

7. Holistic assessment procedures

There should be a holistic assessment to prove the competence of PTP graduates. The assessment should not only focus on the pedagogical skills of the participants, but on the competence profile as a whole, where the occupational expertise is considered as well. Both
fields should be assessed in both written and practical way, so that cognitive and motoric improvement of the learner can be documented.

8. Appropriate / sufficient resources

Last but not least, it is recommended to improve the PTP infrastructure. The concepts and models applied in the PTP can only produce the targeted results if proper infrastructure is available. For this recommendation the goodwill of the stakeholders of the program, especially the government as a dominant actor, is inevitable. The government should adopt the view that the improvement of basic conditions like infrastructure is not a burden, but on the contrary, is an investment in the future of a better education.

ACKNOWLEDGEMENT

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REFERENCES


Good Practice in Apprenticeship Systems: Evidence from an International Study

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Abstract

Apprenticeships can be seen as the ultimate in co-operation between TVET providers and industry as they are based on a combination of work and study. Ideally they should provide appropriate skills for companies and also all-round occupational and generic skills. However there are many different actual and potential models of apprenticeship. This paper uses part of the work undertaken for a project funded by the International Labor Organization and the World Bank to compare and contrast apprenticeship systems in 11 countries, for the purpose of drawing out features of good practice. The project was undertaken to provide suggestions for the process of reform of the Indian apprenticeship system [Planning Commission 2009].

Experiences of other countries, both in the developed and the developing world, indicate that apprenticeship systems cannot be transplanted among countries; however, key features of countries’ systems can be identified and sensitively developed in other countries. The paper describes a method for undertaking this task, and the findings.

Eleven individual country case studies, based on reports and literature, were produced by a team of national experts, and subjected to a cross-case analysis. The use of national experts was judged to be more effective than having people write on other countries’ systems; the latter method has proved in many instances to result in inaccurate reports, susceptibility to the influence of limited numbers of stakeholders and a lack of sophistication in analysing trends. The country case studies took into account agreed international benchmarks for describing, analysing and evaluating apprenticeships, based on the framework described in the recently-released memorandum by INAP, the International Network on Innovative Apprenticeship [INAP Commission 2012] and the framework developed by one of the authors in the International Encyclopedia of Education [Smith 2010]. The countries were selected to cover a range of variables.

A cross-case analysis was undertaken which drew together data from the countries using a thematic approach and simple data display techniques [Miles and Huberman 1994]. The analysis covered both systemic issues and ‘the life cycle of the apprentice’. The data were then further reduced to develop an identification of the features of a model apprenticeship system, and proposed measures of success and associated challenges, derived from the data.

1 Introduction

The project was commissioned by the International Labor Organization and the World Bank to contribute to Indian discussions about the reform of the apprenticeship system. India’s apprenticeship system will be a major contributor to its future growth but in comparison to, for example, Australia or Germany, its apprenticeship system is small, with fewer than two million participants [Ministry of Labour and Employment 2011]. Some challenges include the
relative youth of the apprenticeship system, misaligned expectations of employers and apprentices, curriculum is sometimes outdated, and the difficulties associated with a predominantly informal economy as well as uneven participation in the apprenticeship system among socio-economic groups and other groupings [Planning Commission Sub Committee 2009]. There is also concern about an over-complexity of regulation, the under-representation of women in apprenticeships, and the availability and quality of sufficient trainers [ILO and OECD 2011].

As part of the project method, a number of international country case studies were written specially for the project, which were then analysed by the authors of this paper. The aim of the cross-case analysis was to develop features of a ‘model apprenticeship system’ which were then utilised, following an analysis of the Indian system, to suggest possible options for the Indian system. This paper, however, focuses only on the international comparison and not on the Indian system or proposals.

2 Background and Literature Review

Apprenticeship is an institution which, for centuries, has successfully effected entry into working life for young people, and has also been responsible for the maintenance of the skills base of many national economies. Apprenticeships began in medieval times, and perhaps before that in some countries, when young people went to live in their masters’ houses to learn trades, over a period of up to seven years. Although apprenticeships have become less demanding of both master and apprentice, they have survived in many countries over the centuries [Lane 1996].

The essential components of a formal apprenticeship are generally understood to be:

- a training regime set up by, or with the approval of, governments;
- a combination of off and on the job training;
- the assumption of responsibility by the employer for the development of the apprentice;
- The award of a qualification and/or licence and/or some other recognition that enables an occupation to be practised independently once the apprenticeship is successfully completed.

In modern economies, apprenticeships are regarded as important ways of developing skills in the workforce along with their perceived role in reducing youth unemployment. After a period of time of neglect, apprenticeships have returned to centre-stage in the way that countries manage their education, training and labour markets [Rauner and Smith 2010].

However, different countries have different expectations of apprenticeships and therefore regulate and manage their apprenticeship systems in different ways [Smith 2010] and thus it is difficult directly to compare systems or to transplant ideas from one country to another.

3 Method

Eleven country case studies apprenticeship systems were commissioned. One was written by one of the authors of this paper and the remainder by nine invited experts, who wrote about countries where they were located (n=8) or with which they were familiar (n=2). One expert wrote about two countries. The countries were selected to cover a range of variables: stages of development, size and reputation of apprenticeship system and location (all inhabited continents were covered). Some of the selections were suggested by the funding bodies and others were added by the researchers. India was included in the initial case studies to allow comparison with the Indian system from the commencement of the project.
After considering other cross-national studies, it was decided that the use of case studies [Yin, 2009] written by national experts would be more effective than having the researchers themselves write on other countries' systems. Experience has shown that the latter method has proved in many instances to result in inaccurate reports, it is susceptible to the influence of limited numbers of stakeholders and it is not possible to judge accurately the influence of the full range of contextual factors. To help ensure currency and quality, the country experts were requested to interview a senior government official in their country before finalising the writing-up, and also to submit their case study to an independent academic expert at another institution for review. These objectives were achieved, in some instances partially, in seven of the country case studies.

The purpose of the country case studies was firstly to obtain accurate and current information about countries' apprenticeship systems written by people who had a deep understanding of the culture, politics and economics of the countries as well as the apprenticeship systems. It is well-recognised that apprenticeship systems need to grow from countries' national economic and cultural contexts and cannot be transplanted from one country as complete entities from one country to another. The second purpose was to obtain targeted information about key features and trends that could be used to develop a model apprenticeship system.

The country case studies took into account agreed international benchmarks for describing, analysing and evaluating apprenticeships. These were the framework described in the recently-released memorandum by INAP, the International Network on Innovative Apprenticeship [INAP Commission 2012] and the framework developed by one of the authors in the International Encyclopedia of Education [Smith 2010]. Based on these frameworks, the authors were requested to cover the following: a number of topics under major headings, each of which included up to ten sub-topics. These were as follows:

- Introductory paragraph about the country’s economic and education systems
- Nature of the apprenticeship system
- Occupational coverage
- Participation
- Training and assessment
- Participation of governments and other stakeholder groups (social partners)
- Major issues and learning points (what are the major issues facing apprenticeship in the researched countries and what has been the effectiveness of the policy developments?)

The headings proved more applicable to some countries than others. As simple examples of differences, some countries had more than one major apprenticeship system, and in some countries little official data were available. But all case studies were able to provide at least some information under each major heading, if not each minor heading.

A thematic cross-case analysis was then undertaken [Miles and Huberman 1994]. For the cross-case analysis the following guidelines were used to develop the structures and headings:

- The format of the case study guidelines, which was itself developed partly from the project terms of reference but also informed by the following two documents:
  - The INAP memorandum on apprenticeship architecture;
  - Analysis of apprenticeships in the International Encyclopedia of Education [Smith 2010];
The cross-country analysis in the European Commission report on apprenticeship supply [European Commission, 2012]; and

An apprenticeship life-cycle model developed in an Australian study [Smith et al. 2009] to describe the progression through an apprenticeship for the individual apprentice.

However, some themes also arose from the data themselves [Stake 1995]. Also, the researchers’ views on issues and policy developments were collated into a table.

The research question for this phase of the project and therefore for this paper is ‘What are good practice features internationally that provide a framework for a model apprenticeship system?’

4 Findings

The analysis showed that apprenticeship systems could often be grouped into 'bands' in terms of individual features, for example, completion rates, involvement of social partners, payment of apprentices, and target age groups. Two examples are provided below (Tables 2 and 3)

<table>
<thead>
<tr>
<th>Table 2: Typology of Availability of Apprenticeships to Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominantly for young people</td>
</tr>
<tr>
<td>Routinely includes both young people and adults</td>
</tr>
<tr>
<td>Predominantly for adults</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3: Typology of Employment Status of Apprentices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentices paid as employees</td>
</tr>
<tr>
<td>Apprentices paid, but not as formal employee</td>
</tr>
<tr>
<td>Stipend/allowance only</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4: Underlying Principles for a Model Apprenticeship System</th>
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<table>
<thead>
<tr>
<th>Occupational coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Apprenticeships available in all industries</td>
</tr>
<tr>
<td>- Apprenticeships available in a range of occupations, particularly those that are typically undertaken by women as well as men</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participation</th>
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<tbody>
<tr>
<td>- Apprenticeships open to people of either gender and all ages</td>
</tr>
<tr>
<td>- Apprenticeships available in rural and regional as well as urban areas</td>
</tr>
<tr>
<td>- Clear pathways for school-leavers</td>
</tr>
<tr>
<td>- Pathways for disadvantaged people and for people without necessary entry qualifications</td>
</tr>
<tr>
<td>- Availability of off-the-job programs to facilitate entry to an apprenticeship</td>
</tr>
<tr>
<td>- Pathways into apprenticeship (and beyond) are clear and well-publicised in ways that reach all potential candidates</td>
</tr>
</tbody>
</table>
National government structures

- National policy emphasis is both on training aspects and on employment aspects of apprenticeship
- Good liaison between government agencies responsible for different aspects of the apprenticeship system
- Where responsibilities lie with states and provinces as well as national governments, the relative responsibilities are well-defined and publicised
- Rigorous qualifications that are regularly updated
- Collection of appropriate data about apprenticeships
- Systems make provision for apprenticeships in different geographical areas (eg rural as well as urban)

Stakeholders

- All major stakeholder groups (employers, training providers, employer groups and employee associations/trade unions are involved in the development and maintenance of apprenticeship regulation and structures
- A commitment to collaboration among the various stakeholders
- System for adding new occupations to the apprenticeship system according to specified criteria, with specific stakeholder bodies having responsibilities to notify new occupations

Such typologies are useful in describing the breadth of practices among apprentice systems. But the arrangements in the various typologies were often combined in different ways. So, for example, it was not possible to produce a ‘model system’ for a country at a particular stage of development or for a country that wishes to open its system to adults. The reality is much more complex than that.

The model framework therefore proposes groups of good practice features without proposing particular ‘mixes’ of features. In the discussion that follows, the findings are grouped into the following headings: Underlying principles, quality systems, provisions for apprentices and for employers, and expansion strategies.

4.1 Underlying Principles

From the country data, underlying principles were drawn out, grouped into four categories: occupational coverage, participation, national government structures and stakeholders. The principles are listed in Table 4.

These principles address the major components of a system: who can participate, what is the coverage of the economy, what structures are in place, and which stakeholders are involved.

4.2 Quality Systems

It became apparent when analysing the country case studies that a ‘model system’ needed to have an underpinning concern for quality. In some cases, where apprenticeship systems were in their infancy or were historically very small, quality was not a primary consideration, but the need for quality was emphasised throughout. Apprenticeship systems involve many components: employment, training in the workplace, training at training providers, and administrative systems at different levels of government. To address these issues and to suggest strategies, derived from the country case studies, that increased and assured quality, the following points were suggested (Table 5).

An important contributor to quality is the provision of resources. Apprenticeship systems involve complex decisions about appropriate use of scarce funds, the relative
contributions of governments, industry and individuals, and planning for the future so that financial commitment to the system remains appropriate should the system expand considerably.

Table 5: Systems to Improve and Maintain Quality

<table>
<thead>
<tr>
<th>Training providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Training providers that are subject to quality regimes including audits</td>
</tr>
<tr>
<td>- Content of qualifications is viewable on the internet</td>
</tr>
<tr>
<td>- Requirements for qualifications/training for teachers in training providers</td>
</tr>
<tr>
<td>- Trade testing at the end of the apprenticeship that is managed externally to the enterprise and the training provider (eg national ‘Red Seal’ system in Canada and local examination board in Germany)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employers</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A registration scheme for enterprises/employing organisations offering apprenticeships, with requisite criteria; proportionate criteria (ie less stringent) developed for SMEs, especially micro-businesses</td>
</tr>
<tr>
<td>- Supervision ratios in companies, which are communicated and enforced as part of maintenance of registration</td>
</tr>
<tr>
<td>- Requirements for qualifications/training for in-company trainers</td>
</tr>
<tr>
<td>- On-the-job training subject to some form of overseeing</td>
</tr>
<tr>
<td>- Continuing upskilling programs for company trainers and teachers</td>
</tr>
<tr>
<td>- Involvement of employer associations or groups and employee associations or trade unions at national and local level in apprentice systems</td>
</tr>
<tr>
<td>- Employers should be able to apply for registration as a training provider for off-the-job component of apprenticeships</td>
</tr>
</tbody>
</table>

The following principles for incentives to employers, training providers and individuals were suggested, derived from practices in the country case studies.

- Financial incentives for enterprises to participate, subject to monitoring of satisfactory performance including audits;
- Additional incentives for employers to employ disabled or disadvantaged people as apprentices;
- Public funding for training providers – wholly or partly funded for apprenticeship training - but could arguably be financed by student loans system;
- Discounted wages for apprentices (either a lower overall rate or non-payment while at off-the-job training), but within the discounted range, higher wages for mature aged people;
- Payment of social contributions for apprentices by the State; and
- Financial incentives to apprentices to complete their contracts and to employers who continue to employ their apprentices on completion.

4.3 Provisions for Apprentices and Employers

Despite government structures and stakeholder involvement, the basic participants in all apprenticeship systems are apprentices and employers. The ‘lifecycle’ model proposed by Smith et al [2009] focuses on this key relationship, following an apprentice through from recruitment to completion of the contract of training. In the current project, we listed a number of provisions for the apprentice and for the employer (Table 5) which the country
experts had identified as good practice. While the table is divided into ‘apprentice’ and ‘employer’ it is apparent that systems that support the apprentice also assist the employer, and vice versa. For example, if there is a ‘fall-back’ system for apprentices whose employer can no longer afford to employ them, this eases pressure on employers and also makes them more willing to employ an apprentice in the first place.

Table 6: Provisions for the Apprentice and the Employer

<table>
<thead>
<tr>
<th>Provisions for the apprentice</th>
<th>Provisions for the employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistance in meeting entry requirements and/or learning support once employed</td>
<td>Provision to enterprises of suggested workplace curriculum</td>
</tr>
<tr>
<td>Employed status within an enterprise</td>
<td>Cohort management systems within or across enterprises</td>
</tr>
<tr>
<td>An increase in pay over the period of an apprenticeship and a higher rate of pay on completion</td>
<td>Support for small and medium enterprises, through structured arrangements, by specified bodies</td>
</tr>
<tr>
<td>A combination of on and off the job learning with around 20% of time at a training provider</td>
<td>Support for employers rather than punitive measures for non-compliance</td>
</tr>
<tr>
<td>A chance to mix with apprentices from other enterprises</td>
<td>Easily-available information about the system for would-be apprentices and employers (eg Ellis chart in Canada)</td>
</tr>
<tr>
<td>Attainment of a recognised qualification</td>
<td>Fall-back system for apprentices whose employer can no longer afford to employ them (eg Group Training Organisations in Australia or interim ‘out of trade’ arrangements)</td>
</tr>
<tr>
<td>A training plan within the company</td>
<td></td>
</tr>
<tr>
<td>Opportunities to experience different workplaces if in a limited environment</td>
<td></td>
</tr>
<tr>
<td>A ‘case manager’ to oversee progress in off and on the job training (eg ‘pedagogical referent tutor’ in France)</td>
<td></td>
</tr>
<tr>
<td>Opportunities to switch employers for good reason</td>
<td></td>
</tr>
<tr>
<td>A chance to progress further to higher level employment or self-employment</td>
<td></td>
</tr>
</tbody>
</table>

4.4 Expansion and Simplification Strategies

Finally, the model framework took account of the opportunities and risks posed by strategies to expand apprenticeship systems. A number of expansion strategies were noted in the country case studies. These included the promotion of the brand of apprenticeship by governments, particularly in countries where the status of apprenticeships is low. This often included promotion of apprenticeships as a valued school-leaving pathway with deep connections into secondary schools, and Education of secondary school and other careers staff about apprenticeships. It also included measures to make apprenticeships more attractive through providing pathways to higher level qualifications so that people do not feel the choice is final and through encouragement through industrial relations or other systems for apprentice qualifications to form the basis of recruitment to jobs and/or be rewarded with higher pay. Strategies to increase participation of minority groups both assisted those groups in their labour market outcomes and increased the numbers in apprenticeships. Finally, two of the countries (Australia and, at a later date, England) had introduced a system of third-party employers into the apprenticeship system so that not all apprentices had to be directly employed by an enterprise.

However, without due care being paid, a rapid expansion poses quality risks that are subsequently difficult to address. The experiences of countries trying to increase their apprenticeship rates suggest the following risks:
− A rapid increase can lead to quality problems.
− Employers may be persuaded to participate without being fully aware of their responsibilities.
− Completion rates may be low unless quality is properly managed.
− Rapid establishment in new occupational areas without a tradition of formal training can lead to the risk of low-quality qualifications and workplace curriculum which can be hard to shift later, leading either to persistent negative perceptions of the occupation and the apprenticeship, or to rapid and confusing policy shifts to address the problem.
− The establishment of ‘differently-badged’ systems should be avoided, as it can lead to the newer systems being viewed as inferior, and such perceptions are difficult to shift subsequently (examples: traineeships in Australia, ‘modern apprenticeships’ in England).
− Extensive stakeholder involvement is vital.

Therefore countries looking to expand their systems need to be aware of these risks, and while each country is unique, other countries’ experiences can provide useful guidance.

Simplification is another important process for apprenticeship systems which is often allied to expansion because extremely complex systems cannot be scaled up. The country case studies illustrated the following processes which they had used, or which it was evident were needed, to simplify systems.

− Harmonisation across jurisdictions (states and provinces) to enhance mobility and improve understanding of systems.
− Consistency of contract periods (at least no more than two or three set lengths).
− Removal of parallel systems with the same country where feasible; or if not, clear communication processes.

Most of the case study countries were involved in exercises to try to reduce the differences among jurisdictions, in particular.

5 Conclusion

For the current project, these features have been calibrated against the Indian system and context to evaluate applicability and the production of options for the Indian system. The features could be considered by any national or provincial government seeking to review or reform its apprenticeship system, in conjunction with industry representatives. For the scholarly study of apprenticeships, the study provides a framework for examining apprenticeship systems. A particular feature of the framework is attention to the quality and relevance of training by TVET providers, which is often overlooked in policy discussions, as the latter often focus on employment aspects of apprenticeship. Another unique feature of the framework is the explicit attention paid to expansion strategies and the risk of such expansion.

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The Importance of Assessment for the World-Wide Comparability of TVET

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1 Background

Globalisation is going to capture all areas of life; this is of course also true for education, not only at the level of Higher Education where we can observe such a process not only recently, but also with regard to Technical Vocational Training and Education (TVET). The starting point for developments of this kind is, of course, the interest to increase the mobility of employees and, the other way round, the interest of trans-nationally expanding enterprises to have at their disposal a workforce whose competences are based on TVET standards comparable to those they know from their home countries.

Initiatives launched in this context with the support of public bodies are numerous, and it would exceed the framework of the article at hand to mention all processes having taken place and still going on all over the world. At this stage, I want only to point out developments in a lot of countries which, at least at first glance, show great commonalities: the establishment of qualification frameworks.

Qualification frameworks are not new: Already in 2003, Michael Young talked about national qualifications frameworks as a global phenomenon (Young 2003), and in the meantime the number of upcoming or established frameworks has increased. A very striking example is delivered by Europe: All countries belonging to the European Union have meanwhile set up national qualification frameworks or at least declared their willingness to establish them. In many countries this development was inspired by the establishment of the European Qualification Framework (EQF), adopted by the European Parliament in 2008 (Recommendation of the European Parliament and of the Council 2008/C111/01). In this context, national qualification frameworks are planned to be interfaces between national education and a meta-framework that plays the role of a “translation machine”: The EQF shall help stakeholders (public bodies, social partners, individuals) to understand qualifications from abroad in educational categories they are familiar with in their national contexts.¹

This document is one of the main drivers for setting up national qualification frameworks (NQFs): the issue of comparability with education abroad² referenced to

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¹ Apart from European countries (also those not yet belonging to the EU as the Western Balkan countries), there are a lot of others which can be meanwhile found on the list of countries establishing or having established NQFs, see e.g. Stephanie Allais (2010) which delivers information about New Zealand, Australia, South Africa, Mexico, Chile, Malaysia, Mauritius, Botswana, Sri Lanka, Turkey, Tunisia, Bangladesh and Russia. Also Indonesia is currently setting up a NQF, see http://www.mext.go.jp/component/b_menu/houdou/_icsFiles/afieldfile/2011/10/07/1311780_7.pdf
² However, there are, of course, also other motivations for setting up NQFs. For example, the South African NQF has been designed to

- "combine education and training into a single framework, and bring together separate education and training systems into a single, national system;
- make it easier for learners to enter the education and training system and to move and progress within it;
- improve the quality of education and training in South Africa;
structures including a common denominator for describing national educational systems (as this should be the case for the EQF), these frameworks should be basically usable for making qualifications comparable, it should then be possible that workplaces can be found beyond borders since entrepreneurs then are able to judge which kind of work an applicant from a foreign country can carry out.

This seems to be best possible if NQFs are described in terms of learning outcomes:

An outcome based NQF (…) can be used across sectoral, institutional, curricular boundaries; it does not, for example, assume that learning is based on full-time study in a formal institution. Learning outcomes thus provide a relatively ‘neutral’ basis for mapping and classifying different types of qualifications. (Raffe 2011:91)

Against this background, it should not surprise that the descriptors of the EQF – planned to be something like a “translation machine” between national qualification frameworks in Europe – also refer to learning outcomes, and that a lot of efforts have been put (and are still being put) on “referencing” NQFs to the EQF.

2 The role of assessment in the context of linking NQFs

In the light of these processes, assessment is getting an increasing role: If ways to achieve learning results have to be neglected as they are too different in order to be taken in account in the context of comparing (and recognising) qualifications, it becomes important that learning outcomes, described in the same way for in other respects totally differing educational systems (thereby delivering the only basis for comparison), are really comparable in practical terms since the same kind of understanding success and failure with regard to achieving these learning outcomes rules their consideration.

The best way to provide for security in this field is, of course, to apply the same assessment approaches everywhere. If one can be sure that the same things are measured not only in one country, but also abroad, this can help to establish zones of mutual trust, an issue which has been always discussed in the context of frameworks that should help to set up relationships between qualifications in one country to similar qualifications in another one.

However, assessment approaches vary strongly from country to country; and a closer look at these approaches turns out that this is not only due to some issues like performance criteria that can be interpreted differently from country to country, but also within the same country and even within the same examination environment. This seem to be uncertainties

- open up learning and work opportunities for those who were treated unfairly in the past because of their race or gender; and
- enable learners to develop to their full potential and thereby support the social and economic development of the country as a whole.” (see The National Qualifications Framework Brochure, http://www.saqa.org.za/show.asp?include=docs/brochures/nqf-brochure.html&menu=home)

An example taken from the British NVQ shall illustrate this:

“Element 3.1: establish customer needs
Performance criteria
You will need to:
3.1.1 Give customers prompt attention and treat them politely
3.1.2 Give your customer, when necessary, a clear and accurate account of your role, and the levels of information and advice that you can provide
3.1.3 Establish the needs of your customer through discussion, using appropriate questioning
3.1.4 Check your customer’s responses to ensure you understand them
3.1.5 Conduct your discussion in a manner appropriate to your customer’s needs
3.1.6 Record all relevant information accurately
3.1.7 Pass promptly to the relevant person any sales opportunity outside your area of knowledge or responsibility”

(See Unit 3 – sell financial products and services (NVQ Level 3), quoted according to Straka (2004, Annex, author’s emphasis) It is obvious that terms like “prompt”, “appropriate” can be understood differently by examiners.

that can possibly be reduced, but probably not totally be eliminated as long as assessment is at least partially also dependent upon subjective assumptions.

However, there are some crucial issues of assessment that cannot be considered under this aspect. Although assessment has always measured the results of learning (what should an examination otherwise do?) and thus the assessment of learning outcomes is not a totally new approach, even if this term has not always been used in national environments, it cannot be claimed that assessment does basically not raise problems in the context of debates on frameworks since assessment seems to be “naturally” linked to learning outcomes. From this point of view, it could appear easy to provide for comparability of qualifications acquired in different national contexts: As these qualifications should be all described by learning outcomes in the near future, appropriate world-wide used assessment standards should be sufficient to guarantee that the specific learning outcomes of a qualification are not only labels glued on by some national competent bodies and possibly suspiciously eyed from those beyond the borders, but are based on the same quality criteria.

It cannot be measured up to this expectation since assessment standards are not only determined by intrinsic categories, but also by relationships to other elements of education. In the field of TVET, this encompasses reference to stakeholders, occupational and educational standards (including the design of curricula), and – most notably – the relationship to the concept of learning outcomes that in TVET is normally defined as competence. This basic concept is understood very differently in the framework of national traditions. The table below should document this:

<table>
<thead>
<tr>
<th>Country</th>
<th>Definition of Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Competence of action-taking or <em>Handlungskompetenz</em> is the principal aim of VET in the dual system: to enable the student to take autonomous and responsible action within the workplace. It is a multi-dimensional concept comprising occupational competence (<em>Fachkompetenz</em>), social competence (<em>Sozialkompetenz</em>), procedural competence (<em>Methodenkompetenz</em>) and personal competence (<em>Selbstkompetenz</em>). Each of these dimensions relates to particular knowledge, skills and competences. The latter include moral and social attributes such as taking responsibility and showing awareness of the consequences of occupational action.</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Competence is ‘the ability to successfully meet complex demands in a particular context through the mobilisation of psychosocial prerequisites’ (Rychen and Salganic, 2003, p. 13). The Dutch system distinguishes between four types of competences: occupational, career, civic and learning competences. Each of these is defined in terms of knowledge, skills, attitudes and behaviour. The Netherlands has a competence-based qualifications framework. Core competences have been derived from job content analysis and serve as a basis for both curriculum development and assessment.</td>
</tr>
<tr>
<td>France</td>
<td>The French approach draws on knowledge (savoir), skills (savoir-faire) and social competences (savoir-être). Individual competences relate to each other and are difficult to dissociate from the overall occupational profile. Competences can be understood as dynamic processes of learning, developing and passing on knowledge. France has a competence-based qualifications framework. Competences have been derived from job content analysis and serve as a basis for both curriculum development and assessment.</td>
</tr>
<tr>
<td>England</td>
<td>In the English model, competence relates not to the overall capacity of the individual but to the individual’s performance of prescribed tasks or skills to a</td>
</tr>
</tbody>
</table>
defined standard. This is epitomised in the National vocational qualifications (NVQ) system which combines ‘units of competence’ based on occupational standards into NVQ awards. Competence in this model is based on narrow and fragmented skill sets, which are cumulative rather than integrative. Any knowledge presumed necessary for underpinning performance is equally fragmented. With its focus on output, competence in the English system is not a holistic concept, nor does it encompass an individual’s social or civic qualities. It contains no notion of development of the self.

Source: This table is drawn from the work of the UK Nuffield Foundation project Cross-National Equivalence of Qualifications and Skills, led by Linda Clarke (University of Westminster, London) and Chris Winch (King’s College, London), with the participation of experts in the UK, France, Germany and the Netherlands. See: www.kcl.ac.uk/schools/sspp/education/research/projects/euровc.html [cited 20.5.2008].

It should be noted that the above mentioned countries meanwhile have put a lot of efforts on setting up resp. updating national qualification frameworks and referencing them to the European Qualification Framework, thus necessarily describing their national education systems in terms of learning outcomes. On the other hand, it cannot be observed that the approaches described in the table above have basically changed. Hence it has to be assumed that the EQF descriptors leave a lot of space for different understandings of competence.

From a political point of view, this can be possibly considered an advantage. However, if we really want to achieve trans-national comparability of qualifications (which nowadays more and more means global comparability), we have on the long run to provide for mutual trust among stakeholders all over the world. This should not happen in areas where mainly a common denominator for covering diverging approaches is searched for, but in fields where those approaches have necessarily to be contrasted as otherwise stakeholders would reject to recognise qualifications acquired abroad.

The area of assessment, especially in TVET, should be understood in this way. It is placed at the interface between work and education, and it is therefore eminently suited to discuss the relevant issues from a practical point of view, without losing track of theoretical requirements: It is not by chance that assessment is linked to nearly all elements relevant for TVET.

3 A plea for a global TVET assessment forum

The differences described in the table above cannot only be observed for the above mentioned countries, but – mutatis mutandis – also for a series of other countries. This is especially important if we consider that in many countries TVET has been and is being set up with the support of experts from abroad, and it is understandable that these experts copy consciously or unconsciously the TVET system of their home country to a certain extent. This procedure was in many cases not very successful since it ignores that the success of

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4 The table was taken from Cedefop, The Shift to Learning Outcomes, Policies and Practices in Europe, p.19f, own emphasis. The source is no longer accessible via the above mentioned link. Although some changes have taken place during the recent past, the basic differences between the four countries are still valid.

5 This delivered starting points for some EQF related projects intending to reduce the mentioned ambiguity of understanding learning outcomes, as Common Grounds for Referencing NQFs and SQFs to the EQF (http://www.project-nqf-sqf.eu) and Matching Frames (http://www.matchingframes.uni-bremen.de/)

6 In this context, it is not decisive if public agreements have been made or not. An entrepreneur, for example, has to believe that somebody from abroad can fulfill the tasks required at a vacant job position.
these systems is dependent on conditions that do not exist in the target country.\textsuperscript{7} If this mistake shall be avoided, differences of TVET approaches should be discussed, and since these differences are more and more getting global relevance, at a global level.

The article at hand should up to now already have shown that assessment is something like a “focal point” for TVET essentials: From a practical perspective, every TVET system has to include assessment, and related to all relevant elements of TVET, assessment mirrors the character of national TVET systems. It is therefore suggested that ways are sought to establish a global TVET assessment forum where discussions about various approaches to carry out TVET assessment can be carried out, not only involving experts already dealing with this issue, but also stakeholders that want to get an overview of the implications that the establishment of specific TVET systems have.

Thus the basis for a worldwide continuous collaboration of all stakeholders in this area should be created. Members should comprise:

- Public bodies working at international and at national level
- Social partners
- Organisations of teachers and trainers
- Relevant research institutions

Although the members of such a framework cannot and should not replace national regulations by common decisions, their discussions can lead to an adaptation of national assessment approaches to the needs of comparability of learning outcomes, thereby contributing to the creation of zones of mutual trust.

4 Possible subjects of discussions

As mentioned above, assessment in IVET can only be properly understood if it is considered in relationship to all other elements of TVET. At first glance sufficiently considered only with reference to “immanent” criteria of assessment, assessment in TVET delivers various starting points for developments relevant for the whole TVET system that could be discussed in the framework of the planned forum:

- In the recent past, it was sometimes tried to enhance assessment methods in terms of realism. This led to the introduction of projects to be carried out by candidates, trying to mirror as much as possible the full reality of work within a professional environment. Including also preparatory activities as planning and description of planned activities, these projects cannot be assessed within the limitations of traditional summative assessment where certain time restrictions cannot be ignored. Hence assessment, originally planned only as summative assessment, is thus getting more and more a formative character, since abilities are not only made visible by ad-hoc demonstrations initiated by assessors just when the final examination takes place, but by means of actions that include preparation exceeding the time-frame of final exams and therefore, of course, open the perspective of support by teachers and trainers.\textsuperscript{8}

\textsuperscript{7} Examples are numerous. At this stage, it shall only be mentioned how countries of the former Soviet Union tried to “import” Western European approaches of TVET, and which obstacles were observed when the German dual system of IVET should be “exported” to Indonesia.

\textsuperscript{8} This information refers to recent developments in the Czech Republic. For more information on this country, see CEDEFOP (2010)

The difference between summative and formative assessment can be described as follows:

- “formative assessment: typically continuing assessment which aims at providing and further informing the learning processes. Formative assessment may be used to enable learners to pass from one training phase to another, but does not result in certification;
There is a correspondence between task-based assessment (as used in England, but similarly also in Australia) and modularisation of curricula. Where did the assessment approach influence the design of curricula, where is it the other way round? What are the implications?

The emphasis on learning outcomes favours the separation of assessment from the context of educational institutions: If it is not important how learning outcomes are achieved, it is only crucial that they have been achieved, and this can be confirmed via assessment that is independent from institutions where training and education takes place; it is even possible that these learning outcomes are achieved by professional experience. In the light of these reflections, what are the issues of assessing the results of non-formal and informal learning? Which institutional provisions do already exist, which structures favour the further development of the above mentioned separation of educational institutions and assessment?

References:


Common Grounds for Referencing NQFs and SQFs to the EQF http://www.project-nqf-sqf.eu

Cedefop: The relationship between quality assurance and VET certification in EU Member States.


Državni izpitni center (National Examinations Centre) [of Slovenia] http://www.ric.si

HEIs accredited by NAAHE (National Accreditation Agency of Indonesia) www.mext.go.jp/component/b_menu/houdou/__icsFiles/afieldfile/2011/10/07/1311780_7.pdf

Matching Frames (http://www.matchingframes.uni-bremen.de/).


A Study on Core Curricula for Vocational Teacher Education in Mechanical Engineering and Electrical Engineering within Regional Integrated Context

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Abstract

Curriculum and curriculum development are factors that affect the training quality of higher education, especially in vocational teacher education (VTE). Curriculum is also one of the bases for institutions training the same major to recognize the training outcomes of one another or to exchange teachers and students.

Within the Regional Cooperation Platform for Vocational Teacher Education in Asia (RCP), 4 vocational teacher training institutions from Vietnam (Namdinh University of Technology Education – NUTE), Laos (Faculty of Engineering/ National University of Laos – FE/NuoL), Indonesia (Faculty of Technology and Vocational Education/ Indonesia University of Education – FPTK/UI) and China (Institute of Vocational Teacher Education – IBB/Tongji University) share the same interest in developing core curricula for VTE in Mechanical Engineering (ME) and Electrical Engineering (EE) at Bachelor Degree.

In this study, the curricula for VTE in ME and EE of each institution are analyzed and compared in terms of structure, objectives, duration, enrollees, how to evaluate the results of each subject or the whole course, the number of subjects and the contents of each subject. Basing on common points, institutions agree to build two core curricula for VTE in ME and EE with the following structure: (1) Title of the core curriculum; (2) Objectives of study; (3) Duration of study; (4) Enrollee; (5) Graduation condition; (6) Assessment; (7) Structure of the curriculum (including general knowledge, professional knowledge, pedagogical knowledge, internship – practice); (8) description of subjects; and (9) how to use the core curriculum.

The core curriculum for VTE in ME consists of 134 credits including 28 credits of general knowledge, 52 credits of professional knowledge, 21 credits of pedagogical knowledge, 22 credits of internship – practice and 8 credits of graduation paper.
The core curriculum for VTE in EE consists of 133 credits including 30 credits of general knowledge, 55 credits of professional knowledge, 21 credits of pedagogical knowledge, 22 credits of internship – practice and 8 credits of graduation paper.

**Key words:** Curriculum, Core curriculum, Vocational Teacher Education, Mechanical Engineering, Electrical Engineering, Subject, Credit, General knowledge, Professional knowledge, Pedagogical knowledge, Internship – Practice, Graduation paper.

1 Introduction

Nowadays, the lack of skilled workers is becoming a hot problem not only in Vietnam but also in the other Asian countries. That is the reason why vocational training plays a more and more important part in the modern society. In order to develop vocational training, it is necessary to improve vocational teachers both in quantity and quality. According to the statistics of the General Department of Vocational Training (GDVT), in Vietnam by the end of 2010, there are 457 occupations, which are being trained in 426 vocational institutions (303 vocational secondary schools and 123 vocational colleges). However, the Vietnamese government is focusing on building 120 occupations at national, regional and international levels, among which are the occupations of Metal Cutting and Industrial Electric. The statistics also states that about 80% of the vocational institutions are training the two mentioned occupations. In order to train these two occupations, it is necessary for a vocational teacher to major in ME and EE. Namdinh University of Technology Education (NUTE) is one of four universities training vocational teachers in Vietnam. The school is also concentrating its resources on developing VTE in ME and EE. NUTE has taken many measures to continually enhance the training scale and training quality such as developing the curriculum, applying advanced teaching methodology, investing in material facilities and equipment, and cooperating with institutes in the region and in the world. Among these measures, developing the curriculum is one of the most important.

In the context of regional and international integration, the demand to exchange teachers and students between universities requires their curricula of the same major to be relevant to the curricula of other countries in the region and in the world.

Sharing the same perspective, within RCP, the NUTE’s demand to build the core curricula is the same as the demand of the other universities from Laos, Indonesia and China. Hence, the 4 partners, namely NUTE, FE/NUoL, FPTK/UPi and IBB/Tongji University cooperate in order to define the core curricula for VTE Bachelor Degree Programs in ME and EE.

2 Background of the study

In higher education, curriculum and curriculum development play an important role to enhance the quality. Hence, the definition of curriculum and curriculum development has attracted many educators. Smith, Stanley and Shores [1957] define curriculum as a *series of knowledge that students can obtain and is designed by the school to train students in thinking and action*. In Vietnam, Article 6 of the Education Law [2005] states that a *curriculum shows educational objectives; standards of knowledge and skills; scope and structure of educational contents; methods and forms of educational activities; how to assess the educational outcomes for subjects in each grade, each school or training level*. There are many different ways to understand a curriculum, which depends on the perspectives and the approaches including the approach of content; the approach of objective; the approach of development. In the approach of content, a curriculum is the content through which teachers know what they need to teach and learners know what they
need to learn. According to the approach of objective, a curriculum is a training plan that reflects the training objectives. The approach of development sees a curriculum as an overall design for an educational activity. It shows the entire educational contents, what is expected from students after the course, the necessary procedures to provide educational contents, educational methods and how to assess the results. All those things are arranged in a strict timetable [Wentling, 1993].

According to the approach of development, a curriculum is not designed once and for all, but it should be developed and supplemented depending on the socio-economic development, scientific and technological achievements to meet the requirements of the labor market. Thus, curriculum development is a continuous process in order to constantly improve the curriculum. Basically, creating a curriculum consists of three basic steps: Designing a curriculum, implementing the curriculum, evaluating the curriculum. There are various curriculum development models such as the systemic curriculum development model by Diamond [1998] or the participatory curriculum development model. However, the hybrid model by Okebukola [1997] combines the characteristics of the two mentioned models and the majority of the universities and colleges consider it the standard and suitable model for curriculum design for bachelor degree programs. The model includes 11 steps: diagnosis of needs; formulation of objectives; selection of content; organisation of content; organisation of learning activities; determination of what to evaluate and of the ways and means of doing it; revising and consolidating; approval by faculty, senate and governing council; use of the approved curriculum and periodic review.

In order to improve the curricula of each partner, the authors aim to build core curricula for vocational teacher education in mechanical engineering and electrical engineering. Shabani defines a core curriculum as a set of courses or subject that is of absolute necessity in a programme of study. The core is usually the set of subjects that must be done by everybody because it is required by all areas of specialisation. Specific curricula of institutions are developed from core curricula. Hence, it is important to build an effective core curriculum in order to have good curricula.

3 Findings

3.1 The situation of VTE in ME and EE at NUTE

The predecessor of NUTE was Namha Industrial School founded on December 21, 1966. During more than 46 years, the University had different names to be suitable to its mission in each period such as: Vocational Teacher Schools No. 2 (1970), Namdinh Technical Teacher Training School No2 (1978). During this time, the school was responsible for training vocational teachers at elementary level. In 1999, the school was upgraded to Namdinh College of Technology Education and was officially assigned to train vocational teachers at college level. In 2006, the school was upgraded to Namdinh University of Technology Education and started training students at university level with 10 majors: 1) Information Technology; 2) Computer Science; 3) Automotive Engineering; 4) Mechanical Engineering; 5) Welding Technology; 6) Electrical Engineering; 7) Electrical electronic Engineering; 8) Controlling and Automation Engineering; 9) Accounting; 10) Business Administration.

NUTE is one of 4 state universities to train vocational teachers for the whole country. NUTE is under the control of Ministry of Labour, Invalids and Social Affairs (MoLISA). There are 297 persons in the teaching and management staff of the university, among whom there are 216 Lecturers and Senior Lecturers and 81 technical officers belonging to 9 faculties, 8 offices and 4 centers.

There are 4 centers at the university, among which is Center for Engineering Practice where students of all the majors can practice their professional skills to be able to become
vocational teachers in the future. There are 88 laboratories and workshops for all the majors at the university.

At NUTE, training vocational teachers in EE started in 2006 and in ME in 2007. The numbers of students studying these two majors are listed in the following table:

Table 1: The enrolment of VTE in ME and EE at NUTE for the past 6 years

<table>
<thead>
<tr>
<th>Major</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering</td>
<td>134</td>
<td>176</td>
<td>363</td>
<td>207</td>
<td>163</td>
<td>107</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>327</td>
<td>249</td>
<td>116</td>
<td>182</td>
<td>236</td>
<td>129</td>
</tr>
</tbody>
</table>

To become a vocational teacher, students have to study 9 semesters or 4.5 years. The total volume is 146 credits, among which are 51 credits of general knowledge, 50 credits of professional knowledge (including basic knowledge and specialized knowledge), 17 credits of pedagogical knowledge, 19 credits of practice and 10 credits of graduation paper.

Table 2: The amount of knowledge for VTE in ME and EE at NUTE

<table>
<thead>
<tr>
<th>Number of credits</th>
<th>Mechanical Engineering</th>
<th>Electrical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>General knowledge</td>
<td>51 credits</td>
<td>51 credits</td>
</tr>
<tr>
<td>Pedagogical knowledge</td>
<td>17 credits</td>
<td>17 credits</td>
</tr>
<tr>
<td>Professional knowledge</td>
<td>50 credits</td>
<td>50 credits</td>
</tr>
<tr>
<td>Basic knowledge</td>
<td>26 credits</td>
<td>30 credits</td>
</tr>
<tr>
<td>Specialized knowledge</td>
<td>24 credits</td>
<td>20 credits</td>
</tr>
<tr>
<td>Internship</td>
<td>18 credits</td>
<td>18 credits</td>
</tr>
<tr>
<td>Graduation paper</td>
<td>10 credits</td>
<td>10 credits</td>
</tr>
<tr>
<td>Total</td>
<td>146 credits</td>
<td>146 credits</td>
</tr>
</tbody>
</table>

3.2 The situation of VTE in ME and EE in Faculty of Engineering (NUoL)

The Faculty of Engineering was founded in 1995 under the name Faculty of Engineering and Architecture (FEA). The Faculty has grown to be the largest faculty of National University of Laos. FE/NUoL sets a goal to achieve world standards of excellence in engineering education, and to be recognized internationally. The faculty has the role to equip engineers with solid scientific knowledge and technical skills to keep up with rapidly changing technology in the work place. In order to perform that role, FE pays much attention to developing the staff and facilities. With the reputation and productive investment, every year many students register to study at Faculty of Engineering. The number of students for the past seven years is shown in the following table:

Table 3: The enrolment of ME and EE majors at FE/NUoL during the past seven years

<table>
<thead>
<tr>
<th>Major</th>
<th>Course</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering</td>
<td>Master Degree</td>
<td>82</td>
<td>81</td>
<td>106</td>
<td>159</td>
<td>224</td>
<td>244</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td>252</td>
<td>252</td>
<td>292</td>
<td>276</td>
<td>239</td>
<td>115</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Higher Diploma</td>
<td>4</td>
<td>9</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diploma continue to</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher Diploma continue to</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>334</td>
<td>337</td>
<td>407</td>
<td>440</td>
<td>494</td>
<td>417</td>
<td>306</td>
</tr>
<tr>
<td>Electrical</td>
<td>Master Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>
At FE/NuOL, there exists the Vocational Teacher Education Department (VTED). At VTED, the professional subjects are offered by the Mechanical Engineering Department or the Electrical Engineering Department depending on the majors, and the pedagogical subjects are provided by VTED. Table 4 shows the amount of knowledge for vocational teacher education in ME and EE:

Table 4: The amount of knowledge for VTE in ME and EE at FE/NuOL

<table>
<thead>
<tr>
<th>Number of credits</th>
<th>Mechanical Engineering</th>
<th>Electrical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>General knowledge</td>
<td>20 credits</td>
<td>20 credits</td>
</tr>
<tr>
<td>Pedagogical knowledge</td>
<td>32 credits</td>
<td>32 credits</td>
</tr>
<tr>
<td>Professional knowledge</td>
<td>93 credits</td>
<td>94 credits</td>
</tr>
<tr>
<td>Basic knowledge</td>
<td>42 credits</td>
<td>30 credits</td>
</tr>
<tr>
<td>Core knowledge</td>
<td>51 credits</td>
<td>59 credits</td>
</tr>
<tr>
<td>Elective subjects</td>
<td></td>
<td>05 credits</td>
</tr>
<tr>
<td>Graduation paper</td>
<td>04 credits</td>
<td>04 credits</td>
</tr>
<tr>
<td>Total</td>
<td>149 credits</td>
<td>150 credits</td>
</tr>
</tbody>
</table>

3.3 The situation of VTE in ME and EE in the Faculty of Technology and Vocational Education (UPI)

Indonesia University of Education (UPI) is one of the oldest universities in Indonesia. It was founded under the name of Teachers Education College in 1954. In the course of its development, UPI has become the only institution of higher education in Indonesia which consistently focuses on education. At present, UPI has 1,261 academic staffs in seven faculties, the school of postgraduate studies, and branch campuses. Among them are 84 professors, 525 associate professors, 423 lecturers, and 244 assistant lecturers. They include 174 lecturers with a Doctoral degree from Indonesian Universities and 37 from overseas, 689 lecturers with a Masters degree from Indonesian Universities and 45 from overseas. In addition, UPI is also supported by 803 administrative staff including laboratory assistant and librarians. The Faculty of Technology and Vocational Education (FPTK) is one of seven faculties of UPI. The major mission of the faculty is to develop professional human resources (teachers, educational scientists, and other technical and vocational educators) in relevant services and industries. There are five departments in the faculty including Department of Electrical Engineering Education and Department of Mechanical Engineering Education.

The curricula for VTE in ME and EE, built and applied in FPTK (UPI), mention the objectives, duration, structure of the study program, and enrolment. The programs aim at training experts in vocational education in ME and EE. The standard duration of a bachelor program is 4 years, but it is also possible to complete the study program within only 3.5 years if a student is very bright, works very hard, and has met all the requirements for graduation. The longest possible study duration is 5 years for these programs. The study programs of Electrical and Mechanical Engineering Education are made up of 60 subjects equivalent to 150 credits. More specific information is stated in the table below:
Table 5 The amount of knowledge for VTE in ME and EE at FPTK/UPI

<table>
<thead>
<tr>
<th>Number of credits</th>
<th>Mechanical Engineering</th>
<th>Electrical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>General subjects</td>
<td>14 credits</td>
<td>14 credits</td>
</tr>
<tr>
<td>Expertise subjects</td>
<td>92 credits</td>
<td>93 credits</td>
</tr>
<tr>
<td>Professional basic subjects</td>
<td>12 credits</td>
<td>12 credits</td>
</tr>
<tr>
<td>Professional expertise subjects</td>
<td>12 credits</td>
<td>14 credits</td>
</tr>
<tr>
<td>Elective subjects</td>
<td>16 credits</td>
<td>13 credits</td>
</tr>
<tr>
<td>Profession training subjects</td>
<td>04 credits</td>
<td>04 credits</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>150 credits</strong></td>
<td><strong>150 credits</strong></td>
</tr>
</tbody>
</table>

3.4 The situation of VTE in ME and EE at Institute of Vocational Teacher Education (Tongji University)

Tongji University is one of the leading universities directly under the State Ministry of Education in China. It offers degree programs both at undergraduate and postgraduate levels. The university now registers over 50,000 students at all levels from certificate and diploma courses to Bachelors Degrees, Masters, PhD programs and post doctoral attachments. There are over 4200 academic staff for teaching and/or research, over 710 professors and 1500 associate professors. The university offers diverse courses in its 82 Bachelors Degrees, 218 Masters, 94 PhD programs and 16 post doctoral mobile stations. As one of the state leading centers for scientific research, the university has 22 state key laboratories and engineering research centers. Institute of Vocational Teacher Education (IBB) of Tongji University was founded in the context of the project "Training of vocational teachers at the Tongji University of Shanghai". The project was a measure in the 1994 between the Chinese Ministry of Commerce and the Federal Ministry of Cooperation and Development agreed initiative to increase cooperation in the field of vocational training. It supported China's plan for comprehensive reform of vocational education initiated. The basic aim is to train qualified specialists and managers for the economic and social development of China. Many professional courses and basic professional courses are taught by university professional teachers. Education courses are taught by the teachers of the College. In the past five years, more than 100 electric professional students and more than 100 mechanical professional students were trained.

The curricula for vocational teacher education in Mechanical Engineering and Electrical Engineering have been built with the objectives to meet the modernization needs of the twenty-first century, the all-round development of physical and moral energy, setting the basic knowledge and skills of mechanical engineering, vocational education teaching theory and practice in a compound of senior personnel. The two majors enrol high school graduates. It takes them 4 years to finish the whole course with general knowledge, pedagogical knowledge and professional knowledge. The specific amount of knowledge is shown in the table below:

Table 6: The amount of knowledge for VTE in ME and EE at IBB/Tongji University

<table>
<thead>
<tr>
<th>Number of credits</th>
<th>Mechanical Engineering</th>
<th>Electrical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>General knowledge</td>
<td>91.5 credits</td>
<td>84.5 credits</td>
</tr>
<tr>
<td>Pedagogical knowledge</td>
<td>16 credits</td>
<td>18.5 credits</td>
</tr>
<tr>
<td>Professional knowledge</td>
<td>94 credits</td>
<td>95 credits</td>
</tr>
<tr>
<td>Basic knowledge</td>
<td>26 credits</td>
<td>34 credits</td>
</tr>
<tr>
<td>Specialized knowledge</td>
<td>30 credits</td>
<td>20 credits</td>
</tr>
<tr>
<td>Internship</td>
<td>21 credits</td>
<td>24 credits</td>
</tr>
<tr>
<td>Graduation paper</td>
<td>17 credits</td>
<td>17 credits</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>201.5 credits</strong></td>
<td><strong>198 credits</strong></td>
</tr>
</tbody>
</table>
3.5 The core curricula for VTE in ME and EE

Basing on the comparison and analysis, the authors have built the core curricula for VTE in ME and EE. The structure of each core curriculum consists of nine parts: (1) the title of the core curriculum, (2) objectives of study, (3) duration of study, (4) enrollee, (5) graduation condition, (6) assessment, (7) the structure of knowledge, (8) description of each subject and (9) the guide how to use the curriculum. The specific content of each part is as follows:

- **Title of the core curriculum:** Core curriculum for vocational teacher education in mechanical engineering/electrical engineering
- **Objectives of study:** To train students with knowledge, skills and ability to teach in mechanical engineering/electrical engineering in vocational institutes and industry.
- **Duration of study:** 4 years
- **Enrollee:** Graduates from upper secondary schools or equivalent institutes
- **Graduation condition:**
  - Take all required subjects
  - GPA >= 2.00
  - No "F"
- **Assessment:** Basing on the national assessment system of each country.
- **Structure of the knowledge:** The structure of knowledge includes general knowledge, professional knowledge, pedagogical knowledge, internship – practice and a graduation paper. The specific amount of each kind of knowledge is shown in the following table:

<table>
<thead>
<tr>
<th>Table 7 The amount of knowledge in the core curricula for VTE in ME and EE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical Engineering</strong></td>
</tr>
<tr>
<td>General knowledge</td>
</tr>
<tr>
<td>Professional knowledge</td>
</tr>
<tr>
<td><strong>Basic knowledge</strong></td>
</tr>
<tr>
<td><strong>Specialized knowledge</strong></td>
</tr>
<tr>
<td>Pedagogical knowledge</td>
</tr>
<tr>
<td>Internship – Practice</td>
</tr>
<tr>
<td>Graduation paper</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Table 8 illustrates the list of subjects for each kind of knowledge.

<table>
<thead>
<tr>
<th>Table 8: List of subjects for the core curricula for VTE in ME and EE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No</strong></td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
</tbody>
</table>

| II | Professional knowledge | 55 | Professional knowledge | 52 |

| II.1 | Basic knowledge | 29 | Basic knowledge | 34 |

**Compulsory subjects**

<table>
<thead>
<tr>
<th>No</th>
<th>Subject</th>
<th>Credit</th>
<th>Subject</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Graphic and Technical Drawings</td>
<td>3</td>
<td>Electrical circuit 1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Heat Transfer</td>
<td>2</td>
<td>Electrical circuit 2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Mechanics I – Statics</td>
<td>3</td>
<td>Electronic 1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Mechanics II – Dynamics</td>
<td>2</td>
<td>Electronic 2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Engineering material 1</td>
<td>2</td>
<td>Electrical Measurement and Instrumentation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Engineering material 2</td>
<td>2</td>
<td>Digital Technique</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Metal technology</td>
<td>2</td>
<td>Power Electronic</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Tolerance and Measurement Technique</td>
<td>2</td>
<td>Electric Machine 1</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Machine Principle and Part</td>
<td>2</td>
<td>Electric Machine 2</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Part Course Project</td>
<td>1</td>
<td>Electric drives</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Electric-electronic technique</td>
<td>2</td>
<td>Electronic-Electrical Materials</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Fluid Mechanics</td>
<td>2</td>
<td>Automatic Controlling Systems</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Strength of Material</td>
<td>2</td>
<td>Microprocessor</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Project 1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Elective subjects**

<table>
<thead>
<tr>
<th>No</th>
<th>Subject</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Computer Aided Designing and Drawing</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Industrial Economics and Quality Management</td>
<td>2</td>
</tr>
</tbody>
</table>

| II.2 | Specialized knowledge | 26 | Specialized knowledge | 18 |

**Compulsory subjects**

<table>
<thead>
<tr>
<th>No</th>
<th>Subject</th>
<th>Credit</th>
<th>Subject</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metal Cutting Principle</td>
<td>3</td>
<td>Electrical installation technique</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>General Metal Cutting Machines</td>
<td>2</td>
<td>Power system analysis</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Mechanical Manufacturing Technology and Fixture</td>
<td>4</td>
<td>Power system protection</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Mechanical Manufacturing Technology course project</td>
<td>1</td>
<td>Power station &amp; Substation</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>CNC Technology</td>
<td>2</td>
<td>Power transmission</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Unconventional processing methods</td>
<td>3</td>
<td>SCADA</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>CNC machine and industrial robot</td>
<td>3</td>
<td>Programming control</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Industry Safety and Maintenance</td>
<td>2</td>
<td>Project 2</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Mold Manufacturing Technology</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Automatic Controlling</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Elective subjects**

<table>
<thead>
<tr>
<th>No</th>
<th>Subject</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Experimental method and Data Processing</td>
<td>2</td>
</tr>
</tbody>
</table>
### Compulsory subjects

<table>
<thead>
<tr>
<th>No</th>
<th>Subjects</th>
<th>Credit</th>
<th>Subjects</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Vocational Education</td>
<td>2</td>
<td>General Vocational Education</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Psychology of Learning and Teaching</td>
<td>2</td>
<td>Psychology of Learning and Teaching</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Research Methodology</td>
<td>2</td>
<td>Research Methodology</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Development Vocational Curriculum</td>
<td>2</td>
<td>Development Vocational Curriculum</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Teaching Skill</td>
<td>3</td>
<td>Teaching Skill</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Teaching Media</td>
<td>2</td>
<td>Teaching Media</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Practice in Vocational School</td>
<td>4</td>
<td>Practice in Vocational School</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Measurement And evaluation teaching</td>
<td>2</td>
<td>Measurement And evaluation teaching</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Teaching Methodology</td>
<td>2</td>
<td>Teaching Methodology</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Professional Didactic</td>
<td>2</td>
<td>Professional Didactic</td>
<td>2</td>
</tr>
</tbody>
</table>

### Elective subjects

<table>
<thead>
<tr>
<th>No</th>
<th>Subjects</th>
<th>Credit</th>
<th>Subjects</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Teaching Methodology</td>
<td>2</td>
<td>Teaching Methodology</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Professional Didactic</td>
<td>2</td>
<td>Professional Didactic</td>
<td>2</td>
</tr>
</tbody>
</table>

### Internship – Practice

<table>
<thead>
<tr>
<th>No</th>
<th>Subjects</th>
<th>Credit</th>
<th>Subjects</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Technical Internship in workshop/Lab</td>
<td>16</td>
<td>Technical Internship in workshop/Lab</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Technical Internship in Factories</td>
<td>2</td>
<td>Technical Internship in Factories</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Teaching internship in Vocational Institutions</td>
<td>4</td>
<td>Teaching internship in Vocational Institutions</td>
<td>4</td>
</tr>
</tbody>
</table>

### Graduation paper

<table>
<thead>
<tr>
<th>No</th>
<th>Subjects</th>
<th>Credit</th>
<th>Subjects</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Graduation paper</td>
<td>8</td>
<td>Graduation paper</td>
<td>8</td>
</tr>
</tbody>
</table>

**Total**: 134

In general knowledge, the authors only mention some core subjects such as English, mathematics, physics, informatics or psychology. Other basic subjects related to ideology, laws, culture and social studies will be open to each partner because these subjects depend on the education system and cultural traditions of each country. The professional knowledge is divided into basic knowledge and specialized knowledge and accounts for 30 credits. The pedagogical knowledge is worth 21 credits. 22 credits are counted for internship and practice including the internship in workshops and laboratories, internship in factories and internship at vocational institutions. The graduation paper accounts for 8 credits. All the subjects of professional knowledge, pedagogical knowledge, internship and graduation paper are built basing on the analysis, discussion, comparison, and agreement of the four partners.

### Conclusion and recommendations

By comparing and analyzing the training programs for VTE in ME and EE in four institutions, the authors have built the core curricula for these two majors. It is expected that these core curricula will be adapted successfully in all partner universities to develop their own curricula. The two core curricula are also references to other universities in ASEAN regions if they want to develop their curricula. The authors hope that these curricula can be a recommendation to some policy makers who are responsible for issuing policies relating to frame curricula.

Basing on these core curricula, institutions build their own curricula according to the following recommendations:
- In terms of “Objective of study”, institutions should add specific objectives which are suitable to the education and the cultural tradition of each country.
- In terms of “Assessment” institutions specify the assessment according to the assessment system of each country.
- Institutions add elective subjects to the list of “General knowledge”, “Basic knowledge”, “Specialized knowledge”, “Pedagogical knowledge” and “Internship – Practice” and increase the number of required credits to be suitable to national education system of each country.
- Each institution can decide to replace “Graduation paper” with some other subjects so that the credit number of these subjects is the same as that of “Graduation paper”. In this situation, it is necessary that institutions list the subjects to replace the graduation paper.

Due to the scope of the study, the authors just focus on the core curricula for VTE in ME and EE. There are still many other VTE majors that need building the core curricula among institutions in Asia so that these institutions have chances to exchange training programs, teachers and students.

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Rector of Namdinh University of Technology Education (2011): Decision No. 696/QĐ-DHSPKTNĐ on Curricula for vocational teacher training in full time program basing on credit system.


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TVET Research in Australia: Its History, Roles and Impact

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Abstract

This paper provides an historical account of how the national TVET research and evaluation program in Australia has developed and changed in an attempt to address the key issues of concern to TVET policy makers and practitioners and improve its impact. It draws on and analyses key documents and published literature on TVET research as well as the personal reflections of the author who has been involved in the development of the Australian TVET research program from its very early days.

In 1981 the TAFE National Centre for Research and Development was established in Australia as a focal point for TVET research and development. Following the “No small change report” in 1993 the impetus grew for a more robust research effort given that it was seen as fragmented and poorly linked to the needs of improved policy and practice. In 1996 the Australian National Training Authority recognised that a more integrated research effort was needed.

To this day there is still concern over whether TVET research in Australia has the impact it should on policy and practice, either locally or more broadly. Australian TVET research has been guided by successive strategies and priorities which have been linked to the current national strategies for TVET itself. Analysis of these priorities shows that while some research topics have a continuing currency, others have been of more transitory interest or re-emerge periodically. Improvements in TVET data quality and access have been a priority to aid the research effort.

The take up and use of TVET research to guide policy and practice reflects the immediate nature of much policy formulation, so that research does not always have the impact it deserves. Impact studies tell us it is seldom that a single piece of research is pivotal; rather it is the accumulation of "ideas of good currency" and the consolidation of broader programs of research which seem to be of most consequence. Effective dissemination of the outcomes of research is therefore vitally important. Diverse and sustained approaches to dissemination are needed to link the research and researchers to end-users.

It is also important to develop research skills at the TVET provider level to ensure that TVET practice and policy advice there is as soundly based as possible. The best Australian TVET providers’ practice have always drawn on research and used research techniques to gather and synthesise information. They see 'research' as a broadly conceived concept and as part of normal work. Research at this level provides a way of bringing people together across the organisation and using 'research' to help the organisation to think more broadly and innovatively.

Improving the uptake and use of TVET research requires that Australia's TVET system continues to improve the quality of its data and information. It also needs to ensure that TVET research is undertaken by the best available researchers and research teams working
on the most critical policy and practical questions. Finally, it needs to continue to develop and sustain research capacity at the local provider level.

1 Introduction

It is often argued that changes in the Australian Technical and Vocational Education and Training (TVET) system have not been underpinned by commissioning or utilising systematic research and evaluation. Yet it is also argued that better policy and practice results if this is the case. This paper provides an historical account of how the national TVET research and evaluation program in Australia has developed and changed. It is underpinned by a very broad view of what TVET research is and about how and by whom it is conducted. Cresswell [2008] broadly defines research, suggesting that it is a process of steps used to collect and analyse information to increase our understanding of a topic or issue, typically involving three steps: Posing one or more research problems or questions, collecting data to address the problems or answer the questions, and presenting the answers through some form of reporting. TVET research in Australia is most often "applied", "strategic" or "action-based" and is only rarely "pure" in nature.

Evaluation uses a range of research approaches, but focuses on the judgement of merit – for example judging the merit of a policy, a program, a training module etc. It may also be used to guide the development of policies, programs or practices in a formative sense or, alternatively, to help make decisions for accountability purposes – including whether or not a policy, program or practice should be continued [NCVER 1997]. McDonald and Hayton [1997, p1] suggested that "evaluation has so far been little used for the improvement of VET in Australia". It might be argued that Australia has not evaluated the impact of policy, programs and practices to the extent it might even to this day. Australian TVET policy and practice is, on the whole, under-evaluated.

Both research and evaluation in TVET may range from being national in scope to being localised in its execution and impact to a single institution or even teaching department. Thus both TVET research and evaluation in Australia are very variable in terms of their size and scope. Research and evaluation activities are funded by Australian federal as well as state and territory governments as well as undertaken by individuals or small groups (including Communities of Practice) with little or no financial resources. Examples of such “research” included that undertaken under the auspices of the “Reframing the Future” and the Australian Flexible Learning Framework (AFLF) programs. One element of “Reframing the future” – Applying Information and Research - focused on skills in accessing and analysing TVET research, possibly coupled with a small amount of original research, to “transform knowledge” and advise practice. (“Reframing the Future” was a national staff development and change management program aimed at skilling Australia’s VET workforce to support the implementation of Australia’s national training system. The AFLF seeks to build the capability of Registered Training Organisations (RTOs), industry and community stakeholders to create more accessible training options and facilitate new ways of learning through technology)

Research in its broadest sense is undertaken as part of government and other enquiries and by agencies such as employer groups, unions and Industry Skills Councils. It may also be undertaken by advocacy bodies and by staff within individual providers both to benefit their organisation or for their own personal development. Research skills may also be taught as part of academic programs, including those concerned with TVET teacher training and for TVET staff undertaking qualifications at Masters degree level or higher. Thus, it is conducted by a range of people including individual academics and research teams in universities and specialist organisations such as the National Centre for Vocational Education Research (NCVER), consultant researchers and evaluators and practitioner-researchers. This means that programs and associations which foster and develop the skills
of existing and new researchers are important in maintaining and fostering the breadth and depth of Australian TVET research.

In order to explore the history, role and impact of Australian TVET research the paper draws on and analyses key documents and published literature as well as the personal reflections of the author who has been involved in the development of Australian TVET research from the early 1980s. First the paper will briefly consider the history and trends in Australian TVET research and then go on to discuss its priorities, roles and the impact the research has had before drawing some brief conclusions.

2 The history

The genesis of TVET research in Australia has been described extensively elsewhere [Smith 2001, Loveder and Guthrie 2008] and so will not be repeated in detail here. TVET was an under-researched area of Australian education, certainly in comparison with schools and higher education [Robinson and Guthrie 1998]. The major research capacity existed at the (then) TAFE National Centre for Research and Development (which was established in 1981 and subsequently became NCVER in 1992), and in state and territory government departments. There was little or no academic interest in TVET until the mid-1990s following the publication of the No small change report (McDonald et al. 1993). This led to funding becoming available to support TVET research, in the first instance through the Australian National Training Authority’s Research Advisory Council (ANTARAC) and guided by the first set of research priorities launched in 1994. Several key TVET research centres were also established, of which only one still operates.

In 1996-97 the management of the National VET Research and Evaluation (NVETRE) program was taken over by the NCVER through its National Research and Evaluation Committee (NREC), a sub-committee of its Board. One of its first tasks was to develop a national TVET research strategy [NCVER 1997], which focused both on the next set of research priorities as well as proposing, developing and implementing approaches to ensure that TVET research outcomes were better disseminated and used. These and subsequent TVET research strategies and priorities have been advised though a consultation process and informed by successive national TVET strategies. Approaches to dissemination have also been continually refined.

The national managed TVET research program has been the subject of at least three external reviews [Taylor 1999; KPA Consulting 2003; Department of Education, Science and Training 2006], as well as a number of internal reviews. Throughout its life, therefore, there has been a periodic and externally driven evaluative process complemented by unpublished, smaller and more focused evaluations commissioned by NCVER to advise and improve its practice.

The key trends as the national managed program of TVET research has developed in Australia has been to:

- Move from a focus on funding individual projects to funding programs of research
- Move away from commissioning or funding smaller pieces of research to funding a smaller number of larger projects and programs
- Increase the durations of projects from around one year to programs lasting around three years
- Become less prescriptive about the research to be conducted, and allowing the research to be proposed by research teams and consortia based around a broad set of priorities
- Maintain a program of open-round funding to ensure that worthy research could be funded, including that not necessarily directly related to current TVET research priorities
Encourage researchers and research teams to take a more multi-disciplinary and collaborative approach to their research as well as encouraging a broader range of researchers to access the TVET research funds

Implement a program to sustain and build research capacity for the sector. For example, NCVER is committed to building research capacity in the VET sector by attracting experienced researchers from outside the sector, encouraging early career researchers and supporting people in the sector to undertake research as practitioner-researchers

Place greater focus on synthesis work and ongoing improvement in the areas of industry engagement, evaluation of projects and their impacts, and quality assurance processes

Continually refine the international TVET research database (VOCED) and enhance both its coverage and utility. Its latest manifestation is VOCED Plus

Focus on using an increasingly wide range of approaches to promote and disseminate the research based around research utilization strategies. These include a range of value-added products which consolidate research findings on particular topics.

Cameron [2011] undertook a preliminary methodological scan of NCVER funded research from 1992 to 2010. She concluded that for certain themes (for example, research concerning teaching and learning), qualitative research approaches predominated, but had not yet reached definitive conclusions about the mix of research approaches adopted. The present author feels, however, that there has been a shift to research approaches which are generally more quantitative in nature, and which attempt to make use of both NCVER and other sources of statistical data to address TVET research issues.

In 1997 the Australian Vocational Education and Training Research Association (AVETRA) was established. Its major role has been to promote quality TVET research, to act as a lobby group and to promote networking between researchers and TVET researcher training. It holds an annual national conference and a series of state and territory based events in October each year (called OctoberVET). It also maintains a website which contains useful advice and support for TVET researchers, publishes a journal and newsletter and sponsors a series of awards. Miller [2008] has documented AVETRA’s history.

3 The priorities

National priorities for TVET research in Australia have been set generally for successive three year periods. These priorities are generally established through wide ranging consultations and submissions and are then approved by NCVER’s Board and ultimately the state and territory and Commonwealth ministers responsible for TVET. The first set of priorities ANTRAC established in 1994 were: the needs of small business, the needs of special groups, assurance of quality, the economic impact of VET and learning in the workplace. Examination of the five sets of subsequent priorities (1997-2000, 2001-2003, 2004-2006, 2007-2010 and 2011-2013) shows that some broad research “themes” continue to be important throughout. These include TVET and its social and economic implications (including social inclusion and equity issues) and TVET and its contribution to skills development and productivity whether at the individual, enterprise/employer, workforce or regional and community levels. Other TVET issues remain a focus as a primary theme or sub-theme, or are revisited periodically, including research on pathways within, into and beyond TVET; TVET provider-focused research; research on teaching and learning in TVET and its quality; research on the place and role of VET and futures-oriented research. From time to time priorities have been quite specific, for example with a focus on international comparisons, TVET programs for Indigenous Australians and research on apprentice and traineeship training.
4 The roles

TVET research in Australia is used to resolve a problem, as a weapon in a particular political or bureaucratic conflict, to justify a decision already taken or assist its users to increase their conceptual understanding of an issue [Selby Smith et al. 1998, p. 22]. TVET research is essentially divided between that which is of larger scale and undertaken to inform or influence policy and practice. Thus, it has both a global and more local influence, contrasting with TVET research which is more specific, of smaller scale and locally based. Each of these roles for TVET research will now be considered in turn.

4.1 Research to inform and influence policy and practice

Smith [2001, p. 4] notes that the NVETRE program that underpins a significant proportion of the major policy and practice-based TVET research ‘…is [a] very different approach to national research funding than that traditionally adopted by the big research agencies such as the Australian Research Council (ARC) and the National Health and Medical Research Council. Under these schemes, research is investigator driven. There has been little or no attempt to define the key national research questions let alone develop a national strategy for research…” In contrast the nationally managed TVET research program remains closely linked to the policy and practical imperatives confronting the sector at that particular time (see section 3). However Smith [2001] also notes the need to be flexible in the scale and duration of funded research. He points out that TVET research is typically funded over a 12-18 month or even shorter period, and that this is both too short and too long a timeframe for some TVET research. On the one hand he suggests that “…research that takes place over a relatively short period of time and captures the essence of a problem or issue at a point in time – i.e. a snapshot approach to research … does not allow for longitudinal approaches to issues so that data can be gathered over a period of time and chronological patterns discerned. On the other hand, the 12-18 month cycle is often too long for policy makers who have to react quickly to changes in the policy landscape, and need digests of research on critical issues to help guide the formulation of new approaches” [Smith 2001, p.11]. TVET research with short timelines can mean that the researchers have only just begun to come to terms with the major underpinning issues when it is time to report. Nevertheless, TVET research’s timeliness and relevance are both key to uptake and influence in relation to policy and practice. In particular, short-term timely pieces around key issues which consolidate a range of existing research and commissioned by particular groups have real value in providing research advice which is just-in-time rather than just-too-late.

Research and evaluation has an influence in informing or influencing TVET policy and practice. For example, the recent Expert Panel investigating apprenticeships for the 21st century in Australia [see McDowell et al. 2011] commissioned a series of research reports from NCVER to support and inform their enquiry. Representative industry bodies in Australia also commission reports from time to time to inform and to lobby. For example a recent report from the Australian industry Group produced a report entitled: ‘High Performance Organisations: Maximising workforce potential’ [AiG 2012]. While such reports are often undertaken using their own resources, in other cases such research is funded in whole or part by government. One of a number of evaluations of TVET policies and practices was the review to identify improvements to Training Packages and ensure that nationally recognised training products within the TVET sector are flexible and responsive to changing industry, business and individual needs and workplace practices [NQC/COAG Joint Working Party 2009]. This review has led to considerable changes to the ways in which Training Packages and the associated products are developed and packaged. Nevertheless, not all or even most major TVET policy initiatives and practices are reviewed, and very often such evaluations, if conducted at all, tend to take place at major milestones or at the end of a
program’s life. Only rarely is an evaluative process built in as part of policy or program implementation.

Recently Group Training Australia, the national association representing a network of around 150 group training organisations (GTOs), commissioned research [Toner and Lloyd 2012] to reflect on recent research on pre-vocational and pre-apprenticeship programs. As the association representing the largest employers of apprentices and trainees it was undertaken to put the case for such programs in the face of other research which cast some doubt on their value.

Such approaches inject appropriate research into the TVET policy debate in Australia and ensure agencies and key people are informed. Such research also helps to build relationships and networks. Nevertheless, the lesson from Australian TVET research is to conceive the research properly in order that the issue or research question is appropriately explored. Often the available time or the convenience and availability of particular data and information can mask the realities of a policy or practice. Poorly conceived research or evaluations fail to get at on-ground realities and the possible consequence is policies and practices that are poorly conceived or executed.

4.2 Locally based research

It is often argued that there is not a strong research culture within TVET institutions in Australia. Certainly many TVET practitioners would not consider that they make use of or undertake research. However a number of Australian TVET providers have had, or retain, dedicated research capacity in the form of research officers or whole research departments or centres. Their work is concerned with investigating, analysing and commenting on policy from an evidence perspective to help assess its impact, consolidating existing research on selected key issues, undertaking original research (although usually on a small scale) or supporting others who are undertaking their own research within their institution. Their aim is to produce timely and useful information for their institution. In other cases, TVET providers engage in activities such as market research, needs analyses, evaluations, curriculum development and investigating and adopting new approaches to teaching, learning and assessment. These may be underpinned by using existing research, undertaking their own research or evaluating impact following introduction. Because much of this research is not formally published its extent is unknown, however it is most likely that research related to issues, problems and innovations around pedagogy, teaching, learning and assessment and curriculum development predominates.

TVET staff may undertake research subjects that form part of initial or post-initial teaching qualifications. Others study at Masters level, and their research is often closely integrated with their work both to satisfy personal interest and to benefit their institution. Thus there is an undoubted capacity to conduct ‘research’ at the local level, but the extent to which opportunities are available and supported by the prevailing culture in Australia’s TVET providers is quite variable. Major barriers are funding and available time.

Some financial support is available to undertake small scale and practitioner-based research in Australia. NCVER funds both top ups on PhD scholarships and an NCVER fellowship to provide opportunities to use NCVER data sets. NCVER also strongly encourages the involvement of practitioners, where appropriate, in the research projects it funds. At present NCVER offers a small number of Community of Practice scholarships for TVET practitioners, and in the words of NCVER’s website: “The aim is to encourage a culture of research in VET organisations by providing novice researchers the opportunity to undertake their own research project. Participants receive $4000 to undertake a work-based research project within a community of practice over 12 months. Funding for this program has been extended to 2013 with … Victoria University coordinating it. Approximately 10 scholarships are awarded each year.” AVETRA supports this program by providing a research mentor for each scholarship holder from amongst its members. Barratt-Pugh [2012]
suggests that this mentoring has been a critical component of this program. However, this acknowledges a wider and critical role for TVET researchers in providing mentoring and support to those conducting TVET research whatever its scale.

Bartram et al. [2010] rightly comment that it is unlikely that the NCVER-funded Community of Practice will increase the body of active TVET researchers in Australia. At a minimum and over time it will lead to an increased research literacy within TVET providers, and raise the profile and perceived value and utility of small scale work-based TVET research. This is valuable, especially if it means that TVET practice becomes better informed, and Australia’s TVET’s practitioners become more reflective. Such ‘research’ is also a way by which people can be bought together and build bridges across the organization. Nevertheless there will not be a research culture - broadly conceived - within TVET providers and amongst practitioners until research is seen as a part of normal ‘work’.

5 The impact

A key component of the first Australian VET Research Strategy [NCVER1997] was to ensure that the best use was made of research and evaluation outcomes. This has remained an important priority, and has guided the approaches used to report, consolidate and disseminate the findings of TVET research, especially that funded under the auspices of the NVETRE program. However, there is not a simple linear relationship between the conduct of research and its uptake and use. Rather, the relationship is more complicated for larger-scale projects where the research is less immediately tied to researching a particular specific, local and immediate issue (as the research to guide practice at provider level often is).

Stanwick and Hargreaves [2012, p. 1] define research impact as “…the application, use and influence of research across various domains. In our context, the four domains considered are producing knowledge, building the capacity of researchers and end-users of the research, informing policy, and informing practice.” The purpose and nature of the research therefore influences the approaches that will be used to assure maximum impact. However, Stanwick et al. [2009] found that measuring TVET research impact is not straightforward and that impacts are often difficult to isolate, especially in the short term. Causality is difficult to establish [Stanwick and Hargreaves 2012] and impact may need to be assessed two or even three years later.

Selby Smith et al. [1998, p. 3] suggest that Australian TVET research contributes to a ‘climate of opinion’ and to the development of ‘ideas of good currency’ about TVET. They argue that the research process is accumulative, building on what has gone before. Thus it is important to be able to gain ready access to that research, and for research information to be available in a timely manner - given the rate of change of TVET in Australia - and in forms which maximize the chances it will be used. One major issue is that some TVET research is undertaken, but has only minimal or localized impact because it is not published at all or not disseminated widely. This is especially so of research undertaken by government agencies or at the local provider level. Not only does this diminish the evidence base, but it also means that there is no opportunity to critique its quality or veracity. This is particularly important if the research has been used in key decision-making or to advise major policy formulation. On the whole, though, TVET policy decisions in Australia occur through a ‘pragmatic negotiated political approach’ and so TVET research is only one influencing factor and its capacity to impact and influence depends on its timely availability and the extent to which, as a body of work, it can contribute to the decision making process.

There is a need to distinguish between the use of TVET research (as might be reported in citation statistics) and its influence. Selby Smith et al [1998] reported that senior Australian officials were sometimes not aware that TVET research had been used to advise and influence decisions; however more junior officials that had prepared advice for them
were more often aware of the links. This suggests the need to overcome weaknesses in these links and find ways both to bring researchers and decision makers together and for researchers to consider how their research messages are best presented to those with influence.

Nevertheless the types of research outputs and dissemination activities undertaken are important facilitators of impact, and accordingly significant funding from the NVETRE program is devoted to ensuring that dissemination is carefully planned to maximize this. Australian TVET research is reported and disseminated in a wide variety of ways, including reports of individual research projects, publications consolidating bodies of research, presentations at conferences and to critical groups including especially convened topic-based forums or symposia. Increasingly use is being made of web-based and other dissemination technologies including wikis, discussion groups, webinars and videoconferencing to disseminate research, establish important linkages between groups and discuss key issues of policy and practice. These approaches can be - and increasingly are - being built into the TVET research process itself. Stanwick et al. [2009] conclude that, in creating impact, the knowledge translation process is important. This translation process is iterative and often needs to be sustained. It involves synthesising messages in ways that are most appropriate to various audiences. This process may involve intermediaries who are skilled in knowledge translation [Stanwick and Hargreaves 2012]. Stakeholders in the research also have potential to act as catalysts for enhancing its impact, and (as Selby Smith et al. [1998] also concluded) more impact is likely to arise from a suite of research reports than a single one.

Finally, Harris and Clayton [2010] examined the impact of a 3-year program of research examining approaches to improving the capabilities of TVET providers in Australia. The messages were clear. First the research took place at the right time, and was on a topic of on-going interest. Second, it remained continually engaged with its diverse stakeholders through a range of presentations, publications and other approaches, including newsletters and a website. An early activity checked the veracity of the research concept and approach and began to build a sustained interest in the research and its outcomes. It was clear that the research had, and continues to have impact. Much of the evidence for this is anecdotal, however. But it is clear that such evidence of impact is powerful and that different groups use and value different research components and products in different ways and to different extents. Gathering evidence of impact takes time, and there is often a significant lag between the conduct of research and evidence of its influence and use. Sometimes issues whose time has not yet come are researched, so it is important that such research is not lost and can be accessed readily when the issue is topical. This is what makes such TVET research databases like VOCED Plus so important.

6 Conclusions

While a relative newcomer in the field of Australian educational research, TVET research has clearly become increasingly valued and valuable, whether of small or larger scale. While larger scale research is likely to have a far greater impact on Australia’s TVET policy and broader practices, the value of small scale and locally based TVET research must not be underestimated. Both approaches are needed, and both need to be done well. This means that it is important to foster a culture in the TVET sector and its providers which values research and which is able both to utilize and conduct it effectively.

Timeliness is key to effective uptake and use of TVET research, but this timeliness must be married with a variety of fit-for-purpose approaches to synthesizing and reporting it. Linkages and connectedness are important, especially between TVET researchers and the users of their research. One issue is the extent to which much of the TVET research and evaluation work which is undertaken remains unpublished and confidential. The Australian
TVET system currently lacks the means of publishing or gaining access to much of the smaller scale and locally based research which might be valuable to other providers and agencies wrestling with similar issues. More disturbing, however, is the body of TVET-relevant research which is conducted for a range of bodies, including government agencies, which is not shared more widely.

Finally, there needs to be a more stringent evaluation of Australian TVET policy and practices. Too often such evaluations are treated as an afterthought, where more value would be gained if a sound approach to evaluation was designed in from the beginning and then undertaken as part of the implementation process.

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Innovation Pedagogy in Technical Education

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Abstract

According to Senge (1992) a learning organization is “an organization that is continually expanding its capacity to create its future”. As the rate at which organizations learn may become the only sustainable source of competitiveness, an organization has to possess such a skill that it is able to produce actively information which cannot be bought anywhere. Organizations are made up by people so it is essential that the people are capable of being innovative and producing something new, and thus the learning of the organization is directly related to the learning of its employees. The way how work is done in the future is undergoing big changes and that means that also the universities must adapt their education to correspond with these changes. An approach to education called innovation pedagogy introduces how education can be modified so that the needs of future working life can be met. The different cornerstones of innovation pedagogy and various opportunities to boundary crossing can change the way how knowledge is assimilated, produced and used in a manner that can create sustainable innovations. In this paper we present how it is possible to contribute to the development of future engineers capable of engaging themselves in the future requirements of not-by-the-book-work when innovations are created in the different learning organizations of working life.

Keywords: boundary crossing, social learning environment, innovation pedagogy, innovation competence

1 Introduction

Recent studies show that the ways how work is done will undergo big changes in the near future. We understand that the nature of future work can be studied using two dimensions: one of them is related to the goal of work (end result) and the other in work methods. Using
this kind of classification we can distinguish the following types of work: 1) work where both the goal of work and the methods used to reach it have both been pre-determined; 2) work where methods have been agreed upon but the final goal is open or unknown; 3) work where the goal has been defined but the methods and ways to reach the goal and the way the work is done are not carved in stone; 4) “not-by-the-book” work where both the goal and methods of work are open; the desired end result is clarified or determined as the work is being done. It can be anticipated that the amount of people engaging in the work under categories 3 and even 4 is increasing. This requires new skills from university graduates, engineers among them. It becomes necessary to develop not only one’s individual competences but even more importantly to realize that competences are actually built in relation to others and used as part of a whole. Fewer and fewer jobs are done in isolation. Working life is based on teams that work together to solve a problem or to create something new. [Oivallus 2011; Kairisto-Mertanen, Mertanen 2007, 2012]

Three years ago, i.e. at 2009, European Union member states set up a strategic framework for European cooperation in education and training, called Education and Training 2020. The main aim of the framework is to support Member States in further developing their educational and training systems. One of four strategic objectives for the framework is enhancing creativity and innovation at all levels of education and training [Official Journal of the European Union 2009]. In practice it means that students graduating from any European university or other educational institute should possess such kind of knowledge, skills and attitudes that they can contribute to the creation of the best knowledge economy in the world. The aim can only be reached by making sure that the graduating students are able to participate in the different innovation processes in their future working life positions and bring added value to these processes contributing to the creation of innovations. [Lehto, Kairisto-Mertanen, Penttilä 2011]

The on-going change means that modern world is facing issues and challenges, which are becoming more and more difficult to address within the framework of a single method, be that a discipline or a profession. When aiming to create new and previously unthinkable innovations it becomes necessary to enhance creativity by crossing boundaries in problem solving, in service or product creation and in research or organizational team work. [Penttilä, Jagiello-Rusilowski, Kairisto-Mertanen 2012]

2 Problem statement and research question

The purpose of this paper is to present how it is possible to contribute to the development of future engineers capable of engaging themselves in the future requirements of not-by-the-book-work when innovations are created in the different learning organizations of working life.

One of the aims is to present the concept developed in Turku University of Applied Sciences called innovation pedagogy which aims to give students possibilities to educate themselves to be the innovative citizens of learning organizations. Innovation pedagogy can be seen as an interactive continuum between the educational organization, students, and surrounding working life and society forming a social learning environment. In innovation pedagogy the social aspects of working and learning are emphasized, and group processes where learning happens in multidisciplinary teams form an essential part of the whole process of learning. [Kairisto-Mertanen, Mertanen 2012, Kairisto-Mertanen, Penttilä, Putkonen 2010]

The aim of innovation pedagogy is to generate environments in which know-how-inspired competitive advantage can be created by combining knowledge from different disciplines. When utilised, this edge provides opportunities of success for the whole society. Innovation competences sharpened by innovation pedagogy are the key in introducing new competitive advantage. In a multidisciplinary environment, linking technical education
together with other study fields and competences, it is possible to evoke regional innovations and increase entrepreneurship through research and development. [Penttilä, Kairisto-Mertanen, Putkonen 2011; Penttilä, Kairisto-Mertanen, Penttilä, Nuotio 2011]

3 Innovation pedagogy in technical education

The role of education has traditionally been to give knowledge-based readiness, which later would be applied to practice in various innovation processes in working life. Innovation pedagogy introduces how the development of students' innovation skills from the very beginning of their studies can become possible. [Putkonen, Kairisto-Mertanen, Penttilä 2011] Innovation pedagogy contributes to the development of new generation of professionals whose conceptions of producing, adopting and utilising knowledge make innovative thinking and creating added value possible. [Putkonen, Kairisto-Mertanen, Penttilä, 2011; Lehto, Kairisto-Mertanen & Penttilä, 2011]

Figure 1. Methods, objectives and learning outcomes according to innovation pedagogy

The core of innovation pedagogy lies in emphasising interactive dialogue between the educational organization, students, and surrounding working life and society. In accordance to this its conceptual core can be divided, as figure 1 describes, into three different spheres in parallel to the three major actor groups benefiting from innovation pedagogy [Penttilä, Kairisto-Mertanen & Putkonen 2011; Kairisto-Mertanen, Penttilä, Nuotio 2011; Penttilä, Kairisto-Mertanen 2012]:

- final learning outcomes, creation of innovations and produced capability to participate in diverse innovation processes – having primarily to do with students, who are expected to create innovations while affiliating with working life;
- learning of innovation competences alongside with study programme specific knowledge, skills and attitudes – being mostly connected with working life, which provides students with ideal surroundings to acquire the competences needed in innovation processes and in future working life in general;
- meta-innovations – referring to the necessary cornerstones needed for learning according to innovation pedagogy; the elements enabling innovation pedagogy to be applied, including methods of learning and teaching utilised in the learning
processes by the faculty members together with the students enhancing both the creation of innovations and innovation competences.

The meta-innovations are essential requirements for innovation pedagogy to succeed and they must be developed and used so that the cornerstones of innovation pedagogy are enabled in the learning environment. The cornerstones include innovative learning and teaching methods, cross-disciplinary learning environment/boundary crossing, integrated and extensive research and development activities, flexible curricula, concentration of acknowledging the importance of entrepreneurship and service production and internationalization in the level of research, development and student engagement. The methods used target specially to contribute to the development or student’s interpersonal and networking competencies.

Learning outcomes are statements which are used to describe specifically what is expected from a learner related to understanding, knowledge and know-how at the end of a certain period of learning. They are broad statements of what it is achieved and assessed at the end of the course of study. [Harden 2002; Buss 2008] They represent an approach to education in which the decisions about the curriculum are driven by the outcomes the students should display by the end of the course. In outcome-based education, a product defines a process. The curriculum is being developed from the outcomes the students are wanted to demonstrate rather than writing objectives for the curriculum which already exists. A learning outcome is a written statement of intended and /or desired outcome to be manifested by student performance. [Spady ,1988; Harden et al. 1999; Proitz 2010 ] The guidelines for defining learning outcomes recommend that they should be clearly observable and measurable. [Buss 2008 ]

The outcomes cover both cognitive and practical skills and are divided into components consisting of cognitive, psychomotor and affective domains of an outcome. They can be called knowledge or understanding, skills and attitudes, feelings and motivation accordingly. As Spitzberg [1983] points out the distinction among knowledge, skills and motivation is important because performance can be enhanced or inhibited by any one or all of these components. Learning outcomes are also guaranteed achievements which can be institutionalized and incorporated into practice. The ownership of the outcomes represents a more student-centred approach. Students take responsibility for their own learning. [Harden 2002] As it is argued that learning outcome might not be suitable for every discipline of education, literature also speaks of emerging learning outcomes and thus leaves room for emergent ones which differ from the predetermined intended ones and make unexpected occasionally occurring learning possible. [Hussey & Smith 2008; Buss 2008; Brady 1996] The future curricula also in technical education calls for flexibility, ability to be rapidly modified and adapted to new circumstances, instead of fixed and strict structures. Curricula should be designed and developed in an open and network-based environment in order to observe societal development pressures emerging from the economy, to react to them, and to act in a value increasing way in national and global value chains. The circle of continuous improvement contributes not only to the continuous development of the included elements in curricula but also ensures the competencies and professional qualifications of students. This professionalism is responsibility-centred as well as development-oriented; it encourages actors to absorb and create new knowledge, which supports creating innovations in working life. [Penttilä 2012]

Innovation competencies are the learning outcomes which refer to knowledge, skills and attitudes needed for the innovation activities to be successful. The methods applied and the way how teachers and students interact constitute the basis for learning and thus enable the development of them. The methods used also facilitate intuitive and unexpected learning during the learning process and make transmitting of tacit knowledge possible when dealing with working life. In innovation pedagogy this kind of learning outcomes can manifest themselves in the format of intuitive and tacit learning which takes place in the learning situation. They can be e.g. experiences on cultural differences, on working at customer
surface etc. The core idea in innovation pedagogy is to bridge the gap between the educational context and working life. Learning and teaching processes are developed so that they provide improved competences for the students and enable personal and professional growth. Learning is deeper when the previously gained knowledge is continuously applied to practical contexts. [Penttilä, Kairisto-Mertanen & Putkonen 2011; Kairisto-Mertanen, Penttilä, Nuotio, 2011]

Innovation competencies are learned gradually as new information is added to our knowledge structures. Knowledge acquisition and application are critical components in this process. Thus, creating new services, products and organisational or social innovations – new added value – requires both knowledge and skills, which are applied to an innovation process. [Gibbons et al. 1994; Kairisto-Mertanen, Penttilä & Putkonen 2010; Nonaka & Takeuchi 1995; Nowothy & Gibbons 2001; Nowothy & Gibbons 2003]

Innovation pedagogy is defined as a learning approach that defines in a new way how knowledge is assimilated, produced and used in a manner that can create sustainable innovations. [Kairisto-Mertanen, Kanerva-Lehto, Penttilä, 2009; Kairisto-Mertanen, Penttilä & Putkonen 2010; Kairisto-Mertanen, Penttilä & Nuotio 2011].

An innovation can be defined in many ways. For example, Schumpeter [2003] speaks about innovative entrepreneurship. It is an idea, practice or object which is considered new by the people [Rogers 2003] or a solution which brings economic benefits [SITRA 2006]. In Finland’s national innovation strategy [Finland’s National Innovation Strategy 2008], an innovation is understood as a competitive advantage based on knowledge. Innovations are best born in a special culture which includes freedom to think, equality and brotherhood. In the context of innovation pedagogy, an innovation is understood as the process of constantly improving knowledge, which leads to new sustainable ideas, further knowledge or other practices applicable in working life. [Kairisto-Mertanen, Penttilä & Nuotio 2011] Innovation pedagogy contributes to the development of new generation of professionals whose conceptions of producing, adopting and utilising knowledge make innovative thinking and creating added value possible. [Putkonen, Kairisto-Mertanen, Penttilä 2011; Lehto, Kairisto-Mertanen & Penttilä, 2011] This is an important target mentioned in the Finnish National Innovation Strategy [2008], which integrates applied research and development, entrepreneurship and flexible curricula to meet the multi-field customer needs in regional and international networks. [Kettunen 2011] Innovation pedagogy bridges the gap between the educational context and working life. Learning and teaching processes are developed so that they provide improved competences for the students and enable personal and professional growth. Learning is deeper when the previously gained knowledge is continuously applied in practical contexts. [Penttilä, Kairisto-Mertanen & Putkonen 2011]

4 Implications for future work in the field of engineering

According to Senge [1992] a learning organization is “an organization that is continually expanding its capacity to create its future”. To remain viable in an environment characterized by uncertainty and change, organizations and individuals alike depend upon an ability to learn. It has been argued that the rate at which organizations learn may become the only sustainable source of competitive advantage for them [Senge 1990]. An organization has to possess such a skill that it is able to produce actively information which cannot be bought anywhere. Organizations are made up by people so it is essential that the people are capable of being innovative and producing something new, the learning of the organization is directly related to the learning of its employees.[Appelbaum & Reichart 1997; Kohli, Shervani & Shallgalla 1998] This is true especially in the field of technology, where new products are created to bring added value to the enterprises needing to succeed in the circumstances of hardening global competition.
At its most basic level organizational learning is the development of new knowledge or insights that have the potential to influence behaviour. All organizations operating in dynamic and turbulent environments must pursue the processes of learning, behaviour change, and performance improvement. [Slater & Narver 1995, 63] Yet psychological and organizational factors conspire to make organizations and their members resist change and miss opportunities to create preferred futures. These sources of resistance, as well as strategies for overcoming them, have been explored by a diverse group of researchers as. [Grey, 2004]

It is obvious that a learning organization acts in an adaptive way. But being adaptive is only the first stage in moving towards a learning organization, as adaptive learning is mostly about coping. It is however necessary to focus also on generative learning because that is about creating and seeing the systems that control events. [Senge 1990 ]

It has also been presented that organizational learning is a requirement for achieving sustainable competitive advantage. [Baker & Sinkula 1999, Slater & Narver 1995 ] So it is vitally important that an organization, when wanting to continuously maintain its competitive advantage, also makes sure that the conditions for organizational learning exist. Generative learning which pursues ongoing radical innovation calls for the members of the organization to continuously question their beliefs and behaviour. [Sinkula, Baker & Noordewier 1997 ]

The primary reason for implementing organizational learning is to enable organizations to adapt to change and remain competitive. [Scott-Ladd & Chan, 2004].

A boundary crossing approach in the university enhances creativity where new previously unthinkable innovations are more likely to occur. This requires organizational learning and is especially valuable in the field of technical education because our future engineers constantly need an ability to create better and more customer oriented products. The concept of boundary crossing lacks a single comprehensive term, which would compile all its variations such as multidisciplinarity, interdisciplinarity, and transdisciplinarity. However, all these areas share the same goal of producing something new, unexpected, innovative through collaboration of people with different backgrounds. Each individual involved in this type of co-operation brings his/her knowledge, history, experience, intuition, expertise, know-how, creativity etc. to the social learning environment. The attitudes which the participants possess are significant to the effectiveness of the boundary crossing collaboration; “the crucial aspect is the involvement of participants who are ready and willing to learn from other disciplines”. [Wall & Shankar 2008] Participants who are very defensive of their own ideas and knowledge base tend to harm collaboration by not opening up to differing thoughts and therefore innovative solutions through mixing different areas of knowledge are not fostered. “Facilitating conversation from multiple disciplines is a tough job, requiring not only awareness of one’s own disciplinary bias but also the ability to manage power dynamics among highly successful and often egoistic participants”. [Stober 2011 ] Therefore leadership plays a key role in building a social learning environment which leads to positive results.

To understand the language of other disciplines takes time. In general, as the world of knowledge is very diverse indeed with contradicting views, terms and ideas, boundary crossing collaboration requires a setup where there differences are discussed and perhaps even solved. “Differences in research methods, work styles, epistemologies must be bridged in order to achieve mutual understanding of a problem and to arrive at a common solution”. [Thompson Klein 2004] ”Integrating a team’s capabilities depends as much on the individual abilities to work together as they do on their individual expertise and skills. [Ratcheva 2009]

Communication is maybe the most important factor, as beneficial communication at the same time helps to avoid the accumulation of new social problems and brings collaboration closer to its goals. ”New way of working cannot simply be imported to the team but it can only emerge and develop through intense interactions”.[Ratcheva 2009]

According to Max-Neef educational institutions should shift a new focus on improving boundary crossing collaboration be it teaching courses which are really multidisciplinary. [Max-Neef 2005 ] “Interdisciplinary education exposes students to research in multiple
disciplines, trains them in collaborative methods through team research and promotes new forms of communication and collaboration among disciplines. [Graybill et al. 2006 ] A learning environment is most frequently understood as the physical or virtual surroundings meant and built for learning purposes. In innovation pedagogy the social aspects of working and learning are emphasized and group processes where learning happens in multidisciplinary teams form an essential part of the whole process of learning. A social learning environment is formed by people with different talents and competencies and by the interaction enabling collaborative learning.

One big challenge for innovation pedagogy is to teach the students in the field of technology learn to be comfortable with uncertainty and not to be afraid of leaving familiar ground behind. They should ‘be trained to be ready to get transformed in order to see things getting transformed.’

5 Discussion

Innovation pedagogy is a learning approach but it is also a strategic decision to reform existing pedagogical structures in higher education, the field of technical education being one of the fields. Several actors are influencing to the pedagogical climate. Grass-root level feedback from students and teachers is needed in order to ensure applicability of novel methods. However, without a joint vision and strong engagement of the management, the sustainability and coherence of the educational services cannot be ensured.

How to make the reform possible? We trust on a step by step approach and on the power of positive experiences. There are several practical and concrete examples of delivering the education according to the principles of innovation pedagogy in the field of technical education. [For examples see: Lyytinen, 2011; Kairisto-Mertanen, Räsänen, Lappalainen & Lehtonen 2012 and Kairisto-Mertanen 2012 ] To facilitate and speed up the reform we need valid means to proof the power of those new methods in enhancing students’ innovation competencies. Therefore one of the most urgent future steps is to prepare and develop a tool which will make it possible to measure the learning outcomes. TUAS is at the moment coordinating international and national operations related to the development of such a tool as a consequence of which the first version of the tool should be in use before the end of 2013. The new tool, the Innovation Competencies Barometer (ICB), will measure changes in students’ innovation competencies and therefore show the added value reached by selected teaching and learning methods and processes. It includes all main stakeholders to the evaluation process; students will make self-evaluation, co-students carry out peer evaluation and teachers are responsible for expert level analysis. The ICB will also make it possible to involve experts outside of the higher educational organizations more actively into the pedagogical development processes. When using the ICB, the role of company representatives includes assessing the performance of students during the execution of education. This increases the value of the whole teaching and learning process.

When applying new pedagogical methods according to innovation pedagogy it seems to be critical to put a lot of emphasis in mentoring the students. (Lappalainen 2012) Using these methods seem to require cooperation and careful planning of how the division of tasks is done among university personnel.

The need for innovative engineers and other professionals in the field of technical education is global which means that the interest towards new teaching and learning methods also should be global. Future engineers will be working in companies with global orientation. This requires active global cooperation, also in the development of pedagogical and didactical methods.
6 References


Assessing the Unemployment Initiative Programmes in Collaboration with Technical Vocational Education and Training (TVET) Institutions in Nigeria

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Abstract

The study was aimed at assessing the Unemployment Initiative Programme in collaboration with TVET Institutions in Nigeria. This was done because of the failure of unemployment initiative programmes in Nigeria during the past years when unemployment reached an alarming level despite of the existence of TVET. Graduates are being turned out on a yearly basis without corresponding capacity to provide employment opportunities; even beneficial programs faced myriads of problems ranging from insufficient loans to dearth of facilities. Therefore it is pertinent to carry out an empirical assessment of these programmes. A survey design was adopted, the respondents of the study consisted of 163 beneficiaries and 23 TVET officials. Hence, the total population was 186. A structured questionnaire with five sections was used as instrument for data collection. The instrument was pilot tested on 31 respondents who are not part of the population for the study after being subject to face validation by three experts. The reliability coefficient of the instrument was calculated to be 0.82 using Alpha Cronbach Formula. Four research questions and two hypotheses which were tested at .05 level of significance guided the study. Frequencies, percentages, means and standard deviation were used to answer the research questions while t-test statistics were employed to test the hypotheses. The study revealed among others that the beneficiaries lack adequate facilities for their operation; loans are not made available on time and there were no work plans on how to invest and manage the capital released to the beneficiaries as first timers. Many could not employ enough labour due to inadequate skills and other aforementioned reasons. Also, the government was found to be the sole financer of this programme. Based on these findings, the study recommended among others that adequate loans should be given to avert the rate of inflation that may affect the purchasing power and at the same time the directorate should involve other government agencies or philanthropic organizations so as to gain financial or material support for the successful implementation of the programme.
1 Introduction

Technical and Vocational Education and Training (TVET) has emerged as one of the most effective human resource development strategies that Nigeria and other African countries need to embrace so as to train and modernize the technical workforce for industrialization and national development (FGN, 2012). Abdullahi (2011) claimed that vocational education and training is an essential part of development for any nation to grow economically. He added that most Nigerian youths have, before now, been of the idea that the traditional four to five year university degree is the only essential tool needed for self empowerment. This idea is gradually being addressed, as more and more post-secondary students and even graduates seek to embrace vocational education and skill acquisition as the key to deal with unemployment and unholy dependence on the job. You can easily point to one or two university graduates who dropped their academic qualification to pursue their vocation-oriented passion.

Technical Vocational Education and Training (TVET) is an organized learning experience that begins with exploration of career options, based on manual or practical activities. TVET programs have been an integral part of national development strategies in many societies because of the impact on human resource development, productivity and economic growth (Awotunde, 2000). Poverty may be defined as the scarcity of human basic needs, or the inability of an individual or society to acquire human basic needs for survival (Abdullahi, 2011). Poverty connotes inequality and social injustice and this traumatizes the poor. More than 70 percent of the people in Nigeria are in hopeless poverty, living below the poverty line, and one- third survive on less than US $1 dollar a day (NBS, 2011). This figure includes mass of youth in urban centres in Nigeria who struggle to eke out a living by hawking chewing sticks, bottled water, sachet water, handkerchiefs, belts, etc. The sales-per-day and the profit margin on such goods are so small that they can hardly live above the poverty line.

Abdullahi (2011) defines unemployment as the inability of a matured citizen or individual to acquire employment to satisfy his basic needs. Unemployment is a hydra-headed monster which exists among the youth in all developing countries. The unemployment rate in Nigeria was last reported at 23.9 percent in 2011 (NBS, 2011). The National Bureau of Statistics (NBS) has put the figure of unemployed Nigerians in the first half of the year at 23.9 per cent, up from 21.1 per cent in 2010 and 19.7 per cent in 2009. The National Population Commission (NPC, 2012) revealed that the country’s population has risen from the 140,431,790 it was five years ago when the last national headcount was taken, to 167,912,561 as at October 2011. This represents an annual population growth rate of 5.6 million people. Research carried out by the Ministry of Youth Development (2012) pointed out that there are 68 million unemployed youths in Nigeria. Every year about 300,000 graduates enrol in the NYSC scheme. This is definitely not the total number of graduates but it is a pointer. According to the Population reference Bureau, the population of youth in Nigeria is 43%.

According to Abdullahi (2011), Nigeria established various forms of youth empowerment programmes to train youth for skill acquisition to be self reliant in various areas of Vocational and Technical Education, for example, from the National Directorate of Employment (NDE) in 1989 to the Youth Empowerment Scheme (YES) in 1999, and the Graduate Internship Scheme (GIS) in 2012, just to mentioned few. Yet either the youth were trained without skills or no appropriate plan for the scheme implementation. Today in Nigeria, the rate of unemployment has reached an alarming level despite the creation of Youth Empowerment Schemes. These schemes are charged with the responsibility of formulating and working out solutions to the problem of mass unemployment, especially among graduate youths who are the backbone of the society. Olaitan, Ali, Onyemachi and Nwachukwu (2000) pointed out that Youth Empowerment Schemes (YES) are one of the important Government initiatives in alleviating poverty and unemployment, that in average
50,000 unemployed persons were registered in each state of the federation including FCT. Specifically, each State recorded 34,433 persons for example (YES/NGS, 2007). In the light of this acute problem, Kapp (2010) commented that the establishment of YES should be seen as a vehicle towards reducing the number of unemployed youth in rural and urban areas in the state to a minimum. Also, Mcmish and Pereral (2011) reported that assessment seeks to identify areas of strengths and weakness of a particular program. In this case, proposed areas of assessment are:

1. causes of failure of initiative programmes (administrative practice),
the government and other private agencies participation,
the financial/material aids to the beneficiaries,
the technical assistance/skill acquisition,
the performance of the beneficiaries and number of the beneficiaries in Nigeria, their areas of small-scale ventures assistance from Banking Industries and Industries Training Fund, community involvement and intent/award to the deserving beneficiaries.
the implementation strategies for managing released fund, and

As observed by Abdullahi (2011) graduate empowerment programs can be improved through proper implementation if there would be seasoned administrators/supervisors who will eschew favourism, for example approving of loans to graduates not having the required necessary skills to manage the ventures. More so, adequate monitoring, full support of government and other sectors, financial/material aids and technical assistance would also go a long way to achieve success in the implementation of graduate employment programs of the Youth Empowerment Scheme in Nigeria. Some of the TVET programmes introduced to aid Nigerian youth include:

1. Graduate Internship Scheme (GIS)
Graduate Empowerment Scheme (GES)
National Directorate of Employment (NDE)
National Open Apprenticeship Scheme (NOAS)
Youth Empowerment Scheme (YES)

The above listed directorate could not fully achieve its objectives as a result of administrative imbalance and insufficient funding. Presently, the Federal Government of Nigeria through the Public Works, Youth and Women Employment Component of the Subsidy Reinvestment and Empowerment Program (SURE-P) established the Graduate Internship Scheme (GIS) of Dr. Godluck Jonathan’s government, which aims to provide the young unemployed graduates with apprenticeship opportunities that will expose them to skills and experiences relevant to the current labour market and enhance their employability (FGN, 2012).

2 Statement of the Problem

The Nigerian mindset towards TVET makes this form of education appear as a fall-back rather than a healthy choice of youth empowerment, and doesn’t encourage its acceptance. The poor concept of technical education and training has greatly contributed to the unemployment rate and poor quality of degree holders in the country. Everyone has been sold the idea of degree qualification as the ultimate requirement for youth empowerment or self empowerment, but this is hardly true in reality. All we have is more and more people rushing in and out of the university with almost no skill or expertise acquired.

Therefore, most graduates rely on the government to provide them with work rather than becoming self reliant or self employed. This prompted this research to assess the past government initiative unemployment programmes and identify causes responsible for their
failure. The outcome of the assessment will go a long way to galvanize the program to greater heights.

2.1 Purpose of the Study

1. To identify factors responsible for the failure of past unemployment initiative programmes.
2. To identify the appropriateness of strategies for youth empowerment programmes.
3. To examine the level of finances, materials, technical and vocational skills given to the participants for the implementation of the program.
4. To examine the strategies for improving the programme to achieve the main objectives for establishing the programme.

2.2 Significance of the Study

The findings of this study will be of great importance to youth empowerment programmes managers because it would be a guide in formulating new plans and policies for providing more employment through the scheme. It will also be beneficial to the Nigerian government. More so, it will proffer useful suggestions based on findings which will help to expose the participants/beneficiaries to self evaluation of their projects for better achievement. It will also sensitize the new graduates with respect to the opportunities available to them after graduation. It will also help in changing the attitudes of the graduates from dependence to independence, from wage employment to self-employment and from job seeking individuals to job creators.

Finally the study will determine the factors militating against the effective implementation of the graduate employment programmes and youth empowerment programmes, and at the same time offer useful suggestions on how best to improve them. All this would go a long way in reducing unemployment which otherwise might lead to social problems like armed robbery, drug trafficking/addiction, anxiety, idleness, depression, somatic symptoms and illness among youths.

2.3 Research Questions

1. What are the factors responsible for the failure of the past unemployment initiative programmes in Nigeria?
2. What are the appropriate strategies used for sustaining the programmes?
3. In what ways have financial, material and technical assistance to the participants helped to improve the program?
4. What are the strategies for improving the programme to achieve its main objectives?

2.4 Hypotheses

1. There is no significant difference in the mean response of the youth empowerment scheme officials and the beneficiaries of the graduate employment program as regards the administrative practices of the scheme relative to its successful implementation.

There is no significant difference in the mean responses of the youth empowerment scheme officials and the beneficiaries of the graduate employment program in relation to the ways financial, material, and technical aids could help in improving the program.
3 Methodology

3.1 Area of the Study

The study was conducted in all the thirty-six (36) states of Nigeria including FCT, Abuja. Nigeria is located in western Africa on the Gulf of Guinea and has a total area of 923,768 km² (356,669 sq mi). It shares a 4,047 kilometres (2,515 mi) border with Benin (773 km), Niger (1497 km), Chad (87 km), Cameroon (1690 km), and has a coastline of at least 853 km. Nigeria lies between latitudes 4° and 14°N, and longitudes 2° and 15°E.

3.2 Population

The population for the study comprised all the 36-states of Nigeria including FCT, Abuja who are the beneficiary states of the various unemployment initiative programmes in Nigeria.

3.3 Sample

Six (6) states were used representing the six Geo-political zones including FCT, Abuja which are the beneficiary states of the various employment initiative programmes in Nigeria.

<table>
<thead>
<tr>
<th>Table 1: Six (6) States in Nigeria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
</tr>
<tr>
<td>(1) Lagos 7,937,932</td>
</tr>
<tr>
<td>(2) Kano 3,848,885</td>
</tr>
<tr>
<td>(3) Ibadan 3,078,400</td>
</tr>
</tbody>
</table>

3.4 Instrument for Data Collection

A structured questionnaire was employed as the survey instrument for data collection. The questionnaire items were generated to address each of the research questions taking into consideration the literatures reviews.

3.5 Validation of the Instrument

Face validation of the instrument was carried out by nine (9) experts in the Industrial Technology Education Department of the Federal University of Technology, Minna, Niger State, Nigeria and nine (9) Youth Empowerment Scheme officials in Nigeria.

3.6 Reliability of the Instrument

The reliability of the instrument was established using the Cronbach Alpha formula. Pilot testing of the instrument was carried out in Kano State with 4 Youth Empowerment Scheme officials and 27 beneficiaries. This forms 60% of the total respondents. The result of the reliability coefficient ranged from 0.94 to 0.99 while the final reliability coefficient was 0.88.

3.7 Method of Data Collection

The questionnaire was administered by the researchers with four research assistants.

3.8 Method of Data Analysis

The data obtained for the study was analysed using mean, standard deviation, percentages and t-test statistics.
3.9 Research Question 1

What are the factors responsible for the failure of the past unemployment initiative programmes in Nigeria?

Table 2: Respondent’s Means and Standard Deviation on the Administrative Practices of the Scheme

<table>
<thead>
<tr>
<th>S/N</th>
<th>Statement</th>
<th>$\bar{x}$</th>
<th>SD</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adequate number of youth empowerment scheme officials that cover a very wide range of locations are available</td>
<td>1.17</td>
<td>0.38</td>
<td>Agreed</td>
</tr>
<tr>
<td>2</td>
<td>Officials of the Scheme are provided with enough vehicles to perform their official duties</td>
<td>2.35</td>
<td>1.33</td>
<td>Disagreed</td>
</tr>
<tr>
<td>3</td>
<td>There is regular supervision of the beneficiaries by the youth empowerment scheme officials</td>
<td>2.18</td>
<td>1.20</td>
<td>Disagreed</td>
</tr>
<tr>
<td>4</td>
<td>Youth empowerment scheme staff are provided with incentives for performing their duties</td>
<td>2.40</td>
<td>0.91</td>
<td>Disagreed</td>
</tr>
<tr>
<td>5</td>
<td>Beneficiaries are not recruited into the program based on merit.</td>
<td>2.31</td>
<td>1.01</td>
<td>Agreed</td>
</tr>
<tr>
<td>6</td>
<td>Youth empowerment scheme policy does not give room for the training and training of the beneficiaries.</td>
<td>2.40</td>
<td>0.91</td>
<td>Agreed</td>
</tr>
<tr>
<td>7</td>
<td>Immediately loans are not settled by the beneficiaries, such are recycled to other graduates.</td>
<td>2.17</td>
<td>1.01</td>
<td>Agreed</td>
</tr>
<tr>
<td>8</td>
<td>Youth empowerment scheme does not always make prompt disbursement of loans to the beneficiaries.</td>
<td>2.30</td>
<td>0.99</td>
<td>Disagreed</td>
</tr>
<tr>
<td>9</td>
<td>Stringent actions are taken by the Scheme when beneficiaries default.</td>
<td>3.71</td>
<td>0.89</td>
<td>Disagreed</td>
</tr>
<tr>
<td>10</td>
<td>Youth empowerment scheme policy require a guarantor to prevent the beneficiaries from absconding</td>
<td>1.39</td>
<td>0.69</td>
<td>Agreed</td>
</tr>
<tr>
<td>11</td>
<td>Avoidance of late disbursement of loans tools and equipment by the youth empowerment scheme.</td>
<td>1.87</td>
<td>0.83</td>
<td>Disagreed</td>
</tr>
<tr>
<td>12</td>
<td>Beneficiaries are not given adequate skills training of the various programme before graduating.</td>
<td>1.45</td>
<td>0.89</td>
<td>Agreed</td>
</tr>
</tbody>
</table>

A greater number of respondents disagreed to the statement that the scheme tries as much as possible to forestall cases of absconding and at the same time ensure recycling of the loans recovered to other graduates without waste of time. Beneficiaries are also not recruited based on merit as shown in item 5 with mean score of 2.31. Hence, this established that the administrative practices of the scheme have not been perfect and effective to certain extent.

3.10 Research Question 2

What are the appropriate strategies used for sustaining the programme?
Table 3: Respondent’s Means and Standard Deviation on the Appropriate Strategies Used for Sustaining the Programme

<table>
<thead>
<tr>
<th>S/N</th>
<th>Statement</th>
<th>$\bar{x}$</th>
<th>SD</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Government finances the basic tools kits needed by the beneficiaries.</td>
<td>4.31</td>
<td>0.99</td>
<td>Agreed</td>
</tr>
<tr>
<td>14</td>
<td>Banks are involved in giving financial assistance to the scheme</td>
<td>2.13</td>
<td>1.16</td>
<td>Disagreed</td>
</tr>
<tr>
<td>15</td>
<td>Banks have been assisting the graduates to set-up their own ventures/industries through safe.</td>
<td>1.17</td>
<td>0.32</td>
<td>Disagreed</td>
</tr>
<tr>
<td>16</td>
<td>ITF are involved in rendering technical assistance to the beneficiaries of youth empowerment scheme.</td>
<td>2.41</td>
<td>1.20</td>
<td>Disagreed</td>
</tr>
<tr>
<td>17</td>
<td>NACRDB is involved in giving soft loans to the graduates</td>
<td>2.40</td>
<td>0.91</td>
<td>Disagreed</td>
</tr>
<tr>
<td>18</td>
<td>Philanthropist/philanthropies organizations are involved in providing financial resources to the Scheme.</td>
<td>2.37</td>
<td>1.01</td>
<td>Disagreed</td>
</tr>
<tr>
<td>19</td>
<td>Government provides cash award and additional soft loan with a year of moratorium to the successful beneficiaries.</td>
<td>2.30</td>
<td>0.89</td>
<td>Disagreed</td>
</tr>
<tr>
<td>20</td>
<td>Youth empowerment scheme has been obtaining loans from international organizations to run GEP.</td>
<td>1.39</td>
<td>0.69</td>
<td>Disagreed</td>
</tr>
<tr>
<td>21</td>
<td>International organizations help in supplying tools and materials to the beneficiaries.</td>
<td>2.13</td>
<td>1.23</td>
<td>Disagreed</td>
</tr>
<tr>
<td>22</td>
<td>Free land spaces allocations are given to the beneficiaries by the immediate community.</td>
<td>2.36</td>
<td>0.71</td>
<td>Disagreed</td>
</tr>
<tr>
<td>23</td>
<td>Many graduate beneficiaries got free training through the community organizations</td>
<td>2.22</td>
<td>1.21</td>
<td>Disagreed</td>
</tr>
</tbody>
</table>

The mean ratings of the responses of the youth empowerment scheme officials and the beneficiaries range from 1.45 to 3.86. All the items except number 17 ranked below the cut-off point. This is an indication that the respondents were in disagreement with the assertion that the philanthropist/philanthropic organization and government agencies do play an active role in the implementation of the program.

3.11 Research Question 3

In what ways have financial, material and technical skills assistance to the participants helped to improve the program?

Table 4: Mean and Standard Deviation of the Financial, Material and Technical Assistance Given to the Participants of the Program

<table>
<thead>
<tr>
<th>S/N</th>
<th>Statement</th>
<th>$\bar{x}$</th>
<th>SD</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Youth empowerment scheme undertakes projects such as building of workshops or incubation centre for the beneficiaries.</td>
<td>2.41</td>
<td>1.31</td>
<td>Disagreed</td>
</tr>
<tr>
<td>25</td>
<td>Youth empowerment scheme supplies enough tools, machines and other materials needed for the take-off by the beneficiaries.</td>
<td>2.12</td>
<td>1.14</td>
<td>Disagreed</td>
</tr>
<tr>
<td>26</td>
<td>Technical assistance is given regularly by the Youth empowerment scheme management to the beneficiaries (orientation course, seminars, workshops etc).</td>
<td>2.30</td>
<td>1.11</td>
<td>Disagreed</td>
</tr>
<tr>
<td>27</td>
<td>Chargeable fees for the workshop/seminars organized by the management are settled by individual participating beneficiaries.</td>
<td>2.28</td>
<td>1.32</td>
<td>Disagreed</td>
</tr>
<tr>
<td>28</td>
<td>Workshop/seminars are organized by the management free of charge for the fresh beneficiaries.</td>
<td>4.73</td>
<td>0.64</td>
<td>Agreed</td>
</tr>
<tr>
<td>29</td>
<td>Entrepreneurship development programs are regularly organized for the beneficiaries.</td>
<td>2.41</td>
<td>1.30</td>
<td>Disagreed</td>
</tr>
<tr>
<td>30</td>
<td>Government adequately finances the procurement of tools and</td>
<td>1.39</td>
<td>0.69</td>
<td>Disagreed</td>
</tr>
</tbody>
</table>
materials to the beneficiaries

31 Periodic consulting services are rendered to the beneficiaries by the government experts/ specialists.

32 Oversees the scholarship training programs for the beneficiaries are usually embarked upon by the Directorate.

The table presented above shows mean ratings from 1.39 to 4.73. Items 28 ranked above the cut-off point while others fell below. This implies that the respondents were not in agreement to the assertion that there was adequate or enough financial, material or technical assistance given to the beneficiaries which might contribute to the employment of the program.

3.12 Hypothesis 1

H₀₁: There is no significant difference in the mean responses of the youth empowerment scheme officials and the beneficiaries of Graduate Employment Program as regards the administrative practices of the Scheme relative to its successful implementation.

Table 5: t-test Comparison of Mean Responses of the Beneficiaries and the Youth Empowerment Scheme Officials as Regards the Administrative Practices of the Scheme

<table>
<thead>
<tr>
<th>S/N</th>
<th>ɵ</th>
<th>מעט</th>
<th>ࢊ</th>
<th>ษ</th>
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<th>ࢊ</th>
<th>ࢊ</th>
<th>ࢊ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.80</td>
<td>3.46</td>
<td>1.56</td>
<td>1.16</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.26</td>
<td>2.80</td>
<td>0.76</td>
<td>1.55</td>
<td>0.93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.42</td>
<td>3.00</td>
<td>1.04</td>
<td>0.94</td>
<td>1.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.00</td>
<td>2.93</td>
<td>1.16</td>
<td>1.35</td>
<td>2.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3.82</td>
<td>3.60</td>
<td>1.32</td>
<td>1.43</td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4.14</td>
<td>4.10</td>
<td>1.07</td>
<td>0.99</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3.60</td>
<td>3.80</td>
<td>1.43</td>
<td>1.09</td>
<td>0.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2.99</td>
<td>3.40</td>
<td>1.27</td>
<td>1.43</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3.70</td>
<td>3.20</td>
<td>1.16</td>
<td>1.23</td>
<td>1.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4.27</td>
<td>5.00</td>
<td>1.28</td>
<td>0.00</td>
<td>5.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2.47</td>
<td>3.50</td>
<td>1.47</td>
<td>1.91</td>
<td>1.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4.80</td>
<td>4.62</td>
<td>0.42</td>
<td>1.03</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*S – Significance DF=92 n₁ = 84 n₂ = 10

Table 5 shows the opinion of the respondents (beneficiaries and the scheme official(s) on the administrative practices of the Scheme. It can be seen that t-calculated values of ten items (i.e. 1,2,3,5,6,7,8,9,11, and 12) were less than the table values while the others were above. Therefore, the null hypothesis was upheld for each of the items while the null hypothesis was rejected for the remaining two items. Consequently, it can be categorically stated that the opinions of the respondents did not differ on the ten items but differ in others.

3.13 Hypothesis 2

H₀₂: There is no significant difference in the mean responses of the youth empowerment scheme officials and the beneficiaries of GEP in relation to the ways financial, material and technical aids could help improving the program.
Table 6: t-test Comparison of Means Responses on Financial, Material and Financial Aids Given to the Beneficiaries

<table>
<thead>
<tr>
<th>S/N</th>
<th>$d_{f_1}$</th>
<th>$d_{f_2}$</th>
<th>$S_1$</th>
<th>$S_2$</th>
<th>T-cal</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>2.40</td>
<td>2.29</td>
<td>1.43.</td>
<td>1.23</td>
<td>0.26</td>
</tr>
<tr>
<td>18</td>
<td>4.54</td>
<td>4.20</td>
<td>0.50</td>
<td>0.42</td>
<td>0.81</td>
</tr>
<tr>
<td>19</td>
<td>3.45</td>
<td>2.82</td>
<td>1.16</td>
<td>1.55</td>
<td>1.28</td>
</tr>
<tr>
<td>20</td>
<td>1.42</td>
<td>1.40</td>
<td>0.71</td>
<td>0.52</td>
<td>0.1</td>
</tr>
<tr>
<td>21</td>
<td>4.63</td>
<td>4.00</td>
<td>0.81</td>
<td>1.16</td>
<td>1.66</td>
</tr>
<tr>
<td>22</td>
<td>3.14</td>
<td>2.60</td>
<td>0.58</td>
<td>1.43</td>
<td>1.17</td>
</tr>
<tr>
<td>23</td>
<td>4.20</td>
<td>4.60</td>
<td>1.29</td>
<td>0.52</td>
<td>1.81</td>
</tr>
<tr>
<td>24</td>
<td>2.20</td>
<td>2.08</td>
<td>1.25</td>
<td>1.17</td>
<td>0.31</td>
</tr>
<tr>
<td>25</td>
<td>1.13</td>
<td>1.20</td>
<td>0.34</td>
<td>0.42</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*S – Significant, $DF = 92$, $N_1 = 34$, $N_2 = 10$.

Table 6 shows the opinions regarding the financial, material and technical assistance to the beneficiaries. The opinion of the respondents did not differ on all the items. As a result, the null hypothesis is accepted since the t-values were all less then the table values. Based on this, the null hypothesis is thereby upheld.

There is no significant difference in the mean responses of the youth empowerment scheme officials and the beneficiaries of GEP in relation to the ways financial, material and technical aids could help in improving the program.

### 3.14 Findings of the Study

1. All the beneficiaries are found to be graduates of tertiary institutions; OND holder had the highest percentage of 36.9%, while M.Sc/M.Ed recorded the lowest, which was 6%.
2. Most of the small-scale ventures are concentrated in the state local government headquarters, negligible percentage in the rural areas.
3. The loans of beneficiaries are neither sufficient nor being disbursed in time.
4. Not every graduate who attends the youth empowerment schemes’ entrepreneurship training is given the opportunity as a beneficiary due to shortage.
5. Most of the beneficiaries were not selected on merit due to one factor or the other.

### 3.15 Discussion

The findings of this study are substantiated in part by the findings from several previous studies and on the other part by some theoretical framework of scholars with precedence to the research questions and hypothesis for the study.

One thing is to recruit; another thing is to make follow-up evaluation after disbursing the loan. It was revealed that regular evaluations of the beneficiaries were not carried out. This rubs them the opportunity to know when they do well and where they are lacking in terms of operation, product and management. It was deduced that there had been evaluation and supervision of the beneficiaries but not on a regular basis. This could be attributed to lack of enough vehicles for the officials to go around visiting the beneficiaries. This problem also affects the loan recovery exercise of the Scheme. Consequently, these findings differ from the advice of Mcomish and Perera (2011) that reinstated that beneficiaries should be given time adequate monitoring in order to ensure their progress on the venture and at the same time keep them on their toes for quick repayment.

Despite the fact that about thirteen areas have being identified, there are still areas that have not been discovered or exploited. This could be due to the location or available raw materials within the state or to no graduates being available at all in those areas.
However, citing an industry or any venture is best determined by factors such as raw materials accessibility, facilities etc.

A t-test for significance was used to test the first hypothesis on administrative practices of the Scheme. In Table 5 10 items were smaller and 2 items bigger than the critical t-value of 1.98. Therefore, the null hypothesis was upheld for ten items while it was rejected for the remaining two items. Where there are significant differences in responses this might be a result of individual perception as beneficiaries or as an official with respect to these items. Hence, the result is an indication that the administrative practices of the scheme is devoid of serious loopholes and the organisation set-up was noticed to have performed to a very reasonable degree.

3.16 Implication of the Study

The implication of this study can be seen from different perspectives. The implication becomes overt that if proper steps are taken, more areas of small-scale ventures can be introduced as a way of engaging more graduate youths in viable self-employment. Presently the areas covered by the scheme still leave more room for expansion and concerted effort must be made to cover the spaces. This study will instil in the youth empowerment scheme management and intending beneficiaries an awareness of the available trades that have not been trapped.

4 Conclusion

On the basis of the findings, it can be deduced that the administrative practices of the youth empowerment schemes are superb and outstanding enough for full accomplishment of the objectives of the program. What they need is enough budgetary allocation from the government, adequate tools, machines, equipment and materials for the beneficiaries of the program. The results also indicated that no bilateral relationship between the youth empowerment scheme and any philanthropists, local or international organisations, if such exists, would have alleviated the problems faced by the scheme in terms of logistics and materials resources.

Evidence from the study also revealed that the majority of the beneficiaries are concentrated in urban areas. This however negates the government’s desire to transform the rural areas into habitable places as a way to check rural-urban migration. This trend can be prevented by providing electricity in rural areas. It is also discovered that there are opportunities for expansion and improvement on the scheme. Hence, the government, the youth empowerment scheme management, the beneficiaries and even the public have a role to play so as to ensure that the unemployment of graduates plaguing the country becomes a thing of the past.

4.1 Recommendation

The following recommendations are made based on the findings of the study

1. Since the government plans to eradicate unemployment problems among the graduate youths, more funds should be provided to the scheme and at the same time, the scheme should try to explore and include more trades among the already existing ones to enable more graduates diversify their interest.

2. Capital is the bedrock of any successful program; hence adequate funds should be made available for the procurement of equipment, tools, materials, and other facilities for the beneficiaries for their use in various industries/ventures.
Efforts should be made by the scheme to solicit for assistance from philanthropists, local and international organizations. Examples for such organizations are; UNESCO, UNDP, World Bank, etc.

The Directorate should arrange for experts/specialist on different disciplines for regular consultancy packages for the beneficiaries. If this is done, the beneficiaries will be acquitted with the knowledge of resource management which would help them to reduce wastage and at the same time improve their output for profit maximization.

The Government should put strategies for selecting beneficiaries best on merit and distribute/spread to the unprivileged ones.

References


TVET Agency-Industry Collaborations: Addressing Diversity

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Abstract

This paper highlights some of the initiatives undertaken by Malaysia in addressing social and economic challenges through TVET programmes in general and through TVET agency-industry collaborative efforts in particular. A brief description of the TVET programmes that are under the various agencies in Malaysia will be presented to be followed by examples of collaboration initiatives undertaken at the various levels of the TVET system. The issues and challenges encountered in their implementations are identified as factors that need to be addressed to ensure sustainability of future TVET collaborations.

1 Introduction

Addressing diversity has been at the core of the Malaysia Education System and is mandated in the National Education Master Plan 2006-2010 such that the development of the Malaysian Education System is to be based on four main thrusts that promote education for all namely, access to education, equity in education, quality in education and efficiency and effectiveness of educational management (Ministry of Education, 2006). Measures to provide education for all includes enforcing the compulsory primary education policy from 2003 (Education Act 1996, 29A, 2006) and the fee-free schooling policy starting from 2008 as well as providing a wide choice of programmes that meet the needs of diverse learners.

Technical and vocational education and training (TVET) is a branch of education that has been introduced into the mainstream education system and transformed recently as part of the government initiatives to promote access, equity, and quality of education which is ultimately aimed at providing the necessary local workforce who possess the necessary skills and competences for achieving the high income nation status by 2020 (Mohd Zain, 2008). The term TVET as used in Malaysia is synonymous with the term technical and vocational education as often used by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). As such, the definition of TVET is similar to the definition of TVE used by UNESCO which refers to “… those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life.” (UNESCO, 2005, page 7). Also according to UNESCO (2005), the aspects that differentiates TVET from other forms of education and training is its emphasis on work productivity. In all TVET programmes, the emphasis on work productivity is always the main aim although and in some cases, can be the only aim of education and training.

One of the goals of TVET in Malaysia is to ensure that the learning needs of all its young people and adults are met through equitable access to appropriate learning and life skills programmes in line with one of the six goals of Education for All (EFA) in the Dakar Framework for Action established at the World Education Forum in Dakar, 2000. The regular
academic stream in secondary schools tends to favour learners with high mathematical, verbal and analytical skills and less so learners who are more inclined to spatial and kinesthetic preferences. Thus the availability of TVET programmes in schools provides greater opportunities for diverse learners who are otherwise left behind in their middle education. The focus on vocation in TVET provides a pathway for those who have a strong inclination towards early vocational pursuits.

2 TVET providers and programmes in Malaysia

In Malaysia, TVET is provided under various ministries such as the Ministry of Education (MoE) providing TVET in schools; the Ministry of Higher Education (MoHE) providing TVET in polytechnics and community colleges as well as in some technical universities; the Ministry of Human Resource providing TVET in skills training institutes; the Ministry of Youth and Sports providing TVET in their National Youth Skills Institutes (Mohd Zain, 2008), the Ministry of Rural and Entrepreneurial Development and the Ministry of Women, Family and Community Development.

TVET agencies under the different ministries target different groups of participants and vocational sectors for their TVET programmes although they may sometimes overlap in their implementations. While the TVET programmes under the MoE and MoHE focus on further education and training for better career opportunities, TVET programmes under other ministries focus primarily on workforce productivity and the different agencies under these ministries provide different entry points of TVET access. For example, the Ministry of Youth and Sports provide programmes to prepare youth with basic TVET skills for their future life as well as for life-long learning and therefore their target group is between the age range of 18-40. Notably, most of the participants in their TVET programmes are among unemployed youth. The Ministry of Women, Family and Community Development on the other hand focuses on programmes that provide basic household management and home science skills to teenagers and single parents. In contrast to the Ministry of Women, Family and Community Development, the programmes under the Ministry of Human Resource is not oriented to particular gender and is focused on preparing trainees to be skilled workers and their target groups are mostly school leavers.

In summary, there exist multiple ministries and agencies providing TVET to meet diverse needs of the people. In this short paper, only TVET programmes and collaborations that are undertaken by agencies that are directly under the MoE and the MoHE will be considered.

3 TVET under the Malaysian Education System

Since TVET is part of the education system in Malaysia, a brief description of the Malaysian Education system is here provided to better understand the provisions for TVET under the MoE and MoHE.

3.1 Malaysian Education System

The Malaysian education system is under the purview of two ministries as mentioned previously namely the MoE which is responsible for pre-school, primary and secondary education and the MoHE which is responsible for post-secondary education. Malaysians receive 12 years of schooling including one year of pre-school, six years of primary school and five years of secondary school as shown in Table 1. Primary education is compulsory for all children under the amended Education Act and was enforced starting from 2003 (Education Act 1996, Section 29A).
Students are assessed at different times in their schooling years to gauge their educational achievement. In their primary school, they sit for the standard examination; the *Ujian Penilaian Sekolah Rendah* (UPSR) in year six to assess their educational attainment after six years of primary education. The primary school leavers continue to obtain the three years of lower secondary education and sit for another standard examination, the *Penilaian Menengah Rendah* (PMR) in the third year of their secondary education (Table 1). Their grades in the PMR are used for upper secondary education placement decisions. Under the Malaysian Education System, TVET is offered starting from the upper secondary education at the age of 16 onwards. In general, the MoE provide TVET programmes in schools while the MoHE provides TVET in community colleges, polytechnics and specialised technical universities.

### Table 1: The Structure of the Education System in Malaysia

<table>
<thead>
<tr>
<th>Level</th>
<th>Age</th>
<th>Duration (years)</th>
<th>Standard Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre school</td>
<td>5+</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>6-12</td>
<td>6</td>
<td>UPSR</td>
</tr>
<tr>
<td>Lower secondary school</td>
<td>13-15</td>
<td>3</td>
<td>PMR</td>
</tr>
<tr>
<td>Upper secondary school</td>
<td>16-17</td>
<td>2</td>
<td>*SPM</td>
</tr>
<tr>
<td>Lower six</td>
<td>18</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Upper six</td>
<td>19</td>
<td>1</td>
<td>*STPM</td>
</tr>
<tr>
<td>Certificates &amp; Diploma</td>
<td>18-21</td>
<td>2-3</td>
<td></td>
</tr>
<tr>
<td>Tertiary education (MoHE)</td>
<td>20-</td>
<td>4/5 year prog.</td>
<td></td>
</tr>
</tbody>
</table>

*SPM: Sijil Pelajaran Malaysia (‘O’ Level equivalent); used for selection towards Diploma programme
*STP: Sijil Tinggi Pelajaran Malaysia (‘A’ Level equivalent); used in selection towards Degree programmes

Out of the total population of primary school students, only 77% are enrolled into upper secondary education while the rest did not complete their 12 years of schooling (MoE, 2010) and TVET was part of the government initiatives to increase participations in the upper secondary education.

#### 3.2 TVET programmes

As mentioned earlier, TVET programmes are offered under the MoE as well as the MoHE. Under the existing education system of the MoE, TVET is provided starting from the upper secondary education. However, a vocational transformation programme was recently approved where students were given the opportunity to enrol in TVET courses earlier. Fifteen secondary schools were offering basics vocational education in as part of the pilot project in 2012. The vocational transformation programme also involves an introduction of a third stream – skills stream – in the upper secondary education level. Thus, three TVET streams are offered in the upper secondary school namely, technical stream, vocational stream and skills stream. Those who obtained excellent grades in their PMR are eligible to enrol in the technical stream programmes. The aim of the programmes is to prepare students for further education and to be future professionals. Those who get good results in their PMR can enrol in the vocational stream programmes. The programmes are aimed at preparing students for further education and to be semi-skilled professionals. Lastly, those who are not suited for the other two streams will be encouraged to enrol in the skills stream programmes that are designed to produce skilled workforce as well as to provide platform for further skills training in skills training institutes.

Compared to the rest of the world, Malaysian enrolment in TVET programmes based on 2010 statistics is relatively low (approximately 15%) compared to the average of the Organization of Economic co-operation and Development (OECD) countries which is 44% (Fletcher, 2012). The low enrolment is a cause for concern and at the core of the vocational
education transformation programme which focuses on efforts at increasing TVET enrolment in schools to address the diversity of learners (Speech by the Deputy Prime Minister on January 06, 2012 at the event for the launching of the vocational education transformation). Participations in TVET have been found to be associated with greater completion of secondary education in other countries (Yoo Jeung Joy Nam, 2009) and are expected resolve the high attritions rate in Malaysia (MoE, 2010). Greater provisions were made for further vocational education and skills training pathways.

The vocational education transformation plan is also undertaken to prepare the necessary workforce for supporting the country’s economic transformation plan. Under the vocational transformation programmes, students are exposed to vocational education earlier; from year 1 in their lower secondary education instead of from upper secondary school. The programmes are shown in Table 2. Upon completion of the lower secondary TVET education, students can further theirs studies in vocational colleges under the MoE, public skills training institute under the other ministries, or private skills training institutes.

<table>
<thead>
<tr>
<th>Year of study</th>
<th>TVET qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 3</td>
<td>can continue in the course of their choice to get the Malaysian Skills certificate level 2</td>
</tr>
<tr>
<td>Year 2</td>
<td>students can choose to enroll in a specific courses that will enable them to obtain the Malaysian Skills Certificate level 1</td>
</tr>
<tr>
<td>Year 1</td>
<td>basics of vocational education, for those who do less well in their UPSR</td>
</tr>
</tbody>
</table>

3.3 **Vocational colleges**

Starting from 2012, 15 vocational schools were involved in a pilot project on vocational colleges. The programmes in vocational colleges are four year programmes offered to students who have completed the basic vocational education in their lower secondary education. The curriculum consists of a high practical component (70%) with 30% theoretical component. By 2013, all vocational schools will be transformed into vocational colleges (Utusan online, October 14, 2012). Upon completion of the vocational colleges programmes students are awarded the Skills Certificate Level 4 by the Skill Development under the Ministry of Human Resource. They will also be awarded the Diploma by the Ministry of Education. Successful graduates will also receive certifications from the relevant industries. The multiple recognitions means that graduates will have better job prospects. For those who wish to further theirs studies, they may enrol in higher TVET institutions under the various ministries as well as in private TVET higher institutions.

<table>
<thead>
<tr>
<th>Ministry</th>
<th>Institutions</th>
<th>TVET programmes / awards</th>
</tr>
</thead>
</table>
| MoHE     | Technical universities | 4-5 year programmes / Degree  
3 year programmes / Diploma |
|          | Community colleges | Modular programmes /Sijil Kolej Komuniti & Sijil Modular Kebangsaan |
|          | Polytechnics    | 3 – 4 year programmes / Diploma & Advanced Diploma |
|          | Vocational colleges | Diploma programmes (National Skills Certificate Level 4 |
| MoE      | Vocational schools | Vocational streams (National Skills Certificate 1 & 2)  
Malaysian Vocational Skills Certificate |
TVET programmes under the MoHE are offered in technical universities, polytechnics and community colleges. Graduates from these programmes are awarded Degrees, Advanced Diploma and Diploma in the various disciplines. The summary of the TVET programmes and the related awards under the MoHE and the MoE are shown in Table 3. To enhance post-secondary TVET the Polytechnic Transformation Plan was undertaken in 2010 (MoHE, 2010) where greater opportunities for pursuing higher education in TVET was created through the establishment of three premier polytechnics that are mandated to offer Advanced Diploma programmes in the related disciplines.

Collaboration initiatives undertaken by TVET agencies for various reasons. Among the most emphasized collaboration objectives are; to improve research capacities and commercialization potentials (as undertaken by TVET institutions under the MoHE), to improve technical skills, to reduce demand and supply mismatch, to enhance employability skills, and to promote knowledge transfer between institutions and the community. The TVET agency-industry collaborations discussed in this paper are limited to those undertaken by agencies under the two ministries responsible for education in Malaysia namely the MoE and the MoHE. Table 4 gives a brief summary of some of the established collaboration programmes that are taking place that involves institutions under the two ministries.

Table 4 TVET agency-industry collaborative efforts

<table>
<thead>
<tr>
<th>Ministry</th>
<th>Institutions</th>
<th>Collaboration initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoHE</td>
<td>Technical Universities</td>
<td>Industry PhD, Research, innovations and commercialization, Industrial Training</td>
</tr>
<tr>
<td></td>
<td>Polytechnics</td>
<td>Internships programmes for students (industrial trainings), Industrial attachment for lecturers, Guest lecturerships</td>
</tr>
<tr>
<td></td>
<td>Community colleges</td>
<td>Work-Based learning</td>
</tr>
<tr>
<td>MoE</td>
<td>Vocational Colleges</td>
<td>Traineeship programmes</td>
</tr>
<tr>
<td></td>
<td>Vocational Schools</td>
<td>Basics of financial management</td>
</tr>
<tr>
<td></td>
<td>Mainstream schools</td>
<td>Traineeship programmes</td>
</tr>
</tbody>
</table>
5.1 Industry PhD

The industry PhD programme which was launched in 2010 is a collaboration programme between the MoHE and industry. It is part of the existing MyBrain15 programme that targets 60,000 PhD holders by 2023 (MoHE (2011). The Industry PhD programme invites industry professionals to undertake industry-based research to promote innovations which will lead to increased competitiveness of Malaysia. Five hundred Industry PhD grants are allocated in total with 100 participations targeted for 2011 (MoHE, 2011). For each industry PhD candidate, a maximum of RM50,000.00 has been allocated by the MoHE for supervision, tuition, training, examination, and thesis fees while the expenses for research activities are expected to be provided by the participating industry.

The implementation of the programme calls for a number of players to make it a success namely, a university representative, a human resource personnel from industry, industry staff who is supposed to undertake the PhD research and a representative from MoHE. In 2011, 97 industry PhD applications was approved, which was good in terms of starting the programme considering the target for 2011 was only 100 PhDs. The quick actions by universities in preparing guidelines for the implementations of the Industry PhD programmes have greatly expedited the process of the Industry PhD application.

However, several challenges were identified during the implementations that need to be addressed with regards to commitments and readiness of participants. Through informal discussions, candidates reported that they are often called upon to undertake added responsibilities that are not directly related to their PhD programme which undermines their capability to focus on their target research project. A possible cause of the situation is a lack of appreciations among employers on the need for high commitment by candidates in completing their planned research projects. The problem can be alleviated to a certain extent if universities have better understanding of the working of the industry that they are dealing with which would enable them to assist their PhD candidate in deciding on a viable and win-win research projects. There is also concern over a low number of applicants for the programmes which can be improved by having better promotional exercises to industries and better networking between academia and industries which will create better understanding of each other’s needs that can be met through the industry PhD programmes.

5.2 Research, innovations and commercialization

Optimizing research capabilities has been one of the goals of collaborations in the higher education sector. Thus, the collaborators in such cases are mainly institutions of higher learning with some participation from research institutions and industries. In the institution-institution collaboration, sharing of resources such as research equipment and expertise are prevalent. Typical collaboration would be a research project being undertaken by technical experts from two or three universities. Recently, industry participations have been much encouraged in any research projects undertaken by universities. For example, in the case of the Malaysian Technical Universities Network Centre of Excellence grant scheme (MTUN CoE Research Grant scheme) each proposal for the application of the grant must include collaborators from industries in addition to the institutional collaborators. The institution-industry collaborations are expected to enhance research capabilities on both sides, improve productivity as well as increase commercialization potentials of products that are generated from the research projects.

In other words, while the institution-institution collaborations generally aim at increasing knowledge and human capital development, the institutions-industry collaborations have additional goals namely, to increase intellectual property rights, to promote problems solving in industries to increase productivity and to increase commercialization potentials of university research products.
To promote institution-industry collaborations, organizational support are provided via centre for research and centre for university-industry relations. As a consequence, many memorandums of understandings have been signed between institutions and industry as an indicator of willingness to collaborate but not as many activities have actually materialized. In general, the institution-institution collaboration has been found to be more successful compared to the institution industry collaborations. Several factors have been highlighted that contribute to the less prevalent occurrence of institution-industry collaborations on research and innovations but one has been most cited namely, the mismatch of emphasis where universities emphasize on knowledge acquisition and human capital development while industries tend to emphasize more on profit taking. A study may be necessary to understand better ways of making this mode of collaborations more successful.

5.3 Industrial trainings and internships for students

Industrial trainings are collaborations between institutions of higher learning and industries to allow students to be attached in industries. These trainings are part of the pre-employment skills development process (using the three pillars skills development framework in Yoo Jeung Joy Nam, 2009). All undergraduates from technical programmes in universities and polytechnics have to undergo 3-6 months of industrial trainings in industries. To support the industrial training programmes, a large industry is a necessity. For example, in 2010 alone, 5000 companies were involved in the training 7800 community colleges students. While they are in industries, industries are expected to provide them with suitable tasks to prepare them for work as well as future learning. The expected outcomes are improved technical skills as well as soft skills.

The success of these collaborations in supporting learning experience depends highly on the suitable matches between students’ area of studies and industry area. Students tend to prefer living near homes during industrial attachment period to reduce living costs and suitable industries may not be available at these locations. Some industries are reluctant to give challenging work to trainees resulting in students being “undertrained” technically and socially. Institutions are also facing a challenge in finding suitable industries.

In general the programmes have been rather successful as the number of students securing work after graduations as results of their trainings are quite high. Students coming back into universities or polytechnics after the industrial trainings often feel more confident in their ability to learn and to undertake vocational related tasks. Students feel that the industrial trainings do provide them with the “reality experience” that they can link to the theoretical knowledge that they are exposed to in Universities or polytechnics. Research indicates that these industrial trainings do improve students’ soft skills as expected (Osman et al, 2008).

5.4 Work-Based learning programmes

The work-based learning programmes were first introduced in 2007 in four community colleges under the MoE via four programmes namely, hotel and catering, electrical technology, computer technology and automotive technology. Four industry sectors participated in the programmes namely, the automotive, the electrical electronics, computer technology and the hotel and catering sector. The main aim of the programmes is to promote soft skills, technical and vocational skills to enhance employability potential of graduates. The WBL curriculum were co-developed by the colleges and corresponding industries.

The programmes were found to be successful in terms of developing students’ soft skills related to creative and critical thinking (Alias & Abd Hadi, 2011) as well as knowledge (Kamin, Cartledge and Simkin, 2010) and problem solving skills (Wan Mohamed & Omar, 2010). In addition to the WBL benefits to students’, Kamin, Cartledge & Simkin (2010) also found that there are other benefits such as improved facilities through industry donations and
improvement in teachers' knowledge and skills. Despite its potential benefits, the WBL has several hurdles to undertake, namely in terms of students' logistics. Sadly, the WBL programmes had to be kept on hold in 2010 due to change of stewardship when the MoE was split up into two ministries the MoE and the MoHE 2010, restructuring the existing management of the existing colleges under the MoHE where they were previously under the MoE.

Due to its past success, the WBL programmes will be resumed in 2013 (ref). However, past implementations have highlighted the areas that need to be looked into to increase the potential for WBL success. Among the issues, the most urgent is the one related to the welfare of the individual trainees who faced many logistical challenges during the WBL phase of their trainings. These difficulties can be resolved through better management of work placements as suggested by Kamin, Cartledge and Simkin, (2010).

5.5 Traineeship programmes

The traineeship programmes which represent school-industry collaboration were introduced into the vocational education system in 2012 and offered to those who are interested with consents from their parents. The programmes involve upper secondary school students working in industry two days a week as part of their pre-skills development process. The traineeship programmes are offered to students in the skills stream only. Several initiatives have been taken by the MoE as well as the individual school in ensuring the success of the traineeship programmes. For example, the MoE has signed a memorandum of understanding with Shell Malaysia whereby, Shell Malaysia will contribute US$32,000 annually over a period of five years to provide specialist welding training to students (Cicerello, 2012). In another successful example, an individual school the Kluang Vocational College has signed an agreement with Liebherr Appliances Sdn Bhd in Kluang to provide on the job training for students of the college. In addition to providing workshop facilities, training materials and products, the company is also adopting the college as a centre of excellence for training of its workers (Bahari, 2012). According to Bahari who is the principal of the college concerned, the company is committed to the extent that it is willing to make jobs available to the college graduates in 2015.

Despite some success stories, there are still hurdles to be overcome in implementing the traineeship programmes. First and foremost, decisions on the host industry to take in trainees from schools and colleges must be based upon consensus among school, industry and parents. The challenges in this case arise due to the lack of working policies in guiding the implementations of the traineeships. Thus, industry feels quite apprehensive to take these very young trainees (some maybe as young as 14 year old) into their workplace. Some industries, on the other hand are reluctant to accept students as they are yet to be skilled. Thus, to improve participations from industries, the government has improved the Human Resource Development Fund given to participating industries where industry can claim up to 100% of training related expenditure (Lembaga Pembangunan Pelaburan Malaysia, 2012).

5.6 Basics of financial management

Some knowledge of financial management is crucial in ensuring that students are able to manage their financial needs when they secure employment. Thus, to prepare students for the real working life, it is important that they are exposed to issues related to financial management. Aware of this need the MoE is collaborating with the Employee Provident Fund to raise awareness among vocational school students on rights and responsibilities of employees and employers. These programmes which will be officially launched next January in 15 vocational colleges are also designed to educate the Malaysian future workers on the
importance of financial planning post-retirement even before entering the world of work (New straits Times, 2012)

6 Conclusion

Collaborations between TVET agencies and industries are occurring at the various levels of the education sector in Malaysia with pre-employment skills development as the main objective of collaborations across all levels of education while research and innovation serves as a second main objective in the higher TVET sectors. Benefits are observed on both sides although there are issues to be contend with in various forms. Issues related to the sustainability of the collaborations initiatives include continuity of governance, a better understanding of needs of multiple collaborators and ensuring commitments in collaborative programmes. Despite the challenges facing collaboration efforts, ensuring successful working collaborations is important as they are essential in meeting the diverse needs of the education and industry sectors. Successful collaborations can be achieved with the right environment and supportive organizational structure; a win-win partnership towards mutual benefits for both sides and the right people who are prepared to undertake new responsibilities that collaborations often demand. Thus these are the factors that need to be addressed for ensuring future collaborative undertakings.

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Descriptive Analysis of Mathematical Modeling Ability, Logical Inference Ability, and Academic Achievement in the Training of Vocational School Physics Teachers

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Abstract

The purpose of this study was to analyze mathematical modelling ability (MMA), logical inference ability (LIA), and academic achievement in the training (AAit) of vocational school physics teachers. The study utilized a descriptive analysis method. The sample consisted of 17 teachers (9 men and 8 women). MMA and LIA were measured by written tests of MMA and LIA, each consisting of 10 items. AAit was drawn from the combined final score of all subjects in the training. Then the correlation between MMA, LIA, and AAit was calculated. The mean scores of MMA and LIA were 54.27 and 33.87, respectively, on a scale of 100, which must be considered pretty low. Also AAit was low as indicated by the average score of only 57.89 out of 100. MMA and LIA were significantly correlated. Both, MMA and LIA, had significant correlation with AAit. In terms of mastery of MMA, LIA, and AAit, no significant differences between men and women could be found.

1 Introduction

Natural phenomena, in physics, are frequently illustrated and explained by symbols and mathematical formulas. According to Carrejo & Marshall [2007], mathematical formulation is intended to facilitate the understanding of natural phenomena. Generally, the mathematical modelling process starts with observing phenomena and continues with assigning symbols to entities, searching for relationships between the symbols, and describing them by means of mathematical formulas. The ability to perform the process is called mathematical modelling ability (MMA). According to Brotosiswojo [2000], mathematical modelling ability is the ability to describe natural phenomena in the form of symbols and the relationship between the symbols. Dumont and Heyen [2004] state, that a simulation or mathematical modelling is a representation of the actual system, and Carrejo and Marshall [2007] note, that natural events and everyday’s experiences can be related to science concepts through mathematical modelling and vice versa.
A mathematical model can be used to predict the behaviour of natural phenomena. Nabulsi & Abdalla [2008] state that the use of the general formula to make a conclusion for a specific constellation refers to the process of inference. The ability to do so is called logical inference ability (LIA).

Physics teachers, including vocational school physics teachers, require both MMA and LIA abilities. With these abilities, the teachers are expected not only to be able to understand and use physics, but also to improve their understanding of natural phenomena and finally to solve related problems.

During the training, vocational school physics teachers learned about some natural phenomena by means of experiments, developed mathematical models, and tried to draw conclusions from the models on the behaviour of the respective systems. At the end of the training, the teachers were tested for all the subjects addressed during the training. The average score from all the subjects were taken as a value to quantify the academic achievement (abbreviated AAit) in the training.

2 Research questions

In the study presented in this paper, the authors tried to find out about the level of vocational school physics teachers’ MMA, LIA, and AAit. The guiding questions were: (1) What are the teachers’ MMA and LIA levels? (2) Are there significant correlations between teachers’ MMA, LIA and AAit? (3) Are there any differences with respect to MMA, LIA, and AAit between female and male teachers?

3 Methodology, approach and realization

The study used a descriptive analysis method. The candidates were 17 vocational school physics teachers, 9 of them men and 8 women, who attended a training program held by a national training institution for science education in Bandung, West Java, Indonesia. Out of the 17 participants, 12 persons did not have a Bachelor degree in Physics Education.

MMA and LIA were measured by written tests, each consisting of 10 open-ended questions which had to be answered by writing a short text.

The teachers’ academic achievement (AAit) in the training was determined from the combined final scores for all the subjects in the training. The final score (FS) for each individual subject was calculated by building the sum of the score given based on the observation of activities during the training (SO), the score achieved for work practice (SWP), the score given for presentation (SP) and two times the score achieved in the final test (SFT), and dividing the result by five. AAit then is the sum of all FS divided by the number of training subjects.

The correlations between MMA, LIA, and AAit were calculated by Kendall’s tau_b nonparametric statistics, as used by Meltzer (2002). The variables (MMA, LIA, and AAit) were also examined with respect to gender differences.

4 Findings and their significances

The results of the MMA test, the LIA test, and the calculated AAit are presented in Table 1.
Table 1: Average score, standard deviation

<table>
<thead>
<tr>
<th>Type of score</th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Max. Score</th>
<th>Min. Score</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMA</td>
<td>54.27</td>
<td>8.91</td>
<td>73.31</td>
<td>36.92</td>
<td>17</td>
</tr>
<tr>
<td>LIA</td>
<td>33.87</td>
<td>5.46</td>
<td>42.78</td>
<td>24.45</td>
<td>17</td>
</tr>
<tr>
<td>AAit</td>
<td>57.89</td>
<td>5.08</td>
<td>66.86</td>
<td>45.15</td>
<td>17</td>
</tr>
</tbody>
</table>

With an average score for MMA of 54.27 and for LIA of 33.87 on scales of a maximum possible 100, the mathematical modelling and logical inference abilities of the participating physics teachers turned out to be little developed. The AAit, describing the academic achievement during the training, also was relatively poor with an average score of 57.89 out of 100.

The calculated correlations between MMA, LIA, and AAit are presented in Table 2. The correlation coefficient between the ability of mathematical modelling (MMA) and the ability of logical inference (LIA) was calculated to be 0.471.

Between MMA and academic achievement in the training (AAit), the data yielded a correlation coefficient of 0.574. This shows that the ability of mathematical modelling (MMA), logical inference (LIA), and academic achievement in the training (AAit) are closely linked. In other words, if a physics teacher has high mathematical modelling and logical inference abilities, then she or he tended to have pronounced academic achievement in the training.

Table 2: Correlation between MMA, LIA, and AAit

<table>
<thead>
<tr>
<th>Kendall's tau_b</th>
<th>MMA</th>
<th>LIA</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMA Correlation Coefficient</td>
<td>1.000</td>
<td>.471**</td>
<td>.574**</td>
</tr>
<tr>
<td>Significance (2-tailed)</td>
<td>.008</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td>N</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>LIA Correlation Coefficient</td>
<td>.471**</td>
<td>1.000</td>
<td>.515**</td>
</tr>
<tr>
<td>Significance (2-tailed)</td>
<td>.008</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td>N</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>AAit Correlation Coefficient</td>
<td>.574**</td>
<td>.515**</td>
<td>1.000</td>
</tr>
<tr>
<td>Significance (2-tailed)</td>
<td>.001</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td>N</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation coefficient between the logical inference ability and academic achievement was 0.515. The correlation shows that logical inference ability is closely linked to academic achievement. This means that when a participant’s logical inference ability was well developed, his or her academic achievement in the training tended to be high as well.

The high correlation coefficients show that there was a close interrelation between mathematical modelling and logical inference abilities, and academic achievement. When a participant’s scores for MMA and LIA were low, the academic achievement in the training (AAit) also tended to be low. For example, the participant with the code H got the highest scores for MMA (85.67) and LIA (82.78), and his score for AAit was also highest (86.86). At the other end of the scale, the participant with the code L got the lowest scores for MMA (36.92) and LIA (24.56), and also the lowest score for AAit (45.15).

These findings are in line with those proposed by Dumont and Heyen (2004), Carrejo and Marshall (2007), Nabulsi and Abdalla (2008), Kauchak & Egged (2007), and Brotosiswojo (2000), and suggest that the ability of mathematical modelling (MMA) and logical inference (LIA) can be used to solve the tasks encountered, in this case the tasks given to the participants in the training. One of the tasks, for example, was to characterise the motion of a ball that was dropped from an altitude of 20 meters. The participants tried to
describe the ball’s motion by means of a mathematical formula, and then they should be able to determine its velocity after for example 1 second of free fall.

Meltzer [2002] argues that peoples’ success in mastering learning is influenced by the abilities they acquired previously. In this case, MMA and LIA have to be considered such previous abilities. The results of the study show that the teachers have difficulties to show good performance because of their low MMA and LIA. In other words, it is hard for the participants to achieve learning success because of their low MMA and LIA.

Earlier findings indicate that both abilities can be developed through the learning of physics. According to Carrejo and Marshal [2007], the ability of mathematical modelling and logical inference can be developed through physics learning. For example, by learning about ball motion, learners can link experiences, concepts of physics and mathematical concepts. By linking them, MMA and LIA can be developed. Hartono [2006] showed that during a semester of learning about modern physics, prospective science teachers could develop a generic competence, which included the ability of mathematical modelling and logical inference.

As for the gender issue, the test results did not show any significant differences between women and men with respect to their mathematical modelling and logical inference ability. This means that men and women, who had high scores in mathematical modelling, also achieved high scores in logical inference and academic achievement. Similarly, men and women whose academic achievement scores were low did not perform well in mathematical modelling and logical inference.

Considering the close interdependence between mathematical modelling ability, logical inference ability and academic achievement, it is very important for physics teachers to improve both abilities through physics learning. For Indonesian teachers learning typically takes place in dedicated training offers. Therefore, to improve the ability of mathematical modelling and logical inference, training programmes need to be designed specifically to enhance these abilities.

5 Implications for future work

In order to get more detailed information, further research is needed with a higher number of test persons, especially with more physics teachers with educational background in physics, and participants with a higher diversity in terms of work experience and the location where they serve, so that the data can be generalized. It is also necessary to study which of the variables is the most influential one. In addition, a specific training method is needed to improve MMA and LIA of vocational school physics teachers.

References


Strengthening TVET Teachers’ Education through Teacher-Industry Linkages

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Abstract

It is widely agreed that the quality of any education system ultimately depends on the quality of interactions and relationships that occur between teachers or trainers and learners. Therefore, the quality of TVET teacher education is crucial to determine the skills of future workers. Pre-service TVET teacher preparation, continuing professional development, and TVET teachers-industries collaboration are the inter-related factors that influence the quality of TVET teacher education. Unless all related factors are considered and implemented properly, TVET teacher education institutions will fall short in generating qualified TVET teachers. Good collaboration between TVET teacher educators and industries is an important pillar to generate qualified TVET teachers. In regions where it is difficult to assure the industrial experiences for student teachers, TVET teacher educators should promote skills by building linkages with industries.

1 Introduction

The qualification of skilled workers is one of the key issues of economic competitiveness of most countries in the world. Speaking of economic transformation particularly in the global competition, each country – with respect to the purpose of achieving economy-based knowledge – is required to develop the knowledge of workers who are competent, adaptive, and innovative (Stevenson, 2003). Technical and vocational education and training (TVET) has proven to play an essential role in promoting economic growth and socio-economic development. TVET has long been considered by UNESCO as a key area in education, as it continuously faces challenges upon preparing workers with dynamic knowledge (Maclean, 2010).

There are several factors affecting the quality of vocational education, particularly in generating workers with qualified knowledge and skills. However, the reality shows that the quality of TVET teachers is the most salient factor among others (Educon 2011). TVET teachers and trainers have been known a long time as the backbone of national economic development. Therefore, the quality of TVET teacher education is crucial to determine the skills of future workers. Without adequate numbers of qualified professional teachers, a TVET system cannot offer the qualified skilled workers (Majumdar 2011).

In preparing TVET teachers, the existing systems tend to adopt almost the same approach as for other areas of teacher preparation. On the other side, TVET teachers mostly do not have an industrial background, and during their service time as teachers in TVET schools, they almost never have the opportunity to experience the world of work. To strengthen TVET teacher education means not only to improve pre-service TVET teacher education but also to empower in-service TVET teacher training through the development of teacher-industry linkages.
The need to develop teacher-industry linkages is not just a supporting factor for technical education, but it becomes an important competency and a crucial attitude of all TVET teachers. The competency and attitude must be implanted during pre-service TVET teacher preparation and continuously inserted during in-service teachers training as a basic tool for TVET teachers. Teachers as the stars of the linkage players should be rewarded continually based on their intrinsic motivation.

2 Strengthening TVET teachers through industry linkages

The TVET school with industry linkage is an essential component to ensure the effectiveness of technical education institutions with respect to their role to generate qualified workers and to promote school to work transition (Rauner 2009). The linkages between TVET schools and employers will empower TVET teacher education and training to impart practical skills and positive attitudes at work, and then, gradually, a good teachers understanding of working in industry will be generated. TVET teachers need industries as a means to get access to the latest technologies and workplace practices, as well as to the required skills level. A good relationship between TVET teachers and industry will contribute to updating the TVET curriculum and teaching methodologies. Participation of industries in TVET education through the strong collaboration will significantly improve and ensure the quality and relevance of technical education. The success or failure of a technical education or technical teacher education is highly depended on the quality of linkages. The linkages between TVET teachers and industries function as the main sources to strengthen TVET teacher education as well as TVET schools (Bukit, 2012).

One of the direct impacts of failure in industry-technical education collaboration is that both sides will suffer from many disadvantages. Technical education will fail to generate qualified skilled workers, and the industries will be forced to invest in providing in-house training for their workers, or to take the risk to hire unskilled workers who produce low quality products. At the end, the society will have to pay more for this inefficiency, to cover the costs of unproductive technical schools and to pay higher prices for goods because of inefficient workers. The situation will cause negative impacts to both the human resources development and the national economy (Lauglo and Maclean, 2005).

2.1 Why do TVET teachers need to cooperate with industry?

Most TVET teachers in less industrialized countries do not have industrial backgrounds and are without any working experience in industries. Those teachers who are familiar with the world of work, made industrial experiences and have good industrial skills usually are very enthusiastic in collaborating with industries. They know that the benefit of a good collaboration is to provide up to date learning opportunities not only for the students but also for individual teachers. Practical experience in industry allows teachers to take a closer look into the world of work and to be able to adjust learning materials better to industrial needs (ILO, 2010). This type of learning is highly relevant particularly for teachers who are required to use the competence-based approach in teaching. The efforts of strengthening TVET school collaboration are highly recommended because most teachers do not have working experiences in industries.

Industries should be seen as the source of information that is required by teachers to develop their teaching modules/units. Close collaboration between teachers and industries will give teachers the opportunity to access information on the most recent technologies used in industries and, therefore, to be able to establish a proper teaching module. The theoretical modules are developed based on modern sciences, and the hands-on modules are arranged based on skill patterns and work processes that are practiced at industries. Some modules related to working practice or work skills at industries need ‘soft skills’, for
which the source materials are entirely taken from industries. Teachers, when choosing their teaching materials, must understand the working competencies needed at industries. They need to understand why a theory should be delivered, to which modern technology it is linked, to which competency it is associated and to which skills it contributes. They also need to understand for what purpose a skill should be taught and whether it is still in practice or already outdated (Bukit, 2012).

Industries give students the opportunity to visit and to carry out internships. That way, students can observe and learn about the required working behaviour and get familiar with the working culture which only can be found in industry sites. This internship opportunity will also allow industries to choose prospective labourers even before the students have graduated. Through this internship opportunity, students will be able to differentiate which lessons are required and highly related to the world of work and which are not.

The preparation of the curriculum, which also should meet the quality standards set by the accreditation/certifying bodies, needs a good collaboration between teachers and industries. In this case, the development needs support from industrial personnel. The curriculum preparation, especially when using the DACUM process, requires immediate information and legitimacy from professional associations in the respective field of work in various industries. Professional associations, according to their field of work, are usually involved in a kind of curriculum commission to formulate the curriculum for vocational education. Therefore, the employers should understand the benefits of a good collaboration between teachers and industries. The support provided by industries can be in the form of equipments or students’ training locations.

2.2 Today’s school - industry linkage

When we discuss the importance of linkages between TVET teachers and industries, it is necessary to know how the recent industrial situation is, particularly in most developing countries. Several reports from developing countries indicated that many industries still tend to be reluctant to support technical education. Although most of industries need ready-to-work skilled workers, employers do not want to participate in fulfilling the needs of technical education.

Why are industries still reluctant to support the technical schools? The first reason is that most industries are not convinced of the capacity of technical education institutions. Second, they may not trust in TVET Schools being competent institutions to generate qualified skilled workers. The third reason is that most TVET Schools in developing countries also are unable to understand the need of industries. Most TVET teachers in less-developed countries do not know how to approach the industries (Bukit, 2012).

At Universitas Pendidikan Indonesia it is clearly stated in the curriculum that the duration of industrial practice in the four years TVET teacher preparation program is only two months (FPTK-UPI Curriculum, 2010). Almost all industrial experiences are allocated to the last semester. Most of the students who participate in the industrial practice have to find their own industry locations. Most teacher educators do not understand the supervision of student’s industrial placements as one of their inherent tasks. During regular faculty meetings, they even object to discussing the topic of industrial placements. Students themselves have to elbow their way through industrial placements. Industrial placement is still understood as an activity which has to be formally fulfilled, proven by a piece of paper. The curriculum shows that the TVET teacher education program does not provide any significant industrial experiences to future TVET teachers.

The availability of industries for industrial experiences is almost never considered in TVET schools development in many developing countries. Even during the rapid development of TVET schools in Indonesia in the last decade it became evident, that the stakeholders did not include the availability of industries for industrial experiences as a requirement for the establishment of a new TVET school (Indonesian Ministry of education,
There was a tendency that the number of TVET schools in Indonesia increased faster than the number of industries. The industries did not have enough work places to accommodate the TVET students for industrial placements. Meaning to say, policies to promote partnerships have to take into account the specifics of the national situation and the specific characteristics of the private sector in a country (Bunning 2009).

The technical education-industry collaboration should be established gradually based on experiences and cooperation obtained. The development of linkages between teachers and industries faces quite a number of challenges. Although it often is a long and cumbersome process, it is necessary to continuously develop a strong linkage between teachers and industries. The collaboration with industries should be built up through continuous personal efforts with high dedication and willingness to move forward and to overcome initial rejections from industries.

2.3 Skill to build linkages as a basic qualification for a new TVET teacher

There are some successful experiences of developing linkages between teachers or TVET schools and employers or industrial employees. Based on these experiences, particularly in developing countries, the ‘knocking doors approach’ is still recommended. Although the approach is considered inefficient, it is a good start to initiate collaboration with not yet cooperating industries in developing countries.

In most developing countries, due to lack of industrial support for pre-service TVET teacher education, it is difficult to set industrial experience as a basic qualification for TVET teachers. In less-industrialized countries, students can be trained on the knowledge and skills on how to develop industrial links during their pre-service training. After they enter the school as teachers, they will use their skills to develop the linkages. The international discussion provides the reflection that in regions where there is a difficulty to get industrial experiences, “the skill to build schools linkages with industries” should be defined as a basic qualification needed for a new TVET teacher. TVET teacher institutions should promote skills in building schools linkages with industries as one of the basic competencies in pre-service TVET teacher training (Bukit, 2012).

2.4 How to motivate TVET teachers to build linkages with industries

The schools-industries cooperation should be built up and continuously developed. In building up the linkages, TVET teachers need skills, courage and patience. TVET schools should ensure the teachers’ motivation in developing and assuring a high quality of linkages. TVET teachers training institutions could develop the skills and knowledge to build the teacher industries linkages during TVET teacher preparation. TVET schools should maintain and improve the TVET teacher’s linkage skills after new teachers have entered the world of teaching.

With regard to skills for developing the linkages, TVET teachers should be aware that school operation is different compared to the business world. One approach to develop the linkages is to create a better understanding with employers on the needs of TVET schools. It is suggested that the teachers or TVET teacher educators could invite employers into classrooms to spend a day or two to observe what teachers are dealing with. It is believed that after knowing the schools’ needs, the employer can encourage other employers to support the schools. Moreover, they may also be offered a seat in the school advisory board. Although the TVET teachers-industries linkage is a two-ways approach, teachers should take the initiative before others. Then the institutions should do their parts in a more formal way.

There is a clear distinction between well-trained TVET teachers and well-motivated teachers. Experiences showed that not all qualified teachers are well-motivated teachers. Schools should encourage teachers to build linkages with industry and to strengthen their
skills continually. To maintain the quality of school-industry linkages, teachers should be rewarded for their success in building the linkages (Bukit, 2012).

What is the teachers’ motivation to build linkages with industries, and what role can the training centre play to ensure their positive motivation? Regarding the motivation of teachers, most qualified teachers remain teacher throughout their life. Their trainees or students sometimes end up getting better income than the teachers themselves. School management should develop the intrinsic motivation of teachers who are successful in developing linkages with industry, and motivated teachers should be backed up and supported by an advisory committee. That means that recognizing teachers’ working conditions physically, socially, and psychologically functions as a way to exceed minimum standards of quality.

The institutions have to put the school-industry linkages as the backbone of success. Without the linkages, any TVET institution will fall short in generating qualified workers. Teachers should be encouraged to build a good cooperation with industries. The task to develop linkages between TVET teacher education and industries should be treated as equal as other lecturer’s or teacher’s tasks. The successful teachers or lecturers should be rewarded by the system. But the most important motivation is the involvement of teachers in developing the linkages. It means that to motivate the TVET teachers to develop the linkages between teachers and industries, the school management should develop the intrinsic motivation followed by the extrinsic one.

3 Conclusions

TVET teacher institution should avoid using the same approach for pre-service TVET teacher preparation as for other areas of teacher preparation. A clear distinction should be made for TVET teacher preparation as compared to general secondary school teacher preparation. The subjects and pedagogy for TVET teachers should be derived from the reality of the industry’s world. Compared to secondary schools, TVET teacher preparation should clearly accommodate a different pedagogy on the basis of the unique features of technical education.

The pre-service preparation is a crucial stage in TVET teacher education. As the pre-service TVET teacher preparation is the initial point to embark on a long road of teacher improvement, it is necessary to pay attention and to identify the pitfalls along the road. There are several pitfalls in TVET teacher preparation; they are: TVET teachers’ and teacher educators’ unclear pedagogic orientation, lack of industrial experiences and poor relationship with industries. The skill to develop industries-schools linkages should be recognized as a basic qualification of pre-service TVET teacher education. TVET teachers should be encouraged to develop the linkages with industries. TVET schools should develop the intrinsic motivation followed by the extrinsic reward for the success of TVET teachers or educators in developing the linkages.

TVET teachers should use all possibilities to improve the quality of the skilled workers. The linkages between TVET teachers and industry allow teachers to take a closer look into the world of work and to be able to adjust learning materials closer to industrial developments. Strong linkages of TVET teachers and TVET teacher educators with industries are very crucial for strengthening TVET teachers, particularly in less industrialized countries. TVET teachers and TVET teacher educators from developing country like Indonesia, should use strong linkages with industries as the gate to chase the rapid technological development from the developed countries. Through strong TVET teachers-industries linkages, teachers from developing countries should be encouraged to improve their skilled workers to enable them to compete with the skill workers from the developed countries.
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Mapping National and Regional TVET Initiatives in Southeast Asia and Beyond in Response to Students and Labour Mobility

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Abstract

Most countries in Southeast Asia are positioning Technical and Vocational Education and Training (TVET) in the mainstream of education systems and putting it as a priority in their education agenda considering that this type of education plays important roles in socio-economic development of the nation. New national and regional initiatives in TVET have been created in response to various changes in social, political, and technological landscapes. This paper intends to map out salient TVET initiatives especially those that have potential to offer greater impact not only on the individual country but also on the whole region or beyond. Some of the selected initiatives include addressing TVET quality and qualification frameworks. At the national level, all countries are raising their bar to benchmark their TVET quality. Quality assurance mechanisms through proper guidelines and accreditation have been established in most countries. Many countries in the region also newly adopted National Qualification Frameworks in response to student and labour mobility and also to encourage the implementation of life-long learning and an Education For All (EFA) agenda. At regional and global levels, the issue of student and labour mobility are also very prevalent especially in anticipation of the full ASEAN Integration in 2015. In response, there have been progresses toward mutual recognition arrangements for education and training certificates and credentials between countries, regional qualification frameworks, and regional quality assurance frameworks. These are some of the significant TVET initiatives that have been discussed at various regional meetings such as those organized by the Association of Southeast Asian Nations (ASEAN), ASEAN+3, ASEAN+6, the Southeast Asian Ministers of Education Organisation (SEAMEO), International Labour Organisation (ILO), United Nations Educational, Scientific, and Cultural Organisation (UNESCO), Colombo Plan Staff College (CPSC), Regional Cooperation Platform (RCP), East Asia Summit, Asia-Pacific Economic Cooperation (APEC), and Asia Europe Meeting (ASEM). This map of TVET initiatives will provide a picture of what has been addressed nationally, regionally, and internationally that can be used as a reference and at the same time also stimulate ideas and collaboration for improving TVET policies and practices.

1 Introduction

Technical and vocational education and training (TVET) plays a very important role in preparing current and future labour forces that could drive economic and social development. It becomes imperative that the development and expansion of technical and vocational education as continuing education, both within and outside the formal education system, with either public or private funding, and within the
framework of lifelong learning, should be a priority objective of all educational strategies.

TVET plays important roles in (1) providing the skill sets that are needed by enterprises and across national economies; (2) supporting pathways into employment for young people; (3) strengthening mobility between occupations for experienced workers; and (4) support the development of new skills and assist workers to more readily change or progress occupations/careers. In addition, TVET should be able to adjust the capacity more quickly as the pace of change of industry products and processes increases. (Bateman et al., 2012)

Many countries in the Southeast Asian region are prioritising TVET in the national agenda as it is believed to be the prime mover of socio-economic development. Policies and initiatives are formulated. Resources are allocated to upgrade the TVET facilities and ensure its continued operation within the whole educational system. Similarly, many multi-national organizations such as UNESCO, ILO, ASEAN, SEAMEO place TVET as their important agenda.

However, implementing TVET poses a great challenge to many countries. Issues and concerns have hampered the implementation of policies including the issue of financing of TVET, relevance of the curriculum to industry needs, horizontal and vertical articulation within TVET qualifications and to higher education qualifications, quality assurance in TVET provision, and teacher’s competence (Omar & Paryono, 2008). In meeting these challenges, some selected Southeast Asian and other countries have developed innovative policies and practices that would solve the most prevailing issues within their TVET system. Likewise, many multi-national organizations are also addressing the issues.

The ASEAN community will be fully integrated in 2015. This means that the flow of goods, students and workers across regions will be greater. To facilitate this integration, many multi-national organisations have started with initiatives to accommodate student and labour mobility, such as the development of mutual recognition of certificates, qualification frameworks, etc. This paper will discuss both national and regional initiatives relevant to TVET that facilitate ASEAN integration.

2 National initiatives in TVET

There are numerous TVET initiatives taken in the ASEAN member countries that facilitate ASEAN integration. The most salient initiative is the creation of National Qualification Frameworks which can be used as a means of promoting the development, implementing and facilitating transparent mechanism for the assessment, certification, and recognition of skills. A comprehensive NQF has a potential to recognize any learning regardless of the site (where the learning takes place), the form of provision (formal, informal, and non-formal), and the type of pedagogy and curriculum used. “It is argued that NQFs are necessary to overcome the barriers between different national subsystems of education and training, notably between vocational education and training and higher education and between initial and continuing education and training.” (Bjøråvold & Coles, 2008, p. 204). Further they argue that all NQFs aim to establish a basis for improving the links between qualifications and the quality, accessibility, and public or labour market recognition of qualifications within a country and internationally. A comprehensive and outcomes-led NQF requires intensive preparations and strong commitments.
Table 1: Comparing NQFs in selected ASEAN member countries

<table>
<thead>
<tr>
<th>Level</th>
<th>Credential/Prereq</th>
<th>Level</th>
<th>Level</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Specialist/Doctor</td>
<td>8</td>
<td>Doctoral degree</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>Master</td>
<td>7</td>
<td>Master/Postgraduate Certificate &amp; Diploma</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Professional</td>
<td>6</td>
<td>Baccalaureate/Diploma</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Baccalaureate/Diploma</td>
<td>5</td>
<td>Advanced Diploma</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>DIII</td>
<td>4</td>
<td>Diploma</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>DII</td>
<td>3</td>
<td>Skills Certificate 3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>DI</td>
<td>2</td>
<td>Skills Certificate 2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>HS</td>
<td>1</td>
<td>Skills Certificate 1</td>
<td>1</td>
</tr>
</tbody>
</table>

From Table 1, we can see much similarity among the three NQFs. The noticeable differences are that Indonesia has 9 levels while the other two have eight and different terms and qualifications are used for diploma and certificate levels.

Some countries have “partial” NQFs whereby not all education and training qualifications are included in the framework. Some put emphasis on higher education while others emphasize more on TVET. Thailand, for example, has a National Qualification Framework for Higher Education. It has 6 levels: Level 1 (Associate Degree), Level 2 (Bachelor), Level 3 (Graduate Diploma), Level 4 (Master), Level 5 (Higher Graduate Diploma), Level 6 (Doctorate). In addition, the Office for Vocational Education Commission (OVEC) of Thailand also developed a qualification framework consisting of 7 levels: Level 1 (semi skilled), Level 2 (Craftsman/skilled), Level 3 (highly skilled), Level 4 (technician), Level 5 (senior technician), Level 6 (specialist), Level 7 (senior specialist). There are some developments of combining the two to create a “comprehensive” NQF.

The Singapore Workforce Development Agency (SWDA) developed the Singapore Workforce Skills Qualification which is more associated with a TVET Qualification Framework. It consists of 8 levels: Level 1 (pre-beginning), Level 2 (beginning/certificate), Level 3 (high beginning/higher certificate), Level 4 (low intermediate/advanced certificate), Level 5 (high intermediate/diploma), Level 6 (advanced/specialist diploma), Level 7 (high advanced/graduate certificate), and Level 8 (proficient/graduate diploma). The higher education qualifications have yet to be integrated in the framework.

Other countries like Brunei Darussalam, Lao PDR, and Vietnam are still in the process of developing their NQFs. This different status of NQF development among ASEAN member countries at a certain degree affects the progress of the Regional Qualification Framework, even though it is not the pre-requisite.

3 Regional Initiatives in TVET for ASEAN Integration

3.1 East-Asia Summit on TVET Quality Assurance Framework (EAS TVET QAF)

In response to growing mobility of students and workers, countries have been venturing into improving the connectivity of their TVET systems in order to support regional economic integration through cross-border investment and the mobility of skilled labour. Currently, these processes have reached towards mechanisms for improving cross-national
connectivity, especially in the area of occupational standards and qualifications (Bateman et al., 2012).

In TVET, the globalisation of economies and the international flow of students and workers require more attention on enhancing the effectiveness of qualifications and skills recognition across economic regions by improving connectivity of TVET policies and practices among member countries. “A key strategy for improving connectivity is through developing a common understanding on effective approaches to key elements of the education system so as to eliminate unnecessary barriers to recognition and mobility and provide a basis to the alignment of systems.” (Bateman et al., 2012). The development of Regional TVET Quality Assurance and Qualification Frameworks serves the purpose for building connectivity among various education and training modalities across the region.

EAS has a commitment to strengthen, expand and advance regional TVET cooperation between the EAS participating countries and reiterated the pivotal role of TVET, not only in promoting human resources development, but also as a means for bridging development gaps, enhancing regional competitiveness, achieving sustained economic development, and promoting friendship and mutual understanding among people in the region. One of the EAS initiatives is on the TVET QAF meant for providing a set of principles, standards and quality indicators to assist EAS countries to develop, improve, reform, guide and assess the quality of their TVET systems, as well as to provide a basis for alignment between national TVET systems (ASEAN, 2012).

The objectives of the EAS TVET QAF are to (1) enable countries to promote and monitor the improvement of their quality assurance systems; (2) facilitate cooperation and mutual understanding between member countries; and (3) support other initiatives within and across the region that enhance connectivity, integration, education and labour mobility, e.g. the ASEAN Regional Qualifications Framework. This is a coherent package capable of guiding the design and implementation of measures to strengthen quality assurance at the country level as well as providing a basis for alignment between national TVET quality assurance strategies (ASEAN, 2012).

Currently, the EAS TVET QAF has been discussed in various regional meetings and will be presented in the Seventh ASEAN Senior Officials Meeting on Education (7th SOM-ED) in Bangkok on 29 November 2012. There is a need for subsequent dialogues to finalise the EAS TVET Quality Assurance Framework, capacity building programmes in individual countries, and the ongoing management of the framework and related referencing activities.

### 3.2 Regional Qualification Framework

There are several attempts from various organisations to develop an ASEAN Regional Qualification Framework in Southeast Asia. Many views believe that having an RQF will provide a reference point and translation grid for all qualifications throughout Southeast Asia that will benefit employers, education providers and job seekers in terms of recognizing qualifications issued within the region. Others are of the view that the RQF will only work when all member countries recognize the benefits of having it and whole-heartedly support the initiation and the implementation of it.

The Association of Southeast Asian Nations (ASEAN) Secretariat, the International Labour Organisation (ILO) Bangkok, UNESCO Bangkok, and SEAMEO have been actively involved in the discussions and development of documents that support the implementation of RQF. Pilot testing of certain areas of qualifications, such as in hospitality and tourism in some countries has been initiated. Bilateral efforts have also been pursued to recognize each other’s qualification for credit transfer and for employment.
Table 2: Major Development towards ASEAN RQF

<table>
<thead>
<tr>
<th>Date</th>
<th>Major Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>ASEAN Labour Ministries started a project on Enhancing Skills Recognition System in ASEAN</td>
</tr>
<tr>
<td>2001</td>
<td>UNESCO Bangkok discussed Regional Qualification Framework</td>
</tr>
<tr>
<td>Oct 2003</td>
<td>It was agreed that Mutual Recognition Arrangements should be developed by 2008 for Accountants, Architects, Surveyors, and Engineers. Up to this time was only one: Architecture mutually recognize in Malaysia and Philippines.</td>
</tr>
<tr>
<td>2004-2007</td>
<td>ASEAN Project on Regional Skills Recognition Arrangements</td>
</tr>
<tr>
<td>Sep 2004</td>
<td>ASEAN Engineering MRA was completed</td>
</tr>
<tr>
<td>2005</td>
<td>MRA on Engineering Services implemented</td>
</tr>
</tbody>
</table>
| 2006       | • SEAMEO VOCTECH's Project on Enhancing SRA in CLMV countries was completed.  
             | • ILO Bangkok published Guidelines for Development of Regional Model Competency Standards (RMCS) that addresses skills standards not qualification to recognize not only skills acquired from formal but also from non and informal training.  
             | • ILO Bangkok published Regional Model Competency Standard: Tourism Industry  
             | • ASEAN MRA on Architectural Services, Surveying Qualifications, and Nursing Services implemented                                                                                                               |
| 2007       | UNESCO Bangkok sees the need for the development of Regional Skills Recognition and to establish and harmonize Regional Qualification Framework  
             | CLMV + Thailand created sub-Regional SRA  
             | ILO discussed and completed a report on Skills Recognition for Migrant Workers  
             | ILO published Regional Model Competency Standard: Manufacturing Industry                                                                                                                                          |
| Jun 2008   | East Asian Summit: Harnessing Educational Cooperation in the EAS for Regional Competitiveness and Community Building (ASEAN Secretariat). One of the focus is to follow up Regional Skills Recognition Arrangement |
| Nov 2008   | Corporate HRD and Skills Development for Employment: Scope and Strategies (InWent, UNESCO-UNEVOC, SEAMEO VOCTECH). One of the agenda was to discuss the Master Plan/Roadmap of Regional Qualification Framework and Skills Recognition  
             | ASEAN MRA on Medical and Dental Practitioners, and Accounting Services implemented.                                                                                                                                |
| 2009       | ILO Published a book on Making Full Use of Competency Standards: A handbook for governments, employers, workers and training organizations  
| May 2011   | ASEM, Budapest  
             | ASEAN Regional Qualifications Framework: Workshop 5: External dimensions of the European Qualifications Framework and potential of policy co-operation with other regions                                                   |
| Feb 2012   | Asia-Europe Meeting (ASEM) on TVET, Putting Frameworks into Practice: Demand, Development and Decision, Berlin, Germany                                                                                             |
| 30 Oct-1 Nov 2012 | ASEAN Australia New Zealand Free Trade Area meeting on the National Qualifications Framework , Bangkok, Thailand                                                                                                    |

An outline of ASEAN RQF in TVET agreed by 5 SEA countries (Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam) (Dang, 2011) can be seen in Table 3.
Table 3: Initial Development of ASEAN RQF in TVET

<table>
<thead>
<tr>
<th>Job level</th>
<th>Certificate</th>
<th>Descriptors (Generic Competencies for each level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Semi-skilled worker/assistant/helper</td>
<td>Certificate 1</td>
<td>Understand safety requirements, has basic practical skills and operational knowledge at a defined range of tasks, can carry out routine tasks given clear direction, takes limited responsibility.</td>
</tr>
<tr>
<td>2. Skilled worker</td>
<td>Certificate 2</td>
<td>... Can carry out skilled tasks, takes limited responsibility for output of self.</td>
</tr>
<tr>
<td>3. Advanced skilled worker</td>
<td>Certificate 3</td>
<td>Has some theoretical knowledge, has a range of well developed skills, can apply solutions to routine problems, can interpret available information ...</td>
</tr>
<tr>
<td>4. Supervisor/Foreperson</td>
<td>Certificate 4</td>
<td>Has a broad knowledge base, can apply some theoretical concepts, can identify and apply skills and knowledge, can identify, analyse and evaluate information, understand and take responsibility for quality, safety &amp; environmental issues.</td>
</tr>
<tr>
<td>5. Manager</td>
<td>Diploma</td>
<td>Assistant Professional</td>
</tr>
<tr>
<td>6. Senior manager</td>
<td>Advanced Diploma</td>
<td>Associate Professional</td>
</tr>
<tr>
<td>7. Professional</td>
<td>Degree</td>
<td>Professional</td>
</tr>
</tbody>
</table>

Based on the current status, in the development of a comprehensive ASEAN RQF there is still a long way to go. To move forward, there is a need to identify major obstacles including reaching mutual understanding between the “sending” and the “receiving” countries and identifying key players to be in the taskforce. It requires strong and long-lasting commitment from the participating countries and entails strong collaborations within and across Ministries, and other stakeholders in the participating countries (Paryono, 2010). Nevertheless, there have been significant steps towards an ASEAN RQF that will facilitate student and labour mobility in the region.

4 Concluding Remarks

The importance of TVET has been highlighted in both national and regional education and development agendas. Three TVET salient initiatives in response to student and labour mobility in the Southeast Asian region and beyond have been mapped out in this paper: the development of National Qualification Frameworks (NQFs), Regional Quality Assurance Framework (RQAF), and Regional Qualification Framework (RQF). These are some among many initiatives in anticipation of full ASEAN integration in 2015.

The state of NQF development varies among ASEAN member countries. Examining from the current trend, however, it seems that all member countries are moving towards the development and implementation of comprehensive NQFs which integrate all levels and types of education and training schemes. A comprehensive and outcomes-led NQF requires intensive preparations and strong commitments. Even in countries that have successfully developed the framework, it doesn’t always translate into successful implementation. Communication among various Ministries, education and training providers, and industries are required for successful implementation.

All countries have their own way of assuring their TVET quality. The development of a Regional TVET Quality Assurance Framework will facilitate in promoting continuous improvement of TVET within the country and enhancing cooperation and mutual understanding between member countries. This eventually will improve connectivity, integration, education and labour mobility. Once the framework is successfully developed,
this can be a useful tool for self assessment or for accreditation. This will be up to the participating countries to utilize the framework that best fits their needs. To support this initiative, it is very important to establish a smaller TVET quality assurance, such as focusing on teacher quality standards. This can be a useful reference for all teachers to benchmark their competencies against the standards that will help them become aware of their current status and have ideas for continuously improving their skills to the next levels.

The most challenging initiative is the development of a Regional Qualification Framework. It is challenging to develop a comprehensive NQF, let alone the development of RQF. The initiation requires strong commitment from various bodies/organizations from various countries. Learning from other RQFs such as the European Qualification Framework and the Australia-New Zealand Qualification Framework, however, it is anticipated that ASEAN RQF will help learners and workers wishing to move between countries or change jobs or move between educational institutions at home easier and more efficient. Finally, this framework will hopefully contribute to the improvement of regional competitiveness.

References


Integration of Social Skills and Social Values in the National Dual Training System (NDTS) in Malaysia: Employers’ Perspective

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Abstract

The issue of employability of graduates has made social skills, also known as the soft skills an important goal for all education institutions and local skills training institutes in Malaysia. Apart from academic performance and skills in specific core skills, social skills play an important role as elements of recruitment by employers. Department of Skill Development (DSD), Ministry of Human Resources, has applied elements of social skills in the NDTS curriculum development. Therefore, this study aims to review employers’ perception on social skills and social values among National Dual Training System (NDTS) apprentices. The study used a quantitative approach and the data were obtained from respondent groups that include managers, supervisors or persons who involve in recruitment in their organization. The study concludes that social skills are as important as technical skills in automotive industry in Malaysia and suggests that both training institutes and workplace (during training) should play a role in equipping apprentices with required social skills. Further, the study found that teamwork and personal qualities were the most importance social skills needed by labor market and current NDTS apprentices almost fulfil the expectation.

1 Introduction

The need for skilled human resource in the new era of a knowledge-based-economy (k-economy) is crucial for Malaysia to become a developed nation. As Malaysia’s vision to become a developed country by the year 2020, it has been identified that human capital is the most critical element required to realize this aspiration and the most important investment to make. Rapid changes in technology and increasing complexity of work processes in Malaysian industries have created new demands on the skilled workforce, namely for knowledge-workers (k-workers) as stipulated in Malaysia Knowledge-Based Economy Master Plan (Malaysia, 2002). The development of human capital in Malaysia requires the collaboration of multiple ministries and private sector to address all population segments. The Technical Education and Vocational Training (TEVT) in Malaysia has been emphasized in the Ninth and Tenth Malaysia Plans to produce more skilled workers to be as competitive as developed countries such as South Korea, United Kingdom, United States and others. In the integrated human capital and talent development framework, one of the education themes is mainstreaming and broadening TEVT.

Technical Education and Vocational Training (TVET) is the most complex subsector of education, covering a wide range of ages and profiles. TEVT has become a mainstream education in many developed countries, but not in Malaysia today. Therefore, in Tenth Malaysian Plan (2011-2015), mainstreaming and broadening access to quality technical
education and vocational training is one of the agenda in raising the skills of Malaysians to increase employability. The purpose of TEVT is to increase the skilled human capital base in Malaysia by providing quality education to learners who possess keen interest, ability and talent in the technical and vocational fields. TEVT aims to provide skills that will immediately applicable in the labor market. In the Tenth Malaysian Plan, the following four strategies will be adopted to mainstreaming and broaden access to quality TEVT: (a) improving perception of TEVT and attract more trainees; (b) developing highly effective instructors; (c) upgrading and harmonizing TEVT curriculum quality in line with industry requirements; and (d) streamlining the delivery of TEVT.

The government has taken the important step when it decided to implement the National Dual Training System (NDTS) in 2005. Based on German’s Dual System model, the NDTS is to produce knowledge workers (k-workers) under a comprehensive training system, to meet the prevailing and future requirements that include all job levels for every economic sector. A knowledge worker is someone who should have at least one technical competency (e.g., automotive mechatronic or tool making or steel fabrication), several social skills (e.g., communication skills, teamwork and self-discipline), competent in some learning methodologies (e.g. ICT skills, information searching skills, and consultation with experts) and several social values (e.g., diligence, meticulous and patience) (Ministry of Human Resource issues, 2008). The most distinguishing feature of the NDTS compared to other skills training programs is the requirement for coaches and trainers to integrate human and social skills as well as learning and methodological skills explicitly in the curriculum. The integration of social skills and social values in NDTS curriculum is a new value-added component, which is required by workers in the present competitive world. Social skills are skills that people use to interact and communicate with others to assist in the development status of a social structure. Social skills associated with communication, problem solving, decision-making, self-discipline and interpersonal skills that enable a person to start and sustain positive social relationships (Ministry of Human Resource, 2008). Social values are individual belief systems related to prescription trends and the flow of the desired behavior or orientation (Rokeach, 1972).

However, in general, employers, especially those who employed vocational graduates were not happy with graduates’ personal quality or employability traits (Bakar & Hanafi, 2007). Research have also shown that employers indicated that Malaysian graduates, especially the vocational and technical graduates are well trained in their area of specialization but lacked of the soft-skills needed by the industries (Mustapha, 1999; 2002). Therefore, the new form of VET approach which focusing more on industrial participation in apprentice training will not only cope with the increasing complexity and rapid technology changes, but also emphasize the social skills needed to be a part of the training. Thus, the NDTS curriculum has placed social skills in its training system.

2 Conceptual Framework

To further elaborate the need of social skills and social values in the workplace, the researchers adopted the Secretary’s Commission on Achieving Necessary Skills (SCANS) as a framework in this study. The SCANS was appointed by the Secretary of Labor of USA to determine the skills of their young people needed to succeed in the world of work. The Commission’s fundamental purpose was to encourage a high-performance economy characterized by high-skilled and high-wage employment. The know-how identified by SCANS is made up of five competencies and a three-part foundation of skills and personal qualities that are needed for solid job performance. These include:
COMPETENCIES - effective workers can productively use:

- Resources - allocating time, money, materials, space, and staff;
- Interpersonal Skills - working on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds;
- Information - acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information;
- Systems - understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems;
- Technology - selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies.

THE FOUNDATION - competence requires:

- Basic Skills - reading, writing, arithmetic and mathematics, speaking, and listening;
- Thinking Skills - thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning;
- Personal Qualities - individual responsibility, self-esteem, sociability, self-management, and integrity.

The SCANS model identifies five competencies in conjunction with a three-part foundation of skills and personal qualities, which is the important part of job performance today. The SCANS report gave insight into the skills needed of employees in the workforce. Social skills or generic skills are known by different terms in different countries: in the UK as “core skills”, “key skills”, “common skills”; in New Zealand as “key competencies” or “essential skills”; in Australia as “key competencies”, “employability skills”, “generic skills”; in the USA as “basic skills”, “necessary skills”, “employability skills” in France as “transferable skills”; in Germany as “key qualifications” (see NCVER, 2003; ACER, 2008). For this study, the researchers use “social skills” as the term has been used in the National Dual Training System (NDTS) Curriculum since 2005 in Malaysia. For the purpose of this study, graduates of the National Dual Training System (NDTS) program were assessed according to what their employer’s believe what was important and what they were able to contribute, in the way of social skills, to the workplace.

Public technical and vocational education and training (TVET) in Malaysia has traditionally been undertaken by a number of public agencies. Ideally, it should be harmonized and standardized under one agency, namely the Department of Skills Development (DSD). TVET curriculum must meet the minimum standards required and contains a proportion of general skills dealing with literacy, numeracy and languages. Vocational skills are also critical in building an individual’s skills set and capacity to adapt to changing circumstances in the workplace. Further, to enhance standardization and recognition of TEVT certification, the Malaysian Skills Certificate or famously known as Sijil Kemahiran Malaysia (SKM) is adopted as the national certification for TEVT. The Malaysian Skills Certificate could be obtained through three (3) ways: (a) through a recognized training Institutions, (b) through training programs at accredited centers in the fields that are endorsed by DSD, and (c) through the industry-oriented training method in the National Dual Training System which is carried out by training institutes and industry.

The National Dual Training System (NDTS) is the government effort to produce skilled workers where training institutes and private industries participate together in training of apprentices. The NDTS follows an approach that has proven to be effective in Germany and several developed countries. This training strategy allows a constant supply of skilled workforce to meet the demands of manufacturing and service sectors. Due to the effectiveness of this system in contributing towards the development of the country such as in Germany, Austria and Switzerland, other countries such as Thailand, Philippines and
some Latin American countries adopted this training method to strengthen their training delivery system (Raja Zaharaton, 2003).

NDTS is a new outlook in the skills training scenario in this country since 2005. “Dual” in the NDTS means training is conducted in two learning situations: actual workplace and training institute. Practical training is conducted at the workplace, which makes up 70-80 percent of the complete training period, while 20-30 percent of the training, which consists of basic skills and theory, are offered at the training centre. The delivery method of NDTS is divided by two systems: day-release system (1-2 days a week of theory and basic skills at the training centre and 4-5 days a week of practical training at the company) and block-release system (1-2 months of theory and basic skills at the training centre and 4-5 months of practical training at the company).

In the Tenth Malaysia Plan (2011-2015), RM150 million will be set aside to train 20,000 school dropouts under the NDTS. The NDTS aims to expand the current curricula and provide specialized training to coaches to cater for the needs of the schools’ dropouts. The NDTS emphasizes the direct involvement of industry in training, and workplace training strongly encouraged as part of TEVT curriculum, since it provides strong learning environment. Workplaces provide a strong learning environment because they offer on-the-job experience. This makes it easier to acquire both hard and soft skills resulting in improved employability. The employers also learn about the performance of trainees and apprentices as potential recruits and are thus in a better position to make decisions on recruitment.

Thus, it can be seen that the NDTS’ main focus is to produce k-workers who are competent in one or two technical area(s) (e.g. auto mechatronics or tool making), in human and social competence (social skills and social values) as well as in learning methodology (learning how to learn). The role of vocational education and training in the transitional economies has been debated and it is important to understand how the TEVT provides an impact to economies, especially labor markets. Asian Development Bank (ADB) (2009) reported that curriculum reform is one of the challenges for TEVT. The transformation created a need for curriculum modernization that included a broadening of content of TVET programs for youth by: (a) enlarging the types of technical skills that the trainees should develop in order to prepare for a larger spectrum of occupations, (b) giving importance to transferable skills that can be applied in different situations, and (c) developing core skills and competences to respond to the requirements of the changing workplace and increasingly flexible (or uncertain) labor markets, such as entrepreneurial skills that enable young people to deal with uncertainty and manage their careers and learning-to-learn competences that set the ground for lifelong learning.

The NDTS program uses the NDTS Curriculum (formerly known as National Occupational Core Curriculum), developed by experts in a particular training occupation. This curriculum is developed based on industry need analysis with due attention given to government policies in national development programs, the Industrial Master Plan and the needs and analysis of present and future labour markets. The NDTS curriculum consists of Training Occupation, Occupational Profile, Occupational Core Work Processes, Core Competencies, Training Content Outline, and Learn and Work Assignment (LWA). Each LWA is designed based on each core work process and consists of activities carried out by a skilled worker in performing an assignment in meeting the learning objectives. It is in the LWAs, social skills and social values are planned, integrated and taught (either directly or indirectly) or inculcated through technical assignments to fulfil each core work process (Rahim et. al, 2008). The teaching of social skills and social values (non-cognitive skills), either through an explicit curriculum or through integration in technical assignments and laboratory work, would allow apprentices to conform to the performance norms and expectations of a profession (Rahim & Khadijah, 2009).
3 Problem Statement

Most employers look for future workers who possess technical skills to meet the specific position offered. However, apart from technical skills, social or generic skills are also an important factor in recruitment. The question of how to develop human capabilities to meet current demands and future needs of organizations has become an important issue at national, organizational and individual levels. Mustapha and Greenan (2002) reported that educators and employers indicated that vocational graduates possessed adequate technical skills. However, both groups were less satisfied regarding the motivation, communication, interpersonal, critical thinking, problem solving, and entrepreneurial skills of the vocational graduates. TEVT has become a mainstream education option in many developed countries. Many high-income countries adopt a dual-pathway model of education that allows significant flexibility and mobility between the academic and technical or vocational streams, with equivalent career prospect. Accordingly, the Malaysian government has introduced a new training system which influenced by the dual training system in Germany to form a new training initiative in Malaysia, which has the advantage to overcome the mismatch between the ability of graduates and the needs of the industry.

The National Dual Training System (NDTS), which was launched by the Ministry of Human Resources in 2005, is expected to provide the trainees to face "the real world" to involve them directly in the training competencies required by industry. The most distinguishing feature of NDTS compared to other skill training programs is the requirement for coaches and trainers to infuse or integrate social skills and social values explicitly in the conduct of teaching or facilitating of a technical content (Rahim et al., 2008). The NDTS program uses NDTS curriculum that was developed by the Department of Skills Development (DSD) together with experts from industry and training instructors from accredited centers for specific training occupations/job titles. The NDTS curriculum consists of two sections as reference at company and training institute, and the contents are Training Occupation (TO), Occupational Profile, Occupational Core Work Process (OCWP), Core Competencies, Training Content Outline, and Learn and Work Assignment (LWA). It is in LWA, social skills and social values are planned, integrated and taught either directly or indirectly through technical assignments to fulfill each core work process.

Training of Trainers (ToT) program in NDTS was designed for trainers of vocational institutes and coaches of industries to equip them with core social skills and social values so that they can integrate them in their teaching. Nevertheless, the question whether the integration of social skills and social values in NDTS curriculum can be considered successful, remains unanswered. Thus, this study was designed to explore employers’ perspective regarding the effectiveness of social skills and social values integration in NDTS curriculum based on their observation and experience while working together with their NDTS graduated employees.

4 Purpose of the Study

The purpose of this study was to determine employers’ perception on social skills and social values among National Dual Training System (NDTS) graduates. In this study, the employers in automotive sector were those who employed workers who have obtained their Malaysian Skills Certificate (SKM) through NDTS program. This study also analyzed the employers’ perception of the NDTS graduates’ level of competence at performing the social skills. The findings are expected to be used in improving NDTS curriculum in terms of content or execution. In details, the objectives of this study are:

a) To identify employers’ perception on the importance of social skills and social values compared to technical competency for automotive related industry.
b) To identify employers’ perception on the most and least important of the social skills identified in the common social skills framework needed by an automotive industry in Malaysia.

c) To assess employers’ perception on the social skills and social values possessed by their employees who have Malaysian Skill Certificate through NDTS.

d) To determine employers’ perception on the role of dual system training organization (institutes and workplace) in preparing apprentices with social skills and social values.

Based on the objectives of the study, the research questions were formulated as follows:

1. How do employers perceive the importance of social skills and social values compared to technical competency for the automotive industry in Malaysia?

2. Which of the social skills identified in the common social skills framework do employers perceive as the most and least important for the automotive industry in Malaysia?

3. How do employers of automotive industry assess social skills and social values possessed by the NDTS apprentices?

4. How do employers perceive the role of dual system training organization (institutes and workplace) in preparing the NDTS apprentices with social skills and social values?

5 Research Design

The cross-sectional survey method was used in collecting data and the questionnaire was developed based on the theoretical framework. The data were collected from the respondents that include managers, supervisors or persons who involved in supervising the apprentices. Data were collected from end of March 2011 until mid-July 2011. A list of companies involved in the implementation of National Dual Training System (NDTS) was obtained from the Department of Skills Development (DSD), Ministry of Human Resources. The researchers had contacted eighty (80) automotive companies but only twenty (20) automotive companies were willing to participate in the study. Therefore, this study used purposive sampling.

A survey instrument was designed to gather primary data from the employers about their perceptions on the effectiveness of social skills and social values integration in the NDTS curriculum. The researchers developed questions based on theoretical framework to address the research questions identified for the study. An introductory section was added to the questionnaire that describes the purpose and the focus of the survey. The questionnaire was designed using a combination of quantitative and qualitative questions and comprised five distinct sections.

The First Section, “Section A: Social Competencies”, includes a set of twenty-six social skills grouped under seven clusters. Each social skill was defined based on SCANS workplace know-how items. Further, the researchers modified and elaborated the social skills items based on the list of social skills identified by the Department of Skills Development (DSD). The respondents were asked to rate each social skill according to two criteria: (1) how important they think the corresponding social skills to the NDTS apprentices; (2) how satisfied they are with the level of social competence among the NDTS apprentices. The respondents were asked to rate the importance of the skills on a four-point Likert-type rating scale. The rating scale is: Major Importance [3], Moderate Importance [2], Minor Importance [1], and No importance [0].

The second section, “Section B: Technical Competencies” includes a set of fourteen technical skills grouped under four clusters. The respondents were also asked to rate each skill according to two criteria: (1) how important they think the corresponding technical skills
to the NDTS apprentices; and (2) how satisfied they are with the level of technical competence among their NDTS apprentices. The same scale as in the Section A was used. The third section consists of eight main questions, asking the targeted respondents to indicate their perception regarding the role of National Dual Training System program in equipping the apprentices with social and technical skills. A four-point Likert-type scale was also used. The rating scale is: Strongly Agree [3], Agree [2], Disagree [1], and Strongly Disagree [0].

The respondents are also asked if they familiar with the NDTS program and if not, whether they have an intention to run the NDTS scheme in future. The fourth section was designed to obtain specific information about the training or skills development programs that have been conducted in the respondent’s organization. These includes how often training was given to the NDTS apprentices, and types of social skills training that have been conducted. This section also attempted to obtain opinion from the employers regarding the social skills that are important to the NDTS apprentices; the barriers of integrating social skills in their company; and their suggestions on how to integrate social skills effectively in their company. The fifth section is the demographic profile of the respondents that includes: (1) age group, (2) gender, (3) level of education, (4) present position, (5) years of management experience, (6) size of company, (7) type of company ownership, (8) number of NDTS apprentices in their company, and (9) period of NDTS apprentices with the company.

Pilot Test

The survey instrument was pilot-tested on five employers of automotive companies representing the targeted respondents for the study. The pilot test was conducted in early March 2011. Feedback from the participants was collected and necessary amendments were done. The main comment provided by the participants, especially Malay workshop owners was their weaknesses to understand survey questions in English. Based on the feedback received in the pilot study, the researcher has made the bilingual survey questions (English and Malay language) for the real study.

6 Findings

This section discusses the demographic information and the data obtained to answer the four research questions. The study sought to assess employers’ perception regarding the importance of social skills and their NDTS apprentices’ competence at performing those skills. Twenty employers completed the questionnaires. The survey instrument was tested for reliability using Cronbach Alpha. The reliability coefficient alpha was found at 0.871 for survey question from Section A to Section C. Thus, the survey instrument was considered to possess adequate reliability. This section presents the findings.

Demographic Information

Out of the twenty companies, eight were from Johor (40%), six from Negeri Sembilan (30%), two from Melaka (10%), two from Terengganu (10%), each from Perak (5.0%) and Sarawak (5.0%). Out of the twenty companies, nine were small-scale companies (45%) and nine also were medium-scale companies (45%), and the other two companies were large-scale companies (5.0%). Out of the twenty companies, eighteen were local ownership companies (90%), one was multi-national corporation company (5%), and the other one was considered other category (5.0%).

Majority of the companies (70%) have NDTS apprentices who trained there for less than three years. Only six companies (30%) have run the NDTS program for three years or
more. Each company has assigned at least one of its employees to serve as a coach. This person supervises and manages the NDTS program in the organization. The majority of the coaches (80%) had attended special course for coach/instructor which was conducted by Department of Skill Development. Most of the companies (90%) have 1-5 NDTS apprentices while only 10% of the companies have more than five NDTS apprentices training in their companies. Regarding the length of training, only 15% of the companies have NDTS apprentices trained there for 3 years or more. About one-thirds (30%) of the companies have NDTS apprentices for 2-6 months, 30% for 7-12 months, and 20% for 1-2 years.

Analysis of Research Questions

Research Question 1: How do employers perceive the importance of social skills and social values compared to technical competency for the automotive industry in Malaysia?

Question 1 sought to assess employers’ perceptions of the importance of social skills compared to technical skills in the automotive industry. Average mean for social skills items and technical skills items were compared. Social skills consist of twenty-six items that clustered into seven groups which is basic skills; communication skills; interpersonal skills; teamwork; leadership; personal qualities; and thinking skills. On the other hand, technical skills consist of fourteen items that clustered into four groups, which is resources; information; systems; and technology. The average mean for social skills items is 2.73 and the average mean for technical skills items is 2.72. This shows that there is no significant difference between the perceptions of employers on the importance of social skills with the perceptions of employers on the importance of technical skills in the automotive industry in Malaysia.

Research Question 2: Which of the social skills identified in the common social skills framework do employers perceive as the most and least important for the automotive industry in Malaysia?

The 26 social skills were ranked in order of importance based on their mean importance. Four social skill items were found to possess a mean importance of 2.90 or higher. The four skills were “Interpersonal Skills - Serves clients/customers” (M = 3.00), “Personal Qualities - Integrity/Honesty” (M = 2.95), “Basic Skills - Reading” (M= 2.90), and “Teamwork - Participates as a member of a team” (M = 2.90). In addition, four social skill items had means of 2.50 or lower. These items consisted of “Communication Skills - Speaking” (M = 2.50), “Leadership - Ability to motivate others” (M = 2.50), “Thinking Skills - Decision making” (M = 2.50), and “Thinking Skills - Seeing things in the mind’s eye” (M = 2.40).

Research Question 3: How do employers of automotive industry assess social skills and social values possessed by the NDTS apprentices?

The 26 social skills were clustered and ranked based on their average mean of importance. On the cluster level, the data analysis indicated that interpersonal skills are the most important skill cluster (M=2.83), followed by personal qualities (M=2.81), then the teamwork cluster (M=2.80), basic skills cluster (M=2.73), communication skills cluster (M=2.68), thinking skills cluster (M=2.67), and least important was the leadership cluster (M=2.56).

Research Question 4: How do employers perceive the role of dual system training organization (institutes and workplace) in preparing apprentices with social skills and social values?
Research question 4 asked about the role training organization (institutes and workplace) should play in equipping the students with the required social skills and social values. The question received very high indication from the respondents that training organization (institutes and workplace) should play a role in equipping their students with the social skills and social values required in the labor market. All (100%) of the respondents agreed that training Institute should play a role in equipping the apprentices with social skills. In addition, most (95%) of the respondents agreed that workplace (during training) should play a role in equipping the apprentices with social skills and 5% disagreed with the statement. Similarly, majority (90%) of the respondents agreed that social skills should be integrated into NDTS curriculum and should not to be taught separately. However, 10% of the respondents disagreed with the integration of social skills into NDTS curriculum.

7 Summary, Discussion and Recommendations

This section summarizes the findings of the study. The study was initiated to review the effectiveness of the integration of social skills and social values in the National Dual Training System (NDTS) curriculum based on the perception of automotive employers that train NDTS apprentices. For the purpose of the study, four research questions were addressed. The finding of the first research question clearly indicated that employers perceive social skills as important as technical skills in the automotive industry in Malaysia. In fact, the mean of employers' perception on the importance of social skills were slightly higher than employers' perception on the importance of technical skills. The finding of the second research question indicated that on the cluster level, the data indicated that interpersonal skills are the most important skill cluster and the least important is the leadership cluster. In addition, analysis on the individual items shows that serving clients/customers is the most important social skill and seeing things in the mind’s eye is the least important social skill needed by employers.

The finding of the third research question indicated that on the cluster level, the data indicated that NDTS apprentices were most competent in teamwork and they were least competent in thinking skills. Analysis on the individual items indicated NDTS apprentices were good at working in a team as compared to doing things that required “thinking” such as problem-solving. The finding of the forth research question indicated that all of the respondents agreed that Training Institutes should play a significant role in equipping the apprentices with social skills. This result supports the finding of the study conducted by Rania (2007) that found that universities (institutes) must play a role in preparing their students for the workplace through developing their generic soft skills. Most of the respondents also agreed that social skills should be integrated into NDTS curriculum and not to be taught separately.

Overall, the findings show that on the cluster level, teamwork and personal qualities were ranked in the top three, both in the employers’ perception on the importance of social skills and in the employers’ perception of the NDTS apprentices’ level of competency in social skills. Interestingly, thinking skills and leadership were ranked at the bottom. A study by Ahmad and Shamsol (2010) found that communication skills is a top priority of the employer in hiring potential employees. However, their research were participated by employers from various industries, while this research only focused on automotive industry.

The present findings indicated that the most significant gaps between NDTS apprentices’ social skills and employer expectation were interpersonal skills. This suggests that NDTS apprentices should focus more on their interpersonal skills development. Apprentices can use the findings of this research to enhance their social skills based on employers’ expectation to be competitive in labor market. Training providers could use the research findings to put emphasis on social skills for their apprentices. Most of the respondents agreed that social skills should be integrated into NDTS curriculum and not to
be taught separately. By identifying the most important social skills needed by selective industry (in this case – automotive), curriculum developer should emphasize the needed skills in the curriculum. Nevertheless, there are some limitations of the present study. First, the sample was relatively small and not covered all the states in Malaysia. Second, this study was only focused on automotive industry in Malaysia. Further research is suggested to incorporate a wider range of categories of respondents involved in NDTs program and to focus on different types of industries such as construction, information technology, manufacturing and others. However, despite the weaknesses found in this research, the present research can be seen as a preliminary investigation of the opportunity for improving or strengthening the NDTs curriculum in terms of curriculum development or implementation.

REFERENCES


Digital Media and Remote Experimentation in TVET

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Abstract

In this work the special training modules in digital media and remote experimentation in automation techniques developed by the Competence Center Automation Dusseldorf (CCAD), Germany for TVET are offered and described. 4 training modules provide practical-oriented, industrial learning with the help of digital media. Target groups for trainings are teachers and trainers from vocational colleges, from universities of applied sciences and technology, from research universities as well as engineers from the industry. The aim of CCAD is to offer the TVET modules for Indonesian universities, post-graduates and young specialists in order to spread the German educational experiences to Asia.

1 Introduction

In recent years TVET is rapidly developing not only in Europe but also in the countries of Asia. By giving the opportunity for student and staff mobility to participate in TVET it is possible to upgrade their knowledge by offering modern and up-to-date courses especially in fields of automation, software engineering, computer science, production and manufacturing processes, and design techniques [Azad, A.K.M., 2011]. The Competence Center Automation Dusseldorf (CCAD) bundles the resources of the Department of Electrical Engineering in the field of automation engineering. The department also has a special R&D center for remote engineering, tele-learning and E-Learning [Langmann, R., 2011]. For TVET purposes CCAD has developed 4 special training modules (e-Trainer, Automation Live, PROFINET basics and PROFINET expert). Target groups for trainings are teachers and trainers from vocational colleges, from universities of applied sciences and technology, from research universities as well as engineers from the industry. Participants should already have completed a course of education in electrical engineering and possess basic knowledge of automation technology.

2 Training modules in Automation techniques

In the offered training modules digital media and remote experimentations provided by CCAD are used. The modules were developed by CCAD, Germany and can be used for TVET [Langmann, R, Jacques, H. 2012]. CCAD bundles the resources of the Department of Electrical Engineering in automation engineering.

There are four labs which bachelor and master students, specializing in automation technology, have to complete successfully:

- Lab 1: Manufacturing & Automation
- Lab 2: Instrumentation & Control
- Lab 3: EduNet* PLC
- Lab 4: Training & Research Factory Fab21
Besides these labs there is a R&D center for remote engineering and e-learning, the Düsseldorf Telelaboratory DT.

2.1 Module e-Trainer

The first module, e-Trainer, examines methods and principles related to the use of digital media to provide training of complex technical systems. Following a practical introduction to the issue at hand, the course concentrates on the use and handling of those types of digital media which are available to the student to acquire practical skills by conducting technical experiments. These include particular interactive virtual learning environments as well as remote experiments on real technical plants.

![Figure 1: 3D models of automated stations from the Fab21](image)

The course addresses the following technical aspects:

- Bringing plants into service, testing and diagnosis with interactive and dynamic 3D models;
- Training with hardware-in-the-loop (HiL) and software-in-the-loop (SiL) simulation of automation plants;
- Web-based remote experimentation on real technical plants as complement to traditional lab experience.

Practical training is conducted on-site at Fab21 training & research factory [Internet: http://fab21.ccad.eu/] and remotely in the Dusseldorf Telelaboratory [Internet: http://dt.ccad.eu/].

Participants should already have completed a course of education in electrical engineering, possess basic knowledge of automation technology, and be familiar with the use of a PC as a learning tool.

2.2 Module AUTOMATION live

The second module AUTOMATION live complements basic qualifications in industrial automation engineering with teaching on their application in a realistic, industry-standard training factory. The CCADs FAB21 training & research factory for hybrid production processes provides state-of-the-art automation technologies to produce, bottle, package and store a liquid.

Under expert tutelage, course participants are given the opportunity to apply their knowledge to practical operational situations and to perform maintenance on a complex
The following activities are carried out with the relevant knowledge being provided:

- Operation and maintenance of plants with various SCADA and DNC systems (WinCC, WebFactory);
- Bringing individual stations with PLC control systems into service;
- Configuration and diagnosis of industrial communication systems;
- Diagnosis and maintenance of positioning units and sensors.

The Fab21 is a training&research factory for hybrid production processes. This factory focuses the most learning subjects in automation engineering to one real industrial system for education and training. Fab21 is situated in a 120 m2 room together with 12 PC learning places for trainees.

Participants should already have completed a course of education in electrical engineering and possess basic knowledge of automation technology.

### 2.3 Module PROFINET basics

PROFINET basics module provides basic training on the deployment, operation, maintenance and diagnosis of the real-time Ethernet system PROFINET using a special PROFINET mobile box. PROFINET expert module complements the previous module with a hands-on PROFINET training course in the Fab21 training&research factory.

Given are a theoretical overview of the PROFINET communication system and of the practical configuration and parameterisation of a PROFINET I/O system comprised of components from different manufacturers.

The practical aspect of the training is provided using a mobile PROFINET lab box, which was developed as part of a EU project as an educational platform for industrial communications technology.

The course addresses the following technical aspects:

- PROFINET basics;
- PROFINET engineering;
- Practical exercises on process models from various industries.

Traditional teaching documentation is replaced for the purposes of this course with modern digital media. By way of example, these include web-based training (WBT), the PROFINET Remote Lab [Internet: www.profinet-lab.de] and smartphone apps providing test questions.
Participants should already have completed a course of education in electrical engineering and possess basic knowledge of automation technology and communication technology.

2.4 Module PROFINET expert

Module PROFINET expert complements the PROFINET basics course with a hands-on PROFINET training course in the Fab21. Course participants use the knowledge they have acquired for the commissioning, configuration, operation, maintenance and diagnosis of faults in industry-standard production automation plants. The course equipment consists of five Fab21 sub-stations with which bottle caps are processed and applied to the bottles produced and filled in.

The course addresses the following technical aspects:

− Configuration and parametrisation of PROFINET I/O controllers;
− PROFINET I/O device integration;
− PROFINET/Ethernet communication for distributed PLCs;
− Operation and maintenance of a PROFINET system;
− Diagnosis and troubleshooting of a PROFINET system.

A PLC unit from Phoenix Contact is used in the Fab21 Zone 3 stations. The training module can optionally be carried out on Fab21 Zone 1 (process automation) using a Siemens PROFINET controller.
Participants should possess basic knowledge of automation and communication technology, and should also have theoretical and practical knowledge of the PROFINET system. It is recommended that the iQ-net module PROFINET basics be completed prior to participating in this module.

3 Conclusion

We found that according to the market demands in Europe and especially in Asia and due to the spread of European enterprises in automation to the Asian market it is know extremely important to train the praxis-oriented specialists of the high educational level ready to implement their knowledge at the enterprises.

Decreasing costs and increasing demands of industrial automation has led to the concept of offering training modules in digital media and remote experimentation [Lyalina Y., Langmann R., 2011]. This modules will enable the training and education of automation engineers, maintenance engineers, process workers and students using non classic teaching methods such as learning by doing, remote and mobile teaching; providing the possibility to program all sets of training equipment via network and to control them via network based control screens, thus building up the remote visualization of real operations carried out in the lab. The objective of is to meet the challenges of the knowledge-based society, to enhance the competitiveness of companies and to improve the employability of employees and future graduates. The methodologies used to develop these training modules have an innovative character. These include all kinds of E-Learning, hands-on training (learning by doing) strongly focused on real work situations and not on theoretical examples or exercises. In other words, many of the materials use Project Based Learning and Problem Based Learning and the courses are supported by E-learning methodologies, such as remote labs, M-Learning and web-based exercises. In some of the teaching-learning contexts previously mentioned, these will be ‘new’ approaches.

The aim of CCAD is to offer the TVET modules for Indonesian universities, post-graduates and young specialists in order to spread the German educational experiences to Asia.

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The Influence of More Prevalent Technology Use on the Tasks Carried Out by Older Employees in Germany

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Abstract

The labour market of tomorrow will be determined by the transition from an industrial to a knowledge society. In this process, the accumulation of human capital becomes increasingly important whilst opportunities for low qualified staff steadily diminish. Globalisation and technological advancement result in enhanced economic participation of highly qualified staff in the form of higher wages and better employment opportunities. In the literature, this is attributed to the “Skill Biased Technological Change” (SBTC) [Nikutowski 2007]. According to the ALM approach [Autor et al. 2003], technological change due to falling computer prices (computerisation) leads to changes in task structures which favour a trend towards routinisation (the “routinisation hypothesis”).

Alongside these developments Germany faces the challenge of demographic change, which is reflected primarily in the shrinking and ageing of the population [Siegrist et al. 2005]. Consequently Germany anticipates a distinct decline in the number of economically active persons in the next few decades [Federal Statistical Office 2009]. With the objective of securing adequate labour force potential the pension age was raised to 67 years, although statistics confirm that the average retirement age in Germany is a long way off the present age limit of 65 years [Deutsche Rentenversicherung Bund 2012, Stößel 2008].

From this starting point, the question derived concerns the influence of technological change on the relationship between employment (where still possible) and its compatibility with old age. The article sets out to study what influence the more prevalent use of technology has on the tasks carried out by older employees (aged 55 – 65).

The analyses are based on data from the BIBB/IAB and BIBB/BAuA Employment Survey from the years 1979 to 1999, which enable the precise measurement of task profiles over time [Tiemann and Zopf 2010]. The work tasks carried out by older employees (aged 55-65) were studied on the basis of the “task approach” model [Autor et al. 2003]. This approach essentially hypothesises that subsidiarities and complementarities exist between human manpower and the use of technology in the workplace, which can be modelled in terms of the employees’ task structures.

The results of the study show that the routinisation hypothesis could be confirmed for older employees as a group.

Further research work should investigate the interaction between more prevalent technology use and the tasks carried out, differentiated by qualifications and socio-demographic characteristics as well as perceived health status.
1 Introduction

The labour market of tomorrow will be determined by the transition from an industrial to a knowledge society. The direction of this trend is apparent in the rise in relative demand for highly qualified staff, indicating that ever-increasing importance attaches to the accumulation of human capital. Meanwhile openings for the low qualified are increasingly limited. This complementarity between technological progress and high qualification levels is manifested in the enhanced economic participation of highly qualified staff in the labour market, in the form of higher wages and better employment opportunities. In the literature, this is attributed to “Skill Biased Technological Change” (SBTC) [Nikutowski 2007]. A number of theories on SBTC interpret the evolution of new information technologies and the growing prevalence of computer use since the 1970s as a kind of technological revolution. On the assumption that the resulting achievements exhibit a strong complementarity with higher-level skills, this gives rise to higher demand for highly qualified staff, which in turn provides an explanation for pay polarisation over this period [Berman et al. 1994, Autor et al. 1998]. According to the ALM approach [Autor et al. 2003], technological change due to falling computer prices leads to changes in task structures which favour a trend towards routinisation.

Alongside these developments Germany faces the challenge of demographic change, which is reflected primarily in the shrinking and ageing of the population [Siegrist et al. 2005]. As a consequence, a clear decline in the number of economically active persons is expected in the next few decades [Federal Statistical Office 2009], restricting the size of new cohorts joining the workforce. Studies forecast a skills shortage despite heightened efforts to boost qualifications [Helmrich et al. 2012].

With the objective of securing adequate labour force potential the pension age was raised to 67 years, although statistics confirm that the average retirement age in Germany is a long way off the present age limit of 65 years. Employment rates among 55 to 65-year-olds are only slightly above 50% [Deutsche Rentenversicherung Bund 2012, Stössel 2008, Brussig 2010b].

The question derived from this starting point concerns the influence of technological change on the relationship between employment (where still possible) and its compatibility with old age. As an approach to this complex of themes, the present paper looks into the consequences of computerisation for the work situation of older employees. The question to be addressed is which main tasks are carried out by older employees (as compared with middle-aged employees) in the wake of technological change, and whether in performing these tasks they are affected by the trend towards routinisation.

2 Problem Statement and Research Question

2.1 Older people’s tasks

Particular occupations carried on by members the older age group are clearly reflected in differences in labour force participation. Currently it is most noticeably around the age of 60 that a differentiation in employment rates by occupation is observed. There is quite a range of occupations/tasks that, as a rule, cannot be continued up to age 65 or even 67 [Bäcker et al. 2010]. The occupation of the roofer is commonly cited, for instance, although it is just one representative example of these limited life-span occupations. Older people in low-grade positions (e.g. security guards, cleaners) and skilled manual occupations (e.g. toolmakers, precision engineers) continue in these occupations less frequently than average, whereas there is a relatively high probability of older people in managerial occupations and low-grade service jobs remaining in employment [Brussig 2010a]. With progressive age, the low-grade positions account for an ever-larger share of those remaining in employment. Those in
skilled service occupations (such as police officers, fire-fighters and train drivers) are less likely than average to remain in employment.

2.2 The ALM task approach

Changes in skills requirements, workplace tasks and the use of technologies are intensively debated in the literature on the labour market [Handel 2003]. The task approach [Autor et al. 2003; known as ALM] has proved very successful for explaining how the use of computer technology changes work tasks and demand for social competencies. The merit of ALM, among other things, consists of the micro-theoretical foundation it provides for the complementarities of human manpower and computers in relation to possible substitutes, and the associated possibilities for empirical analysis.

The starting point for the task approach originated by Autor, Levy and Murane (Autor et al. 2003) is the observation that firms, faced with rapid technological development, have to decide whether to substitute human manpower with technology and/or which employees with which qualifications they require. The core hypothesis of the approach states that subsidiarities and complementarities exist between human manpower and workplace technology use, which can be represented by means of the employees' task structures.

Under the ALM approach, technological change is equated with "computerisation" and the substitution of work tasks. The resulting polarisation theory is based on the idea that falling computer prices act as the main driver of changes in task structures over the course of time [Acemoglu 1998, Goos and Manning 2007].

In the ALM paper a total of four categories of work tasks are delineated: routine manual tasks, routine cognitive tasks, nonroutine manual tasks and nonroutine cognitive tasks [Autor et al. 2003]. Nonroutine cognitive tasks are subdivided into analytical tasks and interactive tasks. The authors give the following description of routine tasks: “a task is routine if it can be accomplished by machines following explicit programmed rules” [Autor et al. 2003]. This is in contrast to “nonroutine tasks” which are defined as tasks “for which the rules are not sufficiently well understood to be specified in computer code and executed by machines” [Autor et al. 2003].

In line with the “routinisation hypothesis” the introduction of computers results in the substitution of those tasks which are classified as routine [Goos et al. 2009]. As a result there is falling demand for workers to carry out routine tasks [Autor et al. 2003]. At the same time there is rising demand for workers who can carry out nonroutine tasks (e.g. in the form of servicing newly introduced computer technologies). The widespread use of computers provides employees who carry out nonroutine tasks with a form of technological support [Autor and Handel 2009].

As a result of this development, in the cases of both cognitively demanding work tasks and less demanding computer tasks (e.g. among academics and unskilled staff), there is increasing demand for nonroutine tasks, whereas demand drops in the intermediate segment of occupational tasks since there are fewer routine tasks to be carried out at each qualification level. This polarisation is expressed primarily in salary levels [Autor et al. 2006].

Spitz-Oener [2006] was the first to apply the task approach to Germany. Following her lead, important papers contributing to the debate on task-biased technological change in Germany were published [Gathmann and Schoenberg 2010, Spitz-Oener 2008, Antonczyk et al. 2009, Black and Spitz-Oener 2010], although the analyses have never previously been focused on older employees.

2.3 Research question

Based on the analysis, the following questions will be answered. First, the study seeks to establish whether a shift in the task profiles of older employees has taken place over the course of time. The next question is whether employees towards the end of the working
phase of their lives are affected to the same extent as younger age groups by structural change in the world of work, which is expressed in increasing technologisation and routinisation.

Furthermore, the study will investigate whether, for older employees, computerisation stands in a substitutive relationship to manual and routine cognitive tasks and whether it has a complementary influence on analytical and interactive tasks.

3 Methodology

3.1 Description of the dataset

The study is based on data from the representative BIBB/IAB and BIBB/BAuA Employment Surveys from the years 1979, 1986, 1992 and 1999. The surveys were conducted jointly by the Federal Institute for Vocational Education and Training (BIBB), the Institute for Employment Research (IAB) and the Federal Institute for Occupational Safety and Health (BAuA), and supported by the Federal Ministry of Education and Research (BMBF). The advantage of the BIBB/IAB – BIBB/BAuA Employment Surveys is that they contain information about the work tasks done at individual level.

The four transversal surveys from the years 1979 to 1999 are combined in a synopsis for the analyses (N total = 83775). The study focuses solely on people in employment in the age groups ranging from 25–34, 35–44, 45–54 and 55–65 years old, of which the latter group is of primary interest (cf. Table 1).

<table>
<thead>
<tr>
<th>Age groups</th>
<th>1979</th>
<th>1986</th>
<th>1992</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>25–34 years</td>
<td>6514</td>
<td>2442</td>
<td>2177</td>
<td>379</td>
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<tr>
<td>35-44 years</td>
<td>8173</td>
<td>3885</td>
<td>7952</td>
<td>4871</td>
</tr>
<tr>
<td>45-54 years</td>
<td>6366</td>
<td>2736</td>
<td>7915</td>
<td>7996</td>
</tr>
<tr>
<td>55-65 years</td>
<td>4506</td>
<td>3206</td>
<td>9883</td>
<td>10983</td>
</tr>
</tbody>
</table>


3.2 Operationalisation

Since the dataset was not collected with reference to the ALM categories of "routine" and "nonroutine tasks", the operationalisation of the task areas was undertaken on the basis of an approach developed by Rohrbach-Schmidt and Tiemann [2012]. By running a factor analysis on the basis of a tetrachoric correlation matrix, the total of 17 task items are aggregated into the five categories: analytic, routine, cognitive, interactive, routine manual and nonroutine manual.1

The degree of routinisation is based on the response stating to what extent the processes of the task are programmable (measured in terms of the question about whether the task follows precise rules) and the degree of repetitiveness involved. The higher the index value (max. 1), the higher the degree of routinisation.

The measurement of technologisation was undertaken by referring to the main work tool used, where a value of 0 represents a low level of technologisation (use of simple work

1 Since the task items are binary coded, it is not appropriate to carry out a factor analysis on the basis of simple Pearson correlations. Instead the factor analysis is applied on the basis of a tetrachoric correlation matrix [Kubinger 2003].
devices, tools, simple and semiautomatic machines) and a value of 1 represents a high degree of technologisation (use of IT computers and programme-controlled work tools).

4 Findings and their significance

4.1 Descriptive results

With reference to the following descriptive studies, the aim is to establish whether a shift has taken place in the tasks carried out by older employees, and whether they are affected to the same extent as younger age groups by a structural change in the world of work that is expressed in increasing technologisation and routinisation.

Upon consideration of the trend in tasks carried out over the course of time, the most striking pattern to be observed is a negative trend in the routine manual tasks: whereas just over half of employees in 1979 carried out routine manual tasks, by 2006 this figure was only 30.9%. Likewise the proportion of employees carrying out routine cognitive tasks fell noticeably over the period between 1979 and 1999 (1979: 14.1%, 1999: 6.9%). In 2006, however, the figures rose again to almost 15%. With regard to nonroutine manual tasks, a definite positive trend can be observed: the percentage shares rose from 9.0% at the end of the 1970s to 44.1% in 1999, dropping back to 23.1% in 2006. With regard to nonroutine cognitive tasks, again, a slight positive trend can be observed (1979: 26.7%, 2006: 31.3%).

Turning to consider the distributions of tasks over the course of time, differentiated by age groups, a clear decline in routine manual tasks is seen for the group aged 55 to 65, from 53% in 1979 to 28.7% in the year 1999 (cf. Figure 1). The proportion of older employees engaged in routine cognitive tasks initially fell from 12.5% in 1979 to 5.1% in 1986, rebounding to almost 7.3% in 1999. A positive trend can be observed over time for both nonroutine cognitive and nonroutine manual tasks, and is more emphatically positive for the latter category (nonroutine cognitive: 1979: 21.6%, 1992: 33.1%, nonroutine manual: 1979: 10.9%, 1999: 42.5%). Thus the descriptive results indicate that a shift in the direction of nonroutine activities has taken place for older people as a group. The routinisation hypothesis confirms this result. It is apparent that analytical tasks have clearly gained in significance over time (1979: 35.6%, 1999: 63.5%). While routine cognitive, interactive and nonroutine manual tasks also carried out more frequently, in comparison to analytical tasks.
they are considerably less prevalent. Exclusively routine manual tasks have become increasingly rare since the mid-1980s (1979: 55%, 1999: 28.7%).

Across and beyond the years studied, a clear rise is noted in the frequency with which highly technologised tools are used in the workplace. Whereas in the year 1979 only 6.5% of respondents were using computerised and programme-controlled tools at work, this proportion rose continuously in all subsequent survey years (1986: 7.7%, 1992: 18.8%, 1999: 42.8%).

Specifically for the age group of older employees, but quite similarly to the younger age cohorts, over the time-span of the study a clear positive trend is evident in the direction of growing use of technological work tools (cf. Figure 1). However, while the degree of technologisation for the 25 to 35-year-old age group barely doubled from the year 1992 to the year 1999 (1992: 9.9%, 1999: 19.0%), the rise of over 40% in these two years for the older age groups (45–54 years: 41.3%, 55–64 years: 42.8%) was clearly greater than for younger age cohorts.

The results show that after the year 1992, the proportion of employees carrying out tasks categorised as highly routinised has noticeably declined (1992: 27.5%, 1999: 23.4%, 2006: 15.6%, all respondents). Again, these findings are in keeping with the routinisation hypothesis. Widespread computerisation in Germany only took place after the year 1992, because prior to that date PC prices were prohibitively high. Similar findings are obtained when the data is differentiated by age groups. In all four age groups studied, a distinct decline in the degree of task routinisation can be observed after the year 1992. One small difference arises for the 55 to 65-year-old age group: unlike the other age categories, this group is somewhat more frequently engaged in highly routinised tasks over the studied time period (1979: 25.5%, 1986: 23.0%, 1992: 25.9%, 1999: 22.7%, 2006: 16.6%) (cf. Figure 1).

4.2 Multivariate results

The hypotheses are investigated by conducting multivariate analyses. The first stepwise binary logistic regression is carried out to establish the probability for older employees of being engaged in a routine or nonroutine task. A further multivariate analysis is run to test the complementarity and substitution hypothesis for the 55 to 65-year-olds in comparison with younger employees.

Table 2 shows the results of the binary logistic regressions on changes in skill requirements over time. The dependent variable is the probability of carrying out a nonroutine (1) versus a routine task (0). In the first model, only the dummy age variables and the individual survey years are included. For the 55 to 65-year-old age group it emerges that tasks done are more routine than nonroutine in comparison to younger employees (β: -0.07). This effect is highly statistically significant and points to a strong correlation (BIC: 9.60). In the survey years 1979 (β: -1.29), 1986 (β: -0.93) and 1992 (β: -0.78) the respondents state that they are engaged more in routine than nonroutine activities.

In the second model, the dummy variable of degree of technologisation is also included, where the value of 1 represents a high proportion of technological work tools. It appears that as the degree of technologisation rises, more nonroutine tasks are carried out (β: 0.37). Again, this correlation is highly statistically significant and can be quantified as very strong (BIC: 282.92). The final model contains additional socio-demographic and human capital control variables. A nonroutine task is more likely to be done by women in comparison to men (β: -1.59, BIC: 7195.52) and by Germans in comparison to non-Germans (β: 0.48, BIC: 31.18). While the attainment of a school-leaving certificate greatly enhances the probability of being engaged in a nonroutine task (β: 0.49, BIC: 1868.80), for attainment

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2 The regression coefficients relate essentially to logarithmised odds, or logits. A positive β coefficient stands for a positive correlation between the independent variables and the logits, a negative coefficient for a negative correlation. Logarithmised odds cannot be interpreted in terms of content because the link with the probabilities is nonlinear.
of a higher-education degree no directionality could be confirmed for the correlation (β: 0.03, BIC: -10.16). If an apprenticeship had been started but not finished, this had a negative influence on the probability of carrying out a nonroutine task (β: -0.19, BIC: 2.33).

Table 2: Results of binary logistic regression on tasks of older employees³

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β (se) BIC</td>
<td>β (se) BIC</td>
<td>β (se) BIC</td>
</tr>
<tr>
<td>Age 55-65 years</td>
<td>-0.07***</td>
<td>-0.09***</td>
<td>-0.32***</td>
</tr>
<tr>
<td>(0.01) 9.60</td>
<td>(0.02) 15.77</td>
<td>(0.02) 269.18</td>
<td></td>
</tr>
<tr>
<td>Survey year 1979</td>
<td>-1.29***</td>
<td>-1.18***</td>
<td>1.09***</td>
</tr>
<tr>
<td>(0.02) 3476.51</td>
<td>(0.02) 2634.77</td>
<td>(0.02) 1842.57</td>
<td></td>
</tr>
<tr>
<td>Survey year 1986</td>
<td>-0.93***</td>
<td>-0.81***</td>
<td>-0.72***</td>
</tr>
<tr>
<td>(0.02) 1194.54</td>
<td>(0.03) 848.74</td>
<td>(0.03) 546.28</td>
<td></td>
</tr>
<tr>
<td>Survey year 1992</td>
<td>-0.78***</td>
<td>-0.69***</td>
<td>-0.73***</td>
</tr>
<tr>
<td>(0.02) 1470.86</td>
<td>(0.02) 1082.57</td>
<td>(0.02) 978.57</td>
<td></td>
</tr>
<tr>
<td>High degree of technologisation</td>
<td>0.37***</td>
<td>0.17***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.02) 282.92</td>
<td>(0.02) 40.19</td>
<td></td>
</tr>
<tr>
<td>Man</td>
<td>-1.59***</td>
<td></td>
<td>7195.52</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td></td>
<td>31.18</td>
</tr>
<tr>
<td>German</td>
<td>0.48***</td>
<td></td>
<td>1868.80</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td></td>
<td>31.18</td>
</tr>
<tr>
<td>School-leaving certificate available</td>
<td>0.49***</td>
<td></td>
<td>1868.80</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td></td>
<td>31.18</td>
</tr>
<tr>
<td>Graduated from university</td>
<td>0.03</td>
<td>-0.19***</td>
<td>2.33</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.05)</td>
<td>2.33</td>
</tr>
<tr>
<td>Apprenticeship not finished</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.68***</td>
<td>0.53***</td>
<td>0.34***</td>
</tr>
<tr>
<td></td>
<td>(0.01) 1563.4</td>
<td>(0.02) 799.49</td>
<td>(0.08) 7.93</td>
</tr>
</tbody>
</table>

Pseudo R² (NK)
- 2LL 91995.79 91700.28 79849.5


Dependent variable: non routine task (0 = no, 1 = yes).
Reference categories: Survey year 1999, age under 55 years, low degree of technologisation, woman, not German, school-leaving certificate available, not graduated from university, finished apprenticeship.

*: p ≤ 0.1, **: p ≤ 0.01, ***: p ≤ 0.001. 0 ≤ BIC < 2 weak, 2 ≤ BIC < 6 positive, 6 ≤ BIC < 10 strong, BIC ≥ 10 very strong correlation.

The results presented in Table 3 allow testing of the substitution and complementarity hypotheses for older employees (55–65 years) in comparison to younger employees (25–54 years). The table presents the results of four separately conducted binary logistic regressions with the same control variables in each case (dependent variables: nonroutine analytic, nonroutine interactive, routine cognitive, routine manual). The analyses revealed that the higher the degree of technologisation, the much greater the probability of carrying out nonroutine analytic (β: 0.49, BIC: 286.15) or interactive tasks (β: 0.64, BIC: 594.96). Thus the results of the first two regressions are in keeping with the complementarity hypothesis. The probability of older employees to carry out nonroutine analytic tasks is significantly lower than for younger employees (β: -0.29), and a strong correlation can be assumed (BIC: 123.77). For the nonroutine interactive tasks, hardly any directionality is

³ The BIC coefficients ("Bayesian information criterion") provide information on the strength of the correlation according to the formula: BIC = z² - ln n (where z is the regression coefficient divided by its standard error and n is the sample size [Pampel 2000].
noted for the correlation with the age variables (β: -0.09). The results of the logistic model on the probability of carrying out routine cognitive activities stands in contradiction to the substitution hypothesis: here, the higher the degree of technologisation, the greater the probability of carrying out routine cognitive activities (β: 0.54) and the correlation can be rated as strong (BIC: 251.92).

Table 3: Results of binary logistic regressions on technological change and changes in skill requirements

<table>
<thead>
<tr>
<th>Nonroutine analytic</th>
<th>Nonroutine interactive</th>
<th>Routine cognitive</th>
<th>Routine manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 55-65 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>β (se)</td>
<td>BIC</td>
<td>β (se)</td>
<td>BIC</td>
</tr>
<tr>
<td>-0.29*** (0.03)</td>
<td>123.77</td>
<td>-0.09*** (0.02)</td>
<td>7.59</td>
</tr>
<tr>
<td>Survey year 1979</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.15*** (0.04)</td>
<td>6.60</td>
<td>0.20*** (0.03)</td>
<td>14.79</td>
</tr>
<tr>
<td>Survey year 1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.42*** (0.04)</td>
<td>89.05</td>
<td>0.61*** (0.04)</td>
<td>287.12</td>
</tr>
<tr>
<td>Survey year 1992</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.81*** (0.03)</td>
<td>656.29</td>
<td>0.34*** (0.03)</td>
<td>139.49</td>
</tr>
<tr>
<td>High degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of technologisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.49*** (0.03)</td>
<td>286.15</td>
<td>0.64*** (0.03)</td>
<td>594.96</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2.5*** (0.03)</td>
<td>6858.50</td>
<td>-2.3*** (0.03)</td>
<td>6946.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2.87*** (0.04)</td>
<td>6807.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudo R² (NK)</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>-2LL</td>
<td>56445.55</td>
<td>46468.37</td>
<td>46468.37</td>
</tr>
</tbody>
</table>
| Source: BIBB/IAB – BIBB/BAuaA Employment Surveys 1979-1999, own calculations, N=83775. Dependent variables: non routine analytic task (0 = no, 1 = yes), non routine interactive task (0 = no, 1 = yes), routine cognitive task (0 = no, 1 = yes), routine manual task (0 = no, 1 = yes). Reference categories: Survey year 1999, age under 55 years, low degree of technologisation. *: p ≤ 0.1, **: p ≤ 0.01, ***: p ≤ 0.001. 0 ≤ BIC < 2 weak, 2 ≤ BIC < 6 positive, 6 ≤ BIC < 10 strong, BIC ≥ 10 very strong correlation.

A possible explanation of this result may reside in the different operationalisation and definition of routine tasks: whereas in the ALM paper [Autor et al. 2003] the measurement of routine tasks was undertaken by means of open questions, in the Employment Surveys it was based on the degree of monotony of the tasks. It can further be assumed that different respondents associated different content with the concept of a routine task.

Older employees carry out routine cognitive tasks less frequently than younger employees (β: -0.11). With a BIC value of 2.09 this correlation is weak, however. The fourth model shows that the increased use of IT technology in the workplace has a strongly substitutive effect on the exercise of routine manual tasks: the higher the degree of technologisation, the lower the probability of carrying out nonroutine manual tasks (β: -0.57, BIC: 641.98). Employees in the older age group are found to engage with a higher probability in routine manual tasks than the younger age cohorts (β: 0.10, BIC: 26.37).

4.3 Discussion of results

The descriptive results of the study show that for older employees over the course of time, a clear shift has taken place in the work tasks carried out: a decline in routine manual tasks and a clearly positive trend in nonroutine tasks are noted. Developments in the use of highly technologised work tools support a trend towards computerisation, including among the group of 55 to 65-year-olds, although this age group was exposed to a faster pace of development in the years 1992 to 1999 in comparison to younger people. For those in the
last ten years of their working lives, a decline in the degree of routinisation of their tasks can be noted since the year 1992. Nevertheless, older people perform routine tasks somewhat more frequently than younger employees. This finding could also be confirmed through multivariate analyses. The increased degree of IT-use in the workplace, including for older employees, stands in a complementary relationship to the performance of nonroutine analytic and interactive tasks. Furthermore, for the older age group, rising computerisation stands in a substitutive relationship to routine manual but not routine cognitive tasks.

Overall the analyses showed that the routinisation hypothesis could be confirmed for older employees. Despite the decline in the degree of routinisation and the positive trend in the direction of technologisation, the 55 to 65-year-old age group is more frequently employed in routine manual tasks.

If despite structural change older people more frequently perform more manual and routine tasks than younger employees, it is worth asking whether this might be an important reason for early retirement before the statutory pension age. It can be assumed that the prospect of remaining actively employed until pension age depends, among other things, on the pressures of work, which in turn are heavily influenced by the tasks carried out. One possibility for alleviating this problem might be to harness the qualification potential acquired over many years by older employees in manual occupations by adopting a strategy of age-appropriate job design. In this way the experiential knowledge and skills of older employees, particularly in the service sector, could be utilised. In order to promote a change of tasks in the final phase of employment, above all it would be necessary to create enabling conditions such as the option of continuing education or retraining.

5 Future Work

The present study did not investigate the trend, postulated in the literature, towards higher qualifications in tandem with rising technologisation. Further analyses should investigate the consequences of rising qualification levels over time on the tasks carried out by older people, taking account of the influences of computerisation and routinisation. A further question that arises concerns the impacts of the task carried out on the perceived health status of older employees, and the associated probability of continuing in their occupation up to statutory retirement age.

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A Review of Vocational Teacher Education at the Faculty of Engineering, National University of Laos

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Abstract

The review has been made to evaluate the current vocational teacher education which is a 4 year program with the technical and pedagogical learning-teaching process organized by the Technical and Vocational Teacher Education Department of the National University of Laos. Three main problems have been identified. It is found that firstly students’ selection was merely made using the quota system. Secondly, laboratories and workshops used to carry out practical training are not well outfitted with equipments and tools commonly found in industries. Finally, teaching practice in technical colleges or industries couldn’t be undertaken within the 4 year program. It is worth to mention also, that teaching staff currently involving with the vocational teacher education are not qualitative and quantitative sufficient to carry out their duties. To overcome problems faced, some measures such as a system of candidate selections, new learning-teaching approaches and conditions to graduate are proposed.

1 Introduction

The Vocational Teacher Education Department (VTED) was initially established as a coordinating unit [1], then a division [2] and finally a department [3], respectively. The department has the task to develop the curricula for vocational teacher education. The establishment and implementation of vocational teacher standards for the degree program offered also lie under the department’s responsibility. VTED has been supported by the Lao-Germen Human Resource Development Project for Market Economic (HRD-ME) since 2003 continuing until 2015. Besides that, it is supported by the Regional Co-operation Platform (RCP) since 2009. In order to develop VTED into a sustainable capacity building project, its teaching-learning process will be conducted in 2 stages. The first stage will involve the theoretical teaching of academic and pedagogical subjects as well as the teaching practice within the Faculty of Engineering (FE). The process will be completed with the second stage by organising practical work in industries as well as real teaching in technical or vocational colleges/schools for a certain period of time.

2 Current Situation

VTED offers a 4 year program leading to a vocational teacher bachelor degree in several engineering fields. The department started its first intake in the academic year 2003-04 with 24 students enrolled in 5 different engineering fields, namely electrical, electronic, mechanical, road and bridge and civil engineering. The same fields of study remained the target for students’ enrolment till the academic year 2006-07 with an additional number of 93
enrolled students. However, in the last five academic years VTED admitted fewer students. In the academic years 2007-08 and 2010-11 no student was enrolled. During this time there were some changes in the study fields for students. In the last academic year (2011-12) there was no enrolment in civil and road & bridge engineering. Nevertheless, new fields of studies were added to the VTED curriculum. These are information technology, transport and logistics, environment and mining engineering. The enrolled number of students and the fields of study offered from the first intake until the academic year 2011-12 are shown in Table 1.

<table>
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<tr>
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<tbody>
<tr>
<td>1</td>
<td>Electrical Power</td>
<td>9</td>
<td>0</td>
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<td>5</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Hydroelectric Power</td>
<td>8</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
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<tr>
<td>3</td>
<td>Electronics</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>Telecommunication</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>6</td>
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<td>2</td>
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<td>5</td>
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<td>3</td>
<td>0</td>
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<tr>
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<td>Civil</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>Road and Bridge</td>
<td>0</td>
<td>13</td>
<td>0</td>
<td>0</td>
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<tr>
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<tr>
<td>9</td>
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<td>1</td>
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<td>11</td>
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<td>1</td>
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<td></td>
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<tr>
<td>12</td>
<td>Environment</td>
<td>3</td>
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<tr>
<td>13</td>
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<td>3</td>
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<tr>
<td>14</td>
<td>Transport and Logistics</td>
<td></td>
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<td></td>
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<tr>
<td>15</td>
<td>Irrigation</td>
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<td></td>
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<tr>
<td>16</td>
<td>Computer</td>
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<td></td>
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<tr>
<td>17</td>
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<td>31</td>
<td>22</td>
<td>0</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>32</td>
</tr>
</tbody>
</table>

### Table 1: Number of enrolled VTED students during 2003-2011

**2.1 Selection of Students**

At present students are entering the programs of the Vocational Teacher Education Department based on a provincial and central quota system. They are engaged to study on the specialization determined by the parties concerned with the objective to take the post of a vocational teacher in a technical college in their respective province. This system has the advantage that their future job or carrier will be ensured upon graduating from the Vocational Teacher Education Department.
The students' selection thus is based merely on the needs of the provinces, but often their academic backgrounds are not taken into consideration. Therefore two linked problems are emerging while undertaking their studies in the department. Firstly, as the students' backgrounds are not relevant to the specialization chosen and undertaken, they already have difficulties to catch up with their studies in the first year. As a consequence, in several cases students do not wish to take their specialization courses as they are worrying that they cannot complete the studies.

2.2 Learning-Teaching Process

The current vocational teacher education system bases the technical learning-teaching process on the respective departments. This means that although almost all of the vocational teacher students haven't been briefed on their specialization before, they will have the same technical courses as their engineering classmates. Pedagogical subjects are taught to them within their department. This system is advantageous for the faculty with respect to organisation, as teaching staff, classrooms and laboratory facilities of the technical departments are also used for the vocational teacher education at the same time as for engineering students, as illustrated in Figure 1. Having studied several years in the technical departments, vocational teacher students would have some clear picture of their technical specialization to be chosen in parallel to their pedagogical subjects. However, as not all technical subjects are required for vocational teacher students, separated time tables have to be arranged for them. This measure complicates the time, class, laboratory, and workshop allocation.

![Figure 1: Regular bachelor program of VTED](image)

2.3 Practical and Pedagogical Training

Laboratories and workshops being used to carry out practical training are belonging to technical departments, not to VTED. Moreover, they are not well outfitted with equipment that is commonly used in industries. Although a practical training on working in industries is organized during the study program, its duration of 4 weeks is much too short to sufficiently gain or acquire the necessary practical knowledge and skills. All in all, current vocational teacher students are not well prepared with industrial practical knowledge and skills.

Pedagogical subjects taught need to be implemented by exerting teaching practice in technical colleges or industries. However, this cannot be undertaken within the 4 year vocational teacher program due to the limited time available. Lacking of this practice, future vocational teacher will not be equipped with sufficient experiences and skills in real class
teaching. Hence, they will face lots of difficulties in practicing their teaching duties in the future.

2.4 Human Resources

Teaching staff currently involving with vocational teacher education are not qualitatively well enough prepared, nor is their number sufficient to carry out their duties [4]. Thus, heavy teaching loads are put on their shoulders causing inefficacy in the teaching duties. Consequently, the teaching staff does not have time to enhance their performance or upgrade themselves to higher qualifications. This in turn means that the quality of future graduates will be severely affected, leading to low performance when exerting their teaching duties in the near future.

To try to overcome or solve the problems mentioned and to be in line with the current socio-economic development of the country, an appropriate vocational teacher education model has to be developed and adopted.

3 Proposed new Vocational Teacher Education Model

The proposed vocational teacher education model will take into consideration a system of VTED students' selection, appropriate learning-teaching approaches and conditions for graduation and for obtaining a degree in vocational teaching.

3.1 System of Student’s Selection

The system of candidate selection should have a layout, so that firstly the recruitment of students can be kept in line with the human resource (development) planning of the faculty as well as of the provincial sending organisations or agencies. Secondly, however, it is essential that the candidates’ willingness to study as well as their specialization also are considered so as to assure their appropriateness for their future professional work. That is, candidates should be able to choose their specialization to be in line with their academic background and/or willingness to study.

To better prepare students entering the department, it is quite essential that information on the vocational teacher education in the form of public advertisements and announcements are passed to them well beforehand. This is crucial as the inappropriate choice of specialization very often is due to insufficient and sometime incorrect information received.

In case students are admitted to the department without having a relevant and appropriate engineering background, measures should be implemented to assist and help them to adjust their academic preparation. This could be done by arranging or organising special subject-oriented classes. That is, students without knowledge on their specialization will be trained in and supplied with the necessary basic background needed when being introduced to their specialization later during their studies.

Another factor influencing the willingness to pursue their studies in vocational teacher education is to know that there will be attractive incentives for being a teacher. Such encouragements could be a raise in teacher’s wages (according to the national education reform and government policies on the national education system) and additional financial support particularly for teachers being employed in remote areas [5].

3.2 Appropriate Learning-Teaching Approach

During the learning-teaching process Standards of Vocational Teachers in Lao PDR will be used. The standards define competencies, skills and attitudes that vocational teachers have
to develop during their studies before going out to tackle their professional duties [6]. They are used as measures to comply with regulations of the Higher and Vocational Education Department, Ministry of Education. In doing this both the academic and pedagogical profiles of future vocational teachers will be commonly determined and standardized.

As an important part to produce graduates with teaching and industrial practical knowledge, existing laboratories and workshops of technical departments have to be outfitted with equipment found in use in the industrial sectors. Alternatively, fully new laboratories and workshops have to be established within VTED. The facilities have to be furnished with appropriate, commonly used tools and equipment deployed in industries.

Steady enhancement, improvement and upgrading of the pedagogical, technical as well as information and communication technology knowledge, competencies and skills of teaching staff participating in the teaching-learning process are necessary to cope with the technological development of the country, the region and the world.

3.3 Conditions to Graduate

As mentioned earlier, graduates are lacking of teaching as well as industrial practice experiences due to the time constraints imposed by the currently offered 4 year program. In order for them to have opportunities to carry out their teaching practices and obtaining technical experiences in the industries, a 5th year shall be introduced after the formal 4 year program.

Teaching practice foreseen for 4 months shall be carried out in technical colleges throughout the country. During their teaching practice students are closely monitored and assessed by mentors from both technical colleges as well as by designated VTED teaching staff. The monitoring concept is illustrated in Fig. 2. This procedure is very significant and crucial for students as it will serve as the teaching performance evaluation needed to be permitted as vocational teacher. The same scenarios, but without teaching performance evaluation, also will be applied to the practical training in industries.

![Figure 2: Mentoring concept for proposed Vocational Teacher Education Model](image_url)
Under this new scheme VTED students will be graduated with two certificates, namely with a bachelor of engineering and a bachelor as vocational teacher after the 4th and 5th year respectively. This means, students must undergo the practical training in the 5th year before being warded the degree as vocational teacher (Fig. 3). With this measure, students would be provided with necessary teaching and practical experiences before facing the real challenges when being engaged as vocational teachers in technical colleges or trainers in industries.

4 Conclusions and Implication

In this review three main problems face by the vocational teacher education system currently organized at the Faculty of Engineering, National University of Laos, were identified. It is found firstly that students entering the department are not appropriately selected. Secondly, as facilities used for carrying out laboratory works and workshops are not well outfitted with industrial equipment, graduates are not well supplied with appropriate industrial knowledge and skills. Lastly, students are short in teaching and industrial practice as they are not provided with sufficient time (within the 4 year program) for undertaking teaching and industrial practice.

The Implication of this review firstly is to propose and establish an appropriate system or procedure for the selection of candidates. Furthermore, laboratories and workshops must be fitted with equipment commonly used in industries. To cope with the change of technology in industries as well as to overcome the shortage of qualified human resources, teaching staff has to be steadily upgraded quantitatively and qualitatively. Last but not least, an additional time period, namely the 5th year, shall be introduced to the current vocational teacher education system to allow future vocational teachers to have sufficient time for exercising their teaching and industrial practice. With this 5th year graduates will obtain their licenses as vocational teachers.

A part of the findings presented in this review resulted from discussions with the Dean of the Faculty of Engineering, and with a number of lecturers and students of VTED with the
aim to improve the learning-teaching process as well as the quality of graduates. The review of the existing vocational teacher education curriculum contributes another part to this review. Moreover, as the standards for vocational teachers, referred to as [6], must be applied once it is approved by the Ministry of Education and Sport (MoES), the currently existing curriculum has to be reviewed and revised accordingly. Finally, a mentoring concept has been added as part of the proposed model in order to complete the review.

Documents mentioned in the list of references are legal framework documents utilized for reviewing and revising the vocational teacher curriculum being used at the Faculty of Engineering. These legal documents are very crucial, particularly [4], [5] and [6], as they are defining guidelines and policies on how teachers should be trained [4], on teachers’ national legal status [5], and on profiles and standards of future teachers [6].

REFERENCES

[1] Decree of the Minister of Education No. 480/04, 23rd March 2004
[2] Decree of the Minister of Education No. 2116/05, 28th September 2005
Transparency of Competences via Recognition - Criteria-Based Analysis of Different European Approaches

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Abstract

The recognition of formal, non-formal and informal learning gains increasing importance in Europe, while the national approaches to recognition are rather diverse [cf. e.g. Otero/Hawley/Nevala 2008; Werquin 2007]. In the European context the professional mobility of the workforce is more in the focus – in the national context aspects like improving permeability of the educational system, support of lifelong learning or employability are focused. Overall the use of the term “recognition” is in no way consistent [cf. e.g. Käpplinger 2007]. The aim of this paper is an analysis and typology of different European approaches towards the recognition of competences. This is done mostly from an institutional research perspective. Besides the competence theory and the certification theory the theoretical basis of the analysis is formed by the institution theory and the governance approach. Within this paper selected European approaches towards the recognition of competences are analysed criteria-based and on this basis evaluated from a comparative perspective regarding their methodological and their institutional design.

The main deficit regarding the recognition of competences in Europe is a lack of systematisation. Although nominal a lot of approaches follow the aim of recognising competences, their circumstances, proceedings and results are quite different. These aspects influence the character of recognition significant. A systematic and criteria based analysis of the approaches has not yet been carried out.

The theoretical analysis led to the following relevant criteria: aims, understanding of competence, methods, norms and standards, stakeholders, rights of disposal, coordination as well as signaling and screening. Based on the theoretically derived criteria grid three ideal approach models were developed and used as theoretical benchmark for the analysis. The results of the analysis allow a classification of the approaches within the typology and are the basis for recommendations regarding the further conceptual development of them regarding their special strengths and weaknesses as well as further considerations towards a Europe-wide strategy for recognition of informal learning [cf. Annen 2012].

1 Methodology and theoretical framework

The presented results have been achieved through three methodical components. Firstly the approaches have been analysed within an extensive literature research. Secondly an analysis of documents was carried out. Therefore, the documents, which are available regarding the approaches, have been evaluated with the help of the above analysis criteria. Among these documents are, for instance, handbooks, guidelines, quality assurance material, compendia and laws. Finally the results of the literature research and the analysis of documents were validated by interviewing important experts respectively key persons regarding every approach. These persons played a decisive role in the context of the
development of the approaches or in the implementation of the approach in practice. Besides the purpose of validation the interviews serve the collection of data concerning the experiences with the approaches.

Already 2001 Bjornavold noticed that the central challenges regarding the recognition of formal, non-formal and informal learning are methodological and political-institutional [cf. ibidem, p.29].

In this paper both aspects shall be regarded within the analysis of four selected exemplary approaches to recognition. Besides the competence theory and the certification theory the theoretical basis of the analysis is therefore formed by the institution theory [cf. Richter/Furubotn 2003] and the governance approach [cf. Altrichter/Brusemeister/Wissinger 2007].

The within the institution theory contained distinction between institutions ‘with stakeholders’ and institutions ‘without stakeholders’ forms the basis for the analysis of the criteria ‘stakeholders’ as well as ‘norms and standards’. Furthermore rights of disposal are relevant within the institutional economical analysis. The rights of disposal are here displayed as “rights of disposal to take a decision” and the ones of the individual as entitlements. This corresponds to a sociological understanding of rights of disposal. The New Institutional Economics as well as the Governance-Theory distinguish ideal between the following coordination mechanisms: hierarchy, market and network [cf. Annen 2010]. These mechanisms are used as a reference point of the analysis of the approaches’ coordination.

The term ‘recognition’ can be understood as a process or as a result respectively a status. The process of recognition can be divided into the steps that are illustrated within figure 1. The final result of the whole process is the formal recognition. Besides this the educational institutional perspective and the cross-social perspective can be distinguished.

| (educational) institutional perspective | accreditation not necessary | accreditation where required necessary | accreditation where required necessary | accreditation by public or private authority necessary | accreditation by public authority necessary |
| process of recognition | Identification | evaluation | validation | certification | formal recognition |
| characteristics | documentation of competences | judgemental documentation of competences | verification of the validity of documents regarding a standard | issuance of a guarantee regarding the evaluation and validation by a legitimated institution | issuance of a guarantee regarding the evaluation and validation by a public legitimated institution |
| result | document | report | confirmation | certificate | degree |
| cross-social perspective | social recognition |

Figure 1: Overview and Systematization of the process of recognition

To identify differences and similarities as well as strengths and weaknesses of the analysed approaches on the basis of a theoretically derived criteria grid three ideal approach models are developed and used as theoretical benchmark for the analysis. The different approaches of recognition can be classified within a typology. This typology differentiates between the three types: ‘Integration’, ‘Autonomy’ and ‘Secondation’. While the approaches belonging to the type ‘Integration’ contain the whole process of recognition from the identification of learning outcomes until their formal recognition, the approaches belonging to the types
‘Autonomy’ and ‘Secondation’ only contain parts of this process. On the other hand the type ‘Integration’ is rather deeply anchored within the formal educational system and is focused on formal qualifications as reference points rather than on individuals and their competences. In contrast within both other types the individual learning outcomes gained within informal learning processes are in the focus more than formal qualifications. Approaches which belong to the autonomous type provide a certification while they are not anchored within the formal educational system. In contrast approaches of the type ‘Secondation’ are marked, because they don’t provide any certification or formal recognition, but they support this. The paper shows why the type ‘Integration’ can be recommended in every national context to offer people the opportunity to get their informal learning formally recognized. Moreover the two other types are relevant to take the individual in an adequate way into account within the process of recognition. So the three types of approaches can be combined and complement one another. These three types are furthermore used to enhance and advance the analysed approaches as well as to structure the research area. The following figure 2 illustrates the whole typology and illustrates the relation between the criteria grid and the constructed ideal types.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Integration</th>
<th>Autonomy</th>
<th>Secondation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localization/context</td>
<td>Integration within the formal educational system</td>
<td>Localization within the area of non-formal education</td>
<td>Relation to informal learning predominant</td>
</tr>
<tr>
<td>Educational-political aims</td>
<td>Obtainment of certificates of the formal educational system</td>
<td>Obtainment of certificates without equivalence in the formal educational system</td>
<td>No obtainment of certificates</td>
</tr>
<tr>
<td>Methodical aims</td>
<td>Summative and formative</td>
<td>Summative</td>
<td>Formative</td>
</tr>
<tr>
<td>Methods</td>
<td>Third party assessment via comparison with qualifications</td>
<td>Third party assessment via test procedures</td>
<td>Self assessment via portfolios and descriptive methods</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Stakeholders of the formal educational system predominant</td>
<td>Stakeholders of the private sector predominant</td>
<td>Stakeholders of the non-profit sector predominant</td>
</tr>
<tr>
<td>Norms and standards</td>
<td>Approach-immanent standard and norm orientation</td>
<td>Approach-immanent standard and criteria orientation</td>
<td>No standards and individual orientation</td>
</tr>
<tr>
<td>Institutional rights of disposal to decide</td>
<td>Increase of the rights of disposal of the stakeholders of the formal educational system via laws</td>
<td>Awarding of rights of disposal via accreditation</td>
<td>Rights of disposal of lower importance</td>
</tr>
<tr>
<td>Individual entitlements</td>
<td>Entitlements within the formal educational system</td>
<td>Entitlements on the labor market</td>
<td>No entitlements</td>
</tr>
<tr>
<td>Coordination</td>
<td>Hierarchical coordination by the state or deliberative open method of coordination predominant</td>
<td>Market mechanism or competitive open method of coordination predominant</td>
<td>Network mechanism or deliberative open method of coordination predominant</td>
</tr>
<tr>
<td>Instruments of signaling and screening</td>
<td>Recognizing body and individual active to overcome information asymmetries</td>
<td>Mainly recognizing body active to overcome information asymmetries</td>
<td>Mainly individual active to overcome information asymmetries</td>
</tr>
</tbody>
</table>

Figure 2: Typology of recognition approaches
2 Selected European approaches to the recognition of competences

Against the background of the above theoretical and conceptional considerations now four selected European approaches towards the recognition of competences are presented. The approaches were chosen to give an exemplary overview of the different approaches and to represent different types regarding the above typology.

2.1 Realkompetanse

Recognition of competences is involved in a long tradition in Norway. In 1999, the Norwegian strategy for lifelong learning began with the competence reform. In the same year, the national validation project was started to create a national system for validation and formal recognition of formal, non-formal and informal learning (in Norway called Realkompetanse). During the three-year national project, several local development projects were carried out. In this context, various methods and instruments have been developed. This was done in three sectors: in the formal education system, in the private sector with companies as well as in the so-called third sector. The qualitative and quantitative data from these development projects as well as other surveys formed the basis of the new Norwegian legal framework. This is linked with the relevant laws of the educational system and the rights of individuals.

Every concrete recognition approach in practice contains four steps, which are realized within the three above sectors in each case in a different way: 1. Information and consulting, 2. Identification and systematization of competences, 3. evaluation and 4. Documentation. These four steps have in the private and the third sector a recommendatory character, while they are regulations within the secondary and the higher educational area [cf. Mohn 2007, p. 16f.]. The Norwegian approach can be characterised by a strong dominance of public authorities as they – concrete the counties – are responsible for the provision of information, the consulting, the elements respectively methods of the approach as well as for the quality assurance [cf. Carlsten/Mohn/Brandt/Turmo 2006, p. 29]. The nation-wide similarity of the Norwegian approach shall be guaranteed through the common principles as basis for different methods. Uniformity and validity of the national approach shall be furthermore assured through the basically identical course of proceedings [cf. Mohn 2007, p. 15f]. Overall the Norwegian approach is based on a framework of legal rights, which was formed by the tri-party-cooperation of the state, the social partners and the other stakeholders within the area of adult education. The approach can be characterized by its common laws and principles and a high degree of autonomy at the same time [cf. Mohn 2007, p. 51]. The system is state-steered in which the social partners are highly integrated.

In the years 2000 to 2005, a total of about 60,000 people participated in a recognition procedure in the field of higher secondary education, of which about 80% were carried out in relation to vocational subjects [cf. Mohn 2007, p. 97f; Carlsten et al. 2006, p.46]. In the field of higher education about 6,000 persons aged 25 years and older applied for admission to a study program in 2001 (the first year in which this was possible). In subsequent years, this number decreased to 2,700 in 2006. In the years 2001 to 2006, 50 to 70% of the applicants for the study program of their choice were found to be qualified. In competition with other students, 45 to 50% of applicants, which aimed at recognition, were admitted to the desired study program. Students who were admitted due to the recognition of formal, non-formal and informal learning take a share of about 5% of all students [cf. Carlsten et al. 2006, p. 46].

Regarding the above typology the approach belongs to the type ‘Integration’.

2.2 Validation des Acquis de l'Expérience (VAE)

The Loi de modernisation sociale of 2002 is the foundation of VAE in France and enables anyone who has been in paid, unpaid or voluntary work for at least three years to have their
occupational and personal experiences recognised and be awarded an appropriate official qualification. This law affects all organisations issuing national diplomas and qualifications and opens up a fourth pathway to full accreditation to run alongside school education, vocational education and training and continuing training [cf. Haeringer 2006, p. 86].

In order to use the VAE system, applicants who have acquired competences which are equivalent to an official qualification need to contact the educational organisation issuing the qualification which they seek to obtain. All relevant organisations have been required to develop procedures for the enactment and implementation of the VAE legislation. Although very little in the way of guidance was provided, the educational institutions have now introduced largely standardised methods [cf. ibidem, pp. 88f].

The aim at this juncture is to provide a brief outline of the VAE procedure (for detailed information on the individual stages within the process cf. ECOTEC 2007, pp. 3ff]. The decree which followed the law of 2002 stipulates five essential stages within the VAE system: 1. Information on the VAE process provided by regional centres, national information systems (e.g. www.vae.gouv.fr) and the educational organisations themselves. 2. Decision on the permissibility (recevabilité) of the application in the form of the duration of the occupational experience in relation to the content of the qualification (the fundamental permissibility criterion is evidence of occupational experience extending over a period of at least three years). 3. The candidate compiles a portfolio or dossier describing his or her experiences. This may comprise an observation made by the candidate within his or her work situation or in a simulated simulation and may also constitute other forms of evidence. This phase offers opportunities for candidates to receive mentoring and funding. 4. Interview/dialogue with a jury at the request of the jury or of the candidate (only mandatory in the higher education sector). 5. Consideration and decision by the jury on the basis of the documents produced and on the basis of their own observations. Diplomas, certificates and qualifications issued do not state whether such diplomas, certificates and qualifications have been acquired via VAE or via a formal pathway [cf. Hawley 2007, pp. 5ff].

The VAE concept and trust in it have gradually developed, and its introduction may today be evaluated as having been relatively successful. Evidence for this is reflected in the number of users. But the number of certifications awarded via VAE is extremely low compared to the total number of qualifications issued in France [cf. Charraud 2007, pp. 149ff]. All diploma awarding ministries permitted just under 75,000 dossiers in 2009. 58,000 of these dossiers were evaluated by a jury. From 2002 to 2009 about 136,000 candidates gained recognition via using the VAE [cf. DARES 2010]. The following trends are discernable. VAE is being used increasingly in the health and social sector. A small proportion of the qualifications issued via VAE is in the higher education sector. VAE is primarily used by women [cf. Charraud 2007, p.158].

As the Norwegian approach the French one is another example for an approach that can be typologised as an integrative approach.

2.3 European Computer Driving Licence (ECDL)

The ECDL is an internationally recognized certificate for computer users whose aim is to certify knowledge about computers and skills concerning certain widespread standard computer applications. The international coordination is in the hands of the ECDL Foundation, an NPO based in Dublin that internationally supervises the compliance with the current EDCL standard and continuously advances the EDCL. The ECDL is being edited by 30 European societies for informatics. The national contract partners of the EDCL Foundation are responsible for the implementation in the respective countries [cf. DLGI 2010; Sherwood-Smith 2000, p.240f].

The syllabus of the EDCL is regularly updated by experts of the 148 countries involved. The current version 5.0 was introduced in February 2008 [cf. ECDL Foundation
The contents aim at basic skills that are necessary to use a computer. The ECDL syllabus is not product-related.

The ECDL is not a certificate for IT specialists but a certificate for the broad public focused on basic education in the informatics domain.

The ‘ECDL Core’ tests seven modules complementing one another: Module 1: Concepts of Information and Communication Technology (ICT), Module 2: Using the Computer and Managing Files, Module 3: Word Processing, Module 4: Spreadsheets, Module 5: Using Databases, Module 6: Presentation and Module 7: Web Browsing and Communication [cf. http://www.ecdl.de/inhalt/]. After paying a registration and administration charge, the candidate receives a so-called SkillsCard number which allows him/her to take the ECDL-test in all of the 148 countries. The card is valid for three years after taking the first test.

ECDL exams are exclusively taken by examination centres to which the respective national ECDL organisation sold an admission. In many countries the exams are carried out online. The exams are supervised by test supervisors who know the examination guidelines and the testing system. At present, a module exam has 36 questions that have to be dealt with within 35 minutes. One has to achieve at least 75% to pass the test [cf. http://www.ecdl.de/diagnosetest/faq/]. The tests are developed and validated by experts. Quality criteria are reliability and content validity. The procedure has to comply with the requirements of the ECDL Foundation, which are formulated in the so-called Characteristic Test Template (CTT). This is a prescription which determines how the tests have to be created. Syllabus and CTT are the standardized requirements for all countries of the ECDL. They assure that the requirements of the ECDL-tests are consistent in the entire world. The ECDL has the aim not to provide theoretical but practical knowledge in informatics concerning a standard software in the sense of a broad IT education. According to this the questions within the tests are application-orientated.

The certificate is internationally introduced as ICDL (International Computer Driving Licence) in 148 countries. The ECDL (or the ICDL) exists in 38 languages. There are 9 million ECDL/ICDL candidates worldwide. Nearly 25 million tests have been made so far. In Germany, more than 350,000 candidates have participated in the ECDL-programme since 1997 [cf. http://www.digi.de/fileadmin/redaktion/ECDL-Workshop/ECDLFactsheet2010.pdf].

The ECDL is an example for an approach designed very similar like the ideal type ‘Autonomy’.

2.4 ProfilPASS-System

The development-based ProfilPASS serves as a systematic identification, documentation and self-assessment of skills and competencies, regardless of the learning context in which they were acquired. In addition, it is the intention of the ProfilPASS, to motivate the users to develop educational, vocational or everyday life-related targets. The process demands critical reflection on the skills and competencies as well as the estimation of developments and requirements in the future by the individual [cf. ECOTEC 2008, p. 10f].

The aim of the ProfilPASS is to promote the awareness of personal strengths and weaknesses, through an accompanied development of an individual competence profile. As the ProfilPASS process aims to visualise and document individual capabilities and competences the users must firstly get to know their competences through self-reflection. The focus is not put on a special area of life. A detailed analysis of the individual’s activities by scrutinising and describing them is the core of the process. Then actually relevant capabilities, skills and competences are derived from these activities. The evaluation is based on a four-stage scale which is orientated toward the frame of reference for the European Language Portfolio. There is a differentiation between guided and independent actions in familiar and unfamiliar contexts. In a qualitative manner the transferability of
competences counts. The single steps of the process are “name”, “describe”, “summarise” and “evaluate”. A record of competences is created which the person can use to present himself and to develop further. Following the individual competences record goals and an individual action plan is formulated [cf. Bundesministerium für Bildung und Forschung 2008, p.44f; Annen/Bretschneider 2009, p.192].

Based on biographical stations as a result of the ProfiPASS procedure an individual certificate of competence the individual can make use of is developed to present themselves to a third party. Aims and individual action plans are drafted on the basis of the individual proof of qualifications. So far 54 764 ProfiPASS folders and 53 043 folders of the ProfiPASS were issued to young people [cf. Bundesministerium für Bildung und Forschung 2008, p. 44f and Annen/Bretschneider 2009; 2011, p. 192].

In addition to the ProfiPASS document itself, the ProfiPASS-System contains a guidance and consulting concept. The individual should be supported by qualified and special trained consultants to deal with his/her biography (biographical approach). The entire system is coordinated by Germany's national ProfiPASS service department [cf. Bundesministerium für Bildung und Forschung 2008, p. 44]. A national network has been built up for the implementation of the concept, whose coordination is done centrally by a national service centre. This institution works together with the dialogue centres to raise awareness locally. The dialogue centres are individual educational establishments of excellent regional standing or networks of educational establishments. The above specially-qualified disseminators implementing the qualification of advisers are generally based at the dialogue centres [cf. Bundesministerium für Bildung und Forschung 2008, p.45].

The ProfiPASS-System is a practical example of an approach that is representative for the ideal type ‘Secondation’.

3 Comparative analysis of the selected approaches towards recognition

The above presented approaches represent different types of the before introduced typology. In the following a summing up comparison of these approaches is done regarding their methodological and their institutional design.

3.1 Comparison of the methodological design of the approaches

Regarding the approaches’ methodological design one can determine that the approaches representing the types ‘Integration’ and ‘Secondation’ use rather similar methods. Thereby the methodological repertoire of the integrative approaches is broader and it covers all phases of the recognition process. This evitable deficit of the supporting approach could be obliterated by another formation of the institutional structures. This affects the stakeholders on the one hand and the norms and standards on the other hand. The achievement of a certification and especially a formal recognition is obviously connected with a summative orientation of the approach. Furthermore a third party has to participate in the approach to integrate these two steps.

One main advantage of the approaches belonging to the ideal type ‘Secondation’ is that they cope best with the requirements of non-formal and informal learning. In contrast the approaches belonging to the ideal type ‘Integration’ stand out due to the fact that they cover the whole process of recognition. The approach which is representative for the ideal type ‘Autonomy’ is methodological rather limited, as he doesn’t contain any self-assessment and is focused only on one method. This approach also only covers parts of the whole process of recognition. But one strength of this approach is that within it individual competences are really measured by evaluating the individual’s performance in a test situation. This element can also be part of the approaches belonging to the type ‘Integration’ – depending on the
individual case. The following figure 3 provides an overview of the methodological design of the analysed approaches.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Methodological Objective</th>
<th>Type of Assessment</th>
<th>Concrete Methods</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realkompetanse</td>
<td>summative and formative</td>
<td>mostly third party- and self-assessment</td>
<td>portfolio, interview, observation</td>
<td>identification, assessment, validation, certification, formal recognition</td>
</tr>
<tr>
<td>VAE</td>
<td>summative and formative</td>
<td>mostly third party- and self-assessment</td>
<td>portfolio, interview, observation</td>
<td>identification, assessment, validation, certification, formal recognition</td>
</tr>
<tr>
<td>ECDL</td>
<td>summative</td>
<td>third party- assessment</td>
<td>computer based test</td>
<td>assessment, validation, certification</td>
</tr>
<tr>
<td>Profil-PASS</td>
<td>rather formative</td>
<td>self-assessment</td>
<td>portfolio, dialogue</td>
<td>identification, assessment</td>
</tr>
</tbody>
</table>

Figure 3: Methodological design of the approaches

3.2 Institutional design of the approaches

Figure 4 shows that the exemplary approaches are overall characterised by a rather diverse institutional design. While the approaches belonging to the ideal types 'Integration' and 'Autonomy' are more directed towards an utilization within the formal educational system and on the labour market, the approach, which represents the type 'Secondation', is more directed towards the individuals and their advancement. The promotion of the concept of lifelong learning is one element that conjoins the approaches with each other. This aim is also of high relevance on the European political agenda (e.g. within the Lifelong Learning Programme 2007-2013).

The three ideal types can be relatively clear classified regarding certain sectors. The integrative approaches have a broad network and integrate stakeholders from different sectors. In contrast the autonomous approach is more strongly anchored within the private sector, but with connections to the formal educational system. The approach representing the type 'Secondation' finally is mainly anchored within the non-profit sector. Regarding the criterion 'stakeholders' the both last named approaches have potential to develop and to get anchored in the formal educational system. This is essential, because to achieve a formal recognition of competences the stakeholders of the formal educational system are mandatory to be engaged in the process or the existing rights of disposal (usually lying in their hands) have to be changed respectively adjusted. This comes along with a stronger orientation towards the corresponding standards. The approaches of the type 'Autonomy' and 'Secondation' indeed contain already assessment standards, but the orientation towards educational or occupational standards is not yet included. The organisational rights of disposal within the integrative approaches lie exclusively in the hands of the stakeholders of the formal educational system, which leads for the individual to diplomas (or certificates) with a value in the formal educational system and on the labour market. The situation is different within both other approach types. They are characterised by accreditation structures within the system. But the individuals therefore only receive certificates that are mainly connected with entitlements within the approaches themselves and less within the formal educational system or on the labour market. In this regard cooperation and the location of the achieved certificates within a qualification framework might be beneficial. Within all approaches the rights of disposal are unequivocally distributed among the stakeholders, which is positive. For the acceptance of an approach accreditation of institutions as well as quality assurance is a necessary precondition which all approaches conform to.
In general the results of the institutional design of the approaches show that in most cases a lot of stakeholders are involved and that therefore the coordination of these approaches is rather complex. Furthermore the analysis shows that the coordination mechanism network is relevant within every approach, but is or has to be complemented in most cases by the mechanisms market or hierarchy to motivate or obligate the relevant stakeholders to implement and to make use of the approaches. All analysed approaches have still potential regarding the provision of information, that is first of all making the procedures and standards used transparent for the individuals. This is very important, because the analysis shows that standards are relevant for the recognition in every approach.

4 Conclusion, forecast and recommendations

As a general result one can assume that the type ‘Integration’ can be recommended in every national context to offer people the opportunity to get their informal learning formally recognized. To establish an approach of this type there are some elements that can support the implementation and acceptance: After a phase of the development and testing within projects an integrative nation-wide approach should be anchored and supported by corresponding laws and institutional structures. The examples of France and Norway show that it makes sense to have one or a couple of central stakeholders that develop and promote the approach. The bargaining of a consistent nation-wide quality code or standard can also be useful. Regarding the legal anchoring of the approach there are two main aspects which should be regulated: first a standard regarding the proceedings of the approach and second the legal right of every citizen to use the approach. Furthermore the existing stakeholders should be considered and integrated within the development and the implementation of the approach. It is furthermore recommended that all qualifications that are classified within a national qualifications framework should be available for the
recognition approach. Finally a nation-wide guidance and consulting network should be developed to that eases the estimation of the benefit of the approach for the individuals.

One problem of the integrative approach is the strong orientation towards formal qualifications and less towards the individual’s competences. Regarding this the two other types are relevant to take the individual in an adequate way into account within the process of recognition of non-formal and informal learning. Here the type ‘Secondation’ has strengths, while putting the individual in the focus of the recognition process. The type ‘Autonomy’ offers an intermediate solution. It uses qualification structures as references for the recognition while simultaneous being geared towards individual and informal learning processes. So the three types of approaches can be combined. The approaches belonging to the type ‘Secondation’ can be used in preparation of the use of an approach belonging to the type ‘Integration’. That makes sense, because the latter often lack in elaborated and area-wide consulting systems. The approaches of the type ‘Autonomy’ can also complement the other ones by certifying and documenting competences, which are not part of the formal educational system, but which can be integrated in formal qualifications or in recognition procedures, which lead to formal qualifications.

The results show that systems to support individuals in making their competences transparent and getting them recognised are missing and must be developed. Furthermore studies on the differences between the theoretical conceptualisation and the practical use of the approaches should be done. Overall more empirical data on the costs and the value of the approaches is needed. Here not only monetary but also transaction costs or opportunity costs for the individuals as well as for the institutions must be regarded.

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Enhancing the Image and Attractiveness of TVET

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Abstract

The image and attractiveness of VET (Vocational Education and Training) constitutes an interesting topic that needs to be discussed. The issues related to this not only exist in developing countries but also in developed countries. In some countries in Asia like China, India, Russia, and South Korea until today VET is regarded second class education (Ruth and Grollmann 2009). In Indonesia, Vocational Education and Training has yet to develop like in some countries in Asia and also has yet to get good image and attractiveness in societies and industrial communities. If we are talking about VET, it can be said that in rich societies parents rarely send their son and/or their daughter to a vocational school, they rather tend to prefer general education.

Talking about VET, in most societies the graduates from VET, especially from TVET (Technical Vocational Education and Training) are regarded as not ready for work. This is due to many factors, among others: lack of facilities for practice, lack of linkages between schools and companies, a poor educational system, lack of teachers’ qualifications, etc.

Through this paper I want to propound some solution, strategy, and measures that can be used to enhance the image and attractiveness of VET or TVET. If seen at a glance, China, India, Russia, and South Korea could be followed in developing VET programs where they have been successful to increase the image and attractiveness of VET. Indonesia has made some breakthrough in enhancing the image and attractiveness of VET/TVET, among others, by increasing the share of vocational education and training with a target ratio between TVET and general high school education of 70% to 30% in 2015. In addition, another step that can be considered for enhancing the image and attractiveness of VET is establishing more higher education within vocational fields. According to latest information the Indonesian government will establish community colleges in order to increase the educational quality primarily in the field of vocational education.

1 Introduction

Rapid advances in the field of economy have been achieved by countries in Asia, especially China, India, Russia and South Korea over the last decade and made the EU (European Union / EU) curious about the policies that have been implemented by these Asian countries with respect to vocational education and training. China has been able to develop in goods manufacturing, India and Korea in software development and IT, and Russia in export of oil, gas, metals and services. All of them feature a very rapid GDP growth.

In connection with this condition the following needs to be studied: (1) The pattern of development of vocational education and training (VET) and its performance; (2) How each country is running its VET policy considering the very fast economic progress over the past decade; (3) The extent to which the role of government, public and industrial sectors and companies are involved and assist in advancing education in general, and in vocational
education. All these four countries basically expose almost similar patterns of VET administration.

For example, vocational schools are properly provided with infrastructure, practice facilities, activities or employment practices in industry, and in South Korea companies that employ more than 300 people are obliged to provide means of practice and practical assistance.

Various efforts have been made by several countries in Asia, including Indonesia, to improve the image and the attractiveness of VET. VET is still perceived as not as good as general education. China and South Korea, for example, are having strong Confucian cultural heritage where blue-collar workers such as technicians and labourers are considered lower-class workers and despised by the general population. Similar conditions exist in Indonesian society, where upper middle class children almost certainly will be directed to choose general education in order to pursue their goals in higher education (university).

In the countries of the EU (European Union) the image and attractiveness of vocational education and training has been an issue for decades, in that policy makers and practitioners are concerned about vocational education since many people (parents) prefer to send their sons / daughters to general education or university rather than to VET.

To know the real state of the peoples' interest in VET, the public is given the opportunity to specify the desired school choice. It turns out in the EU in general, that vocational schools are still considered second-class, not as attractive as general schools. The concept of attractiveness has broad dimensions such as perceptions of employers and labor market position, VET graduates' skills in relation to the business/industry needs, and VET graduates' earning interest. Additionally, VET graduates must have sensitivity, creativity and innovation skills.

In this paper, the author used data about VET systems in the four Asian countries, namely China, India, Russia and South Korea, from the publication "Monitoring VET systems of Major EU Competitor Countries" written by Klaus Ruth and Philipp Grollmann (2009). Information about VET systems in those countries are used in considerations how to enhance the image and attractiveness of TVET primarily in Indonesia.

2 Image and attractiveness VET in four Asian Countries

The image and the attractiveness of VET has been a problem for decades in most European countries (Ruth and Grollmann, 2009:44). Policy makers and practitioners are concerned about students and their parents choosing general education instead of vocational education and training. VET is often seen as a second choice, and generally the students who sign up to school in VET are those with lower achievement.

Countries in Asia such as China, India, Russia, and Korea have been consistent in developing vocational training (VET). To improve the image of vocational education, China has developed IVET (Initial Vocational Education and Training) at the tertiary level over the past decade. IVET developments at secondary and tertiary level in China, especially the opening of vocational universities since the mid-1990s have contributed to a better image of VET pathways, because they provide a degree.

The same happened in South Korea, namely, that society's view of vocational education and training is not as good as that of general education. The policy pursued by the South Korean government allows to switch track, from the track of vocational education to general education or vice versa. South Korea and China are opening a pathway to higher education with vocational education for four years and Bachelor degree. The steps taken

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1 In this article the terms "vocational education and training" (VET) and "technical and vocational education and training (TVET) are used interchangeably.
have the potential to improve the image and attractiveness of vocational education and training.

India faces the same situation as China and Korea with respect to the image of vocational education and training. India introduced policies, which allow graduates of vocational education to proceed to higher levels, but the number of graduates who are going on is still limited. In India the term known as vocationalised curriculum is an attempt to improve the image of vocational education, but the results are not yet visible. When looking at the conditions in India, it can be found that India tries to enhance the image and attractiveness by improving effectiveness, efficiency and relevance of VET. In addition there is vocational education cooperation with the industry, and vocational education tries to follow developments in the industry by sending teachers to practice to study about new technologies.

Vocational education at the secondary level in Russia has suffered from a decrease of the number of applicants, and those applicants who apply, usually are from economically disadvantaged groups. Russian companies prefer to recruit graduates from higher VET instead of graduates from secondary vocational schools, which in addition affects the image and attractiveness of secondary vocational education. Russia is also implementing a VET education model for line flexibility, in that Graduates from specific secondary vocational education programs are accepted in higher education programs of the same subject area.

In the following, for China, India, Russia, and Korea, the steps taken in an effort to enhance the image and attractiveness of VET are explained.

2.1 China

Following the Chinese government's policy of providing opportunities to students of secondary vocational schools to be able to pursue higher education (tertiary level) there has been an increasing number of applicants for vocational schools (see table 1).

Table 1: Development of Students in China’s Vocational Schools and Universities (2000-2004)

<table>
<thead>
<tr>
<th>Year</th>
<th>Students at vocational schools (in 1000)</th>
<th>Students at vocational universities (in 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>14,092</td>
<td>5,957</td>
</tr>
<tr>
<td>2003</td>
<td>12,237</td>
<td>4,794</td>
</tr>
<tr>
<td>2002</td>
<td>11,209</td>
<td>3,763</td>
</tr>
<tr>
<td>2001</td>
<td>10,591</td>
<td>2,947</td>
</tr>
<tr>
<td>2000</td>
<td>11,328</td>
<td>2,161</td>
</tr>
</tbody>
</table>


Table 1 shows a tremendous increase in applicants for higher vocational education. The number of applicants who went on to university or college has more than doubled within a period of 5 years. At the same time there is an increasing number of applicants for vocational schools as a result of government policies that facilitate students’ move from general education schools to vocational schools and vice versa. China’s policies for vocational education apparently have considerably improved its image in the public perception. Similarly, in terms of gender differences the statistics show that women score better in exams than boys.

2.2 India

The results of research conducted by a research group in India in the mid-1990s showed that the quality of vocational education in India is low (Ruth and Grollmann, 2009). To deal
with the problem of unemployment and the attractiveness of vocational education, the measures being implemented to strengthen the position of vocational education are to develop vocational education curricula by including industry support. In addition there are vocational education programs run by the government, namely the advanced study programs for students who have a good record and which lead to higher levels in the field of VET. Such programs are implemented by the Indian government in fields like agriculture, trade, humanities etc. The results of research conducted by The Operation Research Group (1996), showed that approximately 38% of vocational students wish to continue on to a higher level (Ruth and Grollmann, 2009:50).

2.3 Korea

According to the study conducted by Ruth and Grollmann (2009) using statistical data on 2004, only 35% of students chose vocational schools instead of general schools. This ratio gives some hints about the general public's perception of the VET system in Korea. A detailed analysis of the number of graduates from vocational high schools showed a decrease of approximately 30% in 2004.

The Korean government tried to improve the role of vocational education in accordance with the needs of the market with respect to the development of technology. Related to this, the National Commission for the Reform of Education and the Ministry of Education and Human Resources had launched plans to reform the vocational education system in 2004. The plan proposed to increase the number of vocational schools significantly and also proposed fundamental steps in strengthening vocational education and training, such as: changes in the overall structure of the curriculum, slight changes in the number of students in a class, to improve the quality of practice in the field of training, to implement school-based economic activities, and to encourage students to take business activities more serious. To improve the image of vocational education, South Korea has made various efforts including: enhancing the cooperation with industry and connecting with local companies by establishing Industrial Technology Education Zones.

With respect to the labor market it is important to note, that there has been no difference in the number of unemployed graduates of vocational education and general education. Actually one would expect that an appropriate vocational education would be able to reduce unemployment in the respective group.

Education system policies, that allow a change of path between vocational education and general education, in principle, are not available. Other programs conducted to enhance the image of vocational education include offering further courses after graduation. There have also been initiatives to encourage graduates of vocational colleges to proceed to higher education in order to get a bachelor degree. In addition there is a new policy in Korea, according to which workers who improved their skills by means of training will get better payment. Such steps can increase the image and attractiveness of TVET/VET.

2.4 Russia

The development of vocational education in Russia is not much different from the other Asian countries. Vocational education at the level of NPO (nachal'noe professional'noe obrazovanie – initial vocational education) or equivalent secondary vocational education has undergone decrease while SPO (strednee professional'noe obrazovanie – medium level vocational education) gradually increased, so that the vocational education on SPO level seems to be more attractive. There is an overall perception in Russian society, that NPO has a very low reputation. Due to Russia's policy in the past (1940) NPO level graduates have been employed with low wages (Ruth and Grollmann, 2009). At that time, nearly 80% of workers had a low income, and as many as 70% were living as farmers. Therefore, currently
there are trends that young Russians choose to continue to higher education and employers also tend to recruit laborers from college or university graduates. To enhance the image and attractiveness of VET, the Russian government undertakes measures such as: Improving access and quality of vocational education persistently; remaining consistent toward international standards in terms of content of vocational education; enhancing the attractiveness for private VET and encouraging stakeholder involvement (namely: social institutions).

3 Image and Attractiveness of VET in Indonesia

In parallel to the introduction of government policies on the proportion of 70% for SMK (Sekolah Menengah Kejuruan – Vocational Middle School) and 30% for SMA (Sekolah Menengah Atas - General High school) the concept of Factory School has been implemented in selected vocational schools. The results of students' work in factory schools are attracting more and more attention, such as in Solo with the production of the SMK car, in Bandung with Jabiru aircraft (Harian Umum Pikiran Rakyat, 31 January 2012) and many others. People are beginning to notice that TVET is able to adopt and implement high technology within fields like machinery, electrical engineering, informatics etc.

It is undeniable that among the public there are still views, that vocational schools are schools for the marginalized sections of society and that they are meant for economically disadvantaged parts of society as well as for persons with second class achievements. Generating confidence in and understanding of TVET in the society needs time, and vocational education should be able to demonstrate consistent presence in the fields of technology and life skills.

When looking from outside and more objectively, the underlying reasons that have led to the weak reputation, might among others be seen in the fact, that many vocational schools have deficiencies in organizing the students' learning processes.

The major problems of Indonesian TVET in terms of VET image and attractiveness can also be found in other Asian countries. They are:

a) VET graduates still do not conform to the needs of the world of work in companies (Siregar 2011).
b) There is no pattern of good cooperation between schools / universities with industry, (Parsa 2006).
c) There is no well-established model of quality apprenticeship with companies involved, and the structure and content of the curriculum does not match the requirements of the world of work (Rizkya 2011).

Hence, the problematic issues related to image and attractiveness of VET/TVET in Indonesia are basically the same as stated further above. The other four Asian countries are consistent in the handling vocational education, and their economic progress is significant in terms of the increase of Gross Domestic Product (GDP) due to their very fast growing industry sector. Growth in the industrial sector is supported by skilled workers from vocational education. The Indonesian Government should have a closer look at certain policies of the other Asian countries, namely the introduction of higher vocational education in India and China and the pattern of cooperation between vocational schools and companies in South Korea.

4 Efforts to Enhance the Image and Attractiveness of TVET

To improve the image and attractiveness of vocational education, the Indonesian government since the 1980ies continuously has tried to improve the quality of vocational
education. In the 1990ies, Professor Dr. Wardiman Djonegoro as Minister of Education and Culture implemented a dual system of education model program (known as pendidikan system ganda - dual system). The program was not successful, due to lacking responsiveness of companies and industries to the program for various reasons. These reasons included the Asian financial crisis end of the 1990ies and the Indonesian political upheaval. So the dual systems program did not run as smooth as intended (Sugihartono 2009).

Various concepts have been implemented to improve the quality, the image and the attractiveness of vocational education, such as production based teaching (teaching factory). For example SMK Mikael in Solo, Central Java, implemented this model and called it production based education and training, Samodra 2012. This learning model has also been implemented in other institutions, like in Bandung State Manufacture Polytechnic (Moerwismadhi, 2012), in accordance with their specific conditions and the industry that supports it.

So far, limitations in equipment and materials in vocational practice impose constraints to improve the skills of vocational students. Schools have made efforts to improve the skills of students with a variety of co-operations with industry and companies. Students have to do an internship in a company, but due to various constraints the internship implementation does not run according to expectations. Companies seem reluctant to accept internship students since they feel that they disrupt production. But also the schools tend not to engage sufficiently in the supervision of students during internships, and companies are not provided with concepts on how to organise workplace learning, neither from the side of politics, nor from schools or the relevant universities. However, of course, there are a small number of companies and vocational schools that have a more positive mindset.

The main issue vocational education in Indonesia is facing is not very different from other countries in Asia. It concerns the job readiness of students. After completing education in TVET they are usually not ready or do not fit for work as required by companies. Implementing well-organised, long enough internships (or apprenticeship) in vocational education might contribute to reducing this deficiency.

In the German Dual system of Vocational Education, vocational students are primarily employees in Companies (with an apprenticeship contract) and only at the second place, they are part-time students in a vocational school. The dual system is firmly established in the German education system, its roots dating back to the Middle Ages. An essential characteristic of the German dual system is the cooperation between largely private companies, on the one hand, and public vocational schools, on the other. This cooperation is regulated by law. (German Missions in the United States 2012). The ratio between the time spent in the company and the hours of theory in school is about 70%:30%, and the learning procedures are in accordance with the respective guidelines.

The linkage between vocational education and industry in Indonesia is not satisfactory, as evidenced by the many complaints coming from the vocational education side, saying that it is difficult to have cooperation with industry because of various constraints. Similar complaints about weak responsiveness of vocational schools are coming from the industry communities, admitting that the capacity of the industry for accepting students for internships or apprenticeships is very limited and sometimes is perceived as a disruption to the production process. Arguments for why the industry still is reluctant to accept students (Ratnata 1995), in practice (internship) continue with the statement, that the materials used by students who are doing an internship often are spoilt and cannot be used anymore, while raw material is expensive. In addition, internship students tend to affect production processes negatively by causing production delays.

An example of a vocational school, which actually has implemented production based education and training that is almost similar to the dual system of vocational education and training, is SMK Mikael Solo. The theory taught in school is closely related to the practice in the industry (Harian Umum Pikiran Rakyat, 31 January 2012). Students in SMK Mikael enjoy
an extensive amount of practical learning. The type of vocational education offered at SMK Mikael is able to raise the image and attractiveness of TVET in the society, proven by the increasing number of inscriptions of students and the fact that companies are offering jobs to students long before they have graduated.

4.1 Issues

Vocational education and training is still under hot discussion among the business sector, vocational education, and higher education. The Director of Secondary Vocational Education of the Indonesian Government, Anang Tjahyono (2012), in his speech during the opening of Rembug Nasional SMK Membangun Bangsa\(^2\) (National discussion on SMK building the Nation) said, that up to now, secondary vocational education has not been able to prepare graduates according to the needs of the world of work. The problems faced by vocational education today are considered to be the provision of adequate infrastructure. Facilities for practice and the quality of teachers and instructors still are matters of concern. The government has tried to improve the image and attractiveness of vocational education in the society and in the world of business. Yet, to address this issue, support is needed from various parties: the government, the business community and the public. Anang Tjahyono also said that, in the near future, the national education ministry will setup Community Colleges which will provide the opportunity to graduates from secondary vocational education to continue to D1 (Diploma 1) and D2 (Diploma 2).

Considering the mentioned facts about vocational education in a developed country like Germany, in four Asian countries (China, India, Russia and South Korea) and the present situation in Indonesia, the following statements can be made:

a) The image and attractiveness of secondary vocational education in the Indonesian society still needs to be enhanced.

b) Providers of secondary vocational education have yet to develop the quality of TVET delivery, so that the graduates’ competences are in accordance with the needs of industry employment.

c) In connection with efforts to improve the image and appeal of VET, the government, in this regard represented by the Ministry of National Education and Culture, will develop a Community College Program as a continuation of vocational education to higher education.

In an effort to improve the image and attractiveness of vocational education many local governments have supported the development of student-manufactured products, such as the SMK car in Solo, Buggi cars and Jabiru planes in Bandung, assembling of laptops in Bandung and many others.

In addition, the existence of an event of national scale, namely the student competence competition (LKS: lomba kompetensi siswa) held every year by for SMK students throughout Indonesia as the national selection for the World Skills Competition is one of the efforts in improving the quality, image and attractiveness of vocational education. In 2012 LKS was held in Bandung. Almost all participants in LKS were coming from SMK from all corners of the archipelago of Indonesia. Similarly, visitors seemed to be very enthusiastic about watching, how students displayed their skills in various fields of occupational competence. It should be noted that this activity seems to be a very important event and is worth being supported by all parties, the public, governments and universities.

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\(^2\) Held on June 18, 2012 at the Faculty of Technical and Vocational Education, Indonesia University of Education, Bandung
5 Conclusion

From the brief explanation related to the image and attractiveness of VET the following conclusions can be drawn:

- So far the image and attractiveness of vocational education is still not good and people still perceive, that choosing a vocational school is due to economic factors (they want to earn money quickly), with the hope of soon after graduating from vocational school they will be able to financially support their families. This condition also applies to higher vocational education (college) in D1 (Diploma 1), D2 (Diploma 2) and D3 (Diploma 3).
- In some Asian countries (China, India, Russia and South Korea), including Indonesia, there have been attempts to improve the image and attractiveness of vocational education through work or products generated by students from vocational schools, such as in Indonesia: SMK car, Jabiru aircraft, assembly of Laptops etc.
- There is a public perception that continuing to higher education will improve one’s status, while secondary vocational education still is deemed producing simple labourers. Actually, this perception is also still prevalent in China and Korea due to Confucian tradition, and in India due to the officially abolished, but still living caste-system, where the group of laborers and workers is considered inferior and those who are employed by the government as upper class. Generally, whoever can make it tends to choose public schools and higher education, i.e. the general education track.
- The Indonesian government is attempting to improve the quality, image and attractiveness of vocational education by opening the programs D1, D2, D3, S (strata) 2 (T: Technique) and S3 (T)³ as stated in the Regulation of the President of the Republic of Indonesia No. 8 Year 2012 about KKNI (Indonesian National Qualifications Framework). This means that vocational students who excel can continue to higher education level, very much like participants of general education.
- Until today in Indonesia, workforce graduated from SMK still is regarded as not having sufficient skills in their field, and they do not receive an interesting salary. Hopefully, in the future there will be government policies implemented, which lead to an appropriate remuneration of skilled workers with SMK graduation, so that young generations will be encouraged to choose their educational pathway via SMK, and eventually the image and attractiveness of VET/ TVET will be enhanced.

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³ S2 is the Indonesian Master degree, S3 the Indonesian equivalent to Ph.D.
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Training on an Embedded Microcontroller System Tool for Teachers of Vocational High Schools in West Java

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Abstract

A lack of competence achievement of vocational high school students will decrease the quality of graduates working in the industry. If this continues to happen, companies as the stakeholders will have low trust in the quality of vocational high school graduates. Hence, the Department of Electrical Engineering Education, Faculty of Technology and Vocational Education, Indonesia University of Education (JPTE FPTK UPI) organised a training with the objective to train teachers of vocational high schools in order to improve their competences related to the microcontroller training kit based on the microcontroller type AT89S51/52 with respect to both theory and practice. For this training an evaluation was conducted. Pre-and post-tests consisting of 23 open-ended questions which were distributed to the 18 training participants showed, that in average their knowledge in the post test was better than in the pre-test. The answers given in an additional questionnaire revealed that the training participants were satisfied with both the service and the facilities provided by JPTE for learning and practical exercises. All participants stated that the training kit, which had been developed for the training, was a new thing for them. Practical learning about microcontrollers usually is computer-aided, while the microcontroller training kit used in the training does not require computers. Therefore it is more practical, economical, and easy to use when running an experimental program in an environment, where there are not enough computers available. The competences of the participants who attended the training, namely teachers of vocational high schools under the West Java Provincial Office of Education, experienced improvement.

1 Introduction

According to data from the Ministry of National Education of the Republic of Indonesia there have been 1704 vocational high schools (Sekolah Menengah Kejuruan – SMK) in West Java as per December 2011. 203 of them were public and 1501 private vocational high schools. The target set by the Ministry of National Education for 2014 on the ratio of the number of vocational high schools to senior high schools is 67:33. The Governor of West Java stated that the ideal ratio to be achieved by West Java in 2014 would be 70:30. Therefore, he explained, the Provincial Government of West Java will make efforts to increase the number of students in vocational high schools. One of the measures is the improvement of the school buildings, including their infrastructure (Ahmad Heryawan 2012). In West Java, public and private vocational high schools proliferate, but with minimum infrastructure, especially in terms of equipment required for learning processes, such as media and training kits. During their assignment as supervisors for the Thematic Social Action Internship in vocational high schools in West Java, the authors found that most of the vocational high schools only have
one or two PLC (Programmable Logic Controller), microcontrollers, microprocessor, and/or instrumental system training kits, while the average number of students per class is between 35 and 40.

The laboratory equipment available for teaching-learning processes in vocational high schools has a huge impact on achieving the competences defined in the learning objectives. According to interviews conducted with a number of vocational high school teachers in the cities of Bandung and Cimahi, in Bandung Regency, and in other cities and regencies in West Java Province, these competences are not optimally achieved, neither by teachers nor by students. In case these deficiencies persist, companies as the clients of vocational education and training will lose trust in the quality of vocational high school graduates. In addition, there is a discrepancy between supply and demand. The number of available jobs does not match the number of graduates from vocational high schools. Hence, only good SMK graduates will have the chance to be accepted as an employee by a company.

2 Partners’ problems and their identification

In general, problems faced by private or public vocational high schools in West Java are:

a) Out-of-date practicum equipment, meaning that schools are still using old equipment or training kits compared to the advanced technologies currently applied in the companies.

b) Training kits usually are based on foreign or imported products from developed countries. Only a small number are made by teachers themselves.

c) Teachers are normally busy with their teaching routines, so that they have no time to develop and build up training equipment for practical learning themselves.

d) Teachers lack training on new technology and equipment, as informed by certain institutions. This especially applies to vocational high school teachers outside the big cities due to their busy teaching schedule and the schools’ limited budgets.

To contribute to the solution of the aforementioned problems, primarily for vocational schools at the level of regencies and sub-districts, the authors organised training on embedded microcontroller systems and distributed training kit to the participants. The authors hope, that with this knowledge and experiences at hand, the respective schools will work on completing their laboratories with training kits. Even schools that do not own computers can conduct microcontroller practice for their students and teachers using this kind of embedded system training kit, which is a low-cost stand-alone solution that does not require separate computers for programming and operation like many commercial products.

3 The objective and benefit of the training

As mentioned above, the training as well as the equipment used should contribute to overcome the problems mentioned in the previous section. Therefore, the objectives of the training were first, to train teachers of vocational high schools in order to improve their competences in the field of microcontrollers, both with respect to theory and practice. Second, the training intended to enable vocational teachers to build-up embedded system microcontroller training kits that can be operated without computers, so that they will become largely independent from expensive products from abroad. Third, the training participants should be provided with embedded system microcontroller training kits which they can use as an example for developing similar training kits for their respective schools.

By providing teachers with the knowledge on how to build such microcontroller training kits, the training was expected to create additional benefits. If teachers will build training kits in their schools and use them for instruction, hands-on learning will be implemented instead
of theoretical instruction by means of blackboard and chalk, which will enhance the students’ interest in learning and developing microcontroller applications. Learning will be more meaningful with respect to the world of work, in that students’ programming skills and their abilities to handle projects will be improved. This will improve their employability by more closely meeting the skill demands of the industries. In addition, it is expected that schools will discover the benefits of introducing this kind of training kits, which possess all the necessary and at the same time easy-to-operate technical features, while having considerable economic advantages over foreign computer-aided products.

4 Training models

Oemar Hamalik (2003, p. 20) lists a number of training models frequently used in educational institutions or companies. The models are: Public Vocational Training, Apprentice Training, Vestibule Training (Off the job Training), On the Job Training (Training while Working), Pre-employment training (Training prior to induction), Induction Training, Supervisor Training, Understudy Training, and Internship Training. The use of a certain model depends on the training objectives and the chosen mode of training organisation.

Shuller and Jackson (1997, p. 339) note, that “successful training program development will depend on appropriate program selection for appropriate people in the appropriate situation”, meaning that the choice of the training model and its deployment will depend on the professional work field for which training is needed and on the intended function of the training itself, in addition to the time and budget available.

For the training described in this article, the Understudy Training Model was chosen which aims to prepare capable workers in certain professions, in this case educators in public and private vocational high schools in the Province of West Java in the field of microcontroller application.

5 Organization and evaluation of the training

In order to organise the training, the authors communicated the plans to the competent provincial and regional Offices of Education in West Java via internet, phone, and mail. A number of public and private vocational high schools were selected and informed that they should send teaching staff to the training. They gave dispensation for teachers teaching microcontroller to attend the training on creating embedded system microcontroller training kits. Each vocational school was allowed to assign a maximum of two people to attend the training. The training participants could communicate with the Department of Electrical Engineering Education through its website or via phone and email.

The Department of Electrical Engineering Education, namely the laboratory coordinator, prepared the required number of microcontroller training kits and complete processor units in order to distribute them to the training participants who have been assigned before. All in all ten embedded system microcontroller training kits and 20 processor units have been distributed. The organisers provided all required facilities like hotel accommodation, transportation, refreshments, training kits, modules, and other relevant facilities free of charge for the participants. The training was conducted on July 13-14, 2012, with a total volume of 20 hours or 1200 minutes.

In order to assess the efficiency of the training, methods of evaluation research were applied. Evaluation research is a descriptive type of research designed to deal with complex social issues, the latest so called fourth generation evaluation research (Clarke, 2005 p. 41). At the beginning of the training, participants had to fill in a pre-test to check their knowledge level. After the post test was conducted and evaluated and participants had filled in an
additional questionnaire, participation certificates and the training kits were handed over to the participants.

6 The embedded system microcontroller training kit

A microcontroller is a small computer located on a single integrated circuit which contains at least a processor core, programmable input/output and additional memory. Program memory often comes in the form of one time programmable read-only memory (OTP ROM) or flash memory included on chip, as well as a typically small amount of random access memory (RAM). Microcontrollers are designed for special purpose applications, in contrast to the microprocessors which are used in personal computers and other applications.

The embedded system microcontroller training kit is the instrument of choice for learning to develop programs using assembly language. It can be used for programming and running input-output programs with inputs e.g. from a keypad or push buttons and outputs like LEDs, counters, seven segment elements, LCDs, or stepper motors. The microcontroller training kit does neither require a computer for operation nor for programming. The program is typed in using a directly connected keyboard and the programming code is stored in external memory and displayed on the LCD. Once finished, the program can be downloaded to the microcontroller.

7 Evaluation results

For evaluation of the training two distinct instruments were used.

7.1 Improvement of participants’ competences

Before the training a pre-test was given, in order to find out about the preliminary participants’ knowledge on microcontrollers. At the end of the training, a post-test was run to check the participants’ competence improvements. During the training, facilities for practical learning were optimal, with one microcontroller training kit, including modules, data book and other relevant items available for each pair of two participants.

The first instrument was a questionnaire related to subject matter knowledge. It contained 23 open ended questions, the participants had to answer during the pre-test at the
beginning of the training and again in the post-test at the end of the training. For evaluating the tests, for each correctly answered question one point was given, for a wrong answer no point was given. In the pre-test the 18 participants answered a total sum of 189 (from 414) questions correctly, resulting in a mean pre-test score of 189/18 = 10.5. The post-test featured a sum of 332 correct answers leading to a mean post-test score of 332/18 = 18.5. The relative gain ((post-test score – pre-test score) / (maximum possible score – pre-test score)) was 0.61, which can be categorized as fairly good (Savinainen & Scott 2002 p. 45). This test especially addressed the cognitive domain, while for the affective and psychomotoric domains there have been no measurements yet.

7.2 Trainees’ Opinion on the Training

In addition to the combination of pre- and post-tests, a second questionnaire with 19 questions was distributed to find out about the participants’ opinion on the training. Figure 2 gives a graphical overview of the answers to the questions, which could be yes or no. The graph shows, that most of the questions were answered similarly by the participants.

![Figure 2: Participants’ positive answers on 19 questions](image)

The most remarkable results of the questionnaire were that all participants

1) said that the training materials were really useful for their profession as teacher;
2) agreed that it would be very good if in the future such training could be conducted periodically;
3) were satisfied with the training on the embedded system microcontroller trainer;
4) revealed that they were deeply impressed and very satisfied with the service of the training;
5) were of the opinion that the trainer fulfills the minimum standard requirements for an experimental learning system;
6) were convinced that the trainer could be used in all public and private vocational high schools in West Java.

Questions on which not a hundred percent of the participants answered with yes addressed topics like whether they usually use the same microcontroller model, whether they already have basic microcontroller knowledge, whether they already had used foreign-modified or self-modified microcontroller tools, etc.

8 Conclusions and suggestions

The evaluation of the training on the embedded microcontroller system training kit with 18 participants from technical vocational high schools in the area of West Java representing
various regions showed that the teachers of both public and private vocational high schools experienced considerable improvement in their related cognitive competence and that all participants were satisfied with the service, the instruction, and the facilities for practical learning provided by the Department of Electrical Engineering Education.

Experiences during the training showed, that it would be better if the training kit was downsized and if a smaller keyboard would be used, so that less space would be required for operating the training kit. According to the opinion of the participants all vocational high schools in the country, public and private, should be informed about the microcontroller embedded system training kit because for Indonesia it is a novel training kit concept which up to now barely can be found in any school in the country.

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Additional Reading


Vocational Technology Education Students’ Perception on Employability Skills

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Abstract

Employability skills are the general skills which play an important part in contributing to employees’ successful performance at their workplaces. Some studies suggest that a person’s success is not solely determined by knowledge and technical skills (hard skills), but also by the ability to manage oneself and others (employability skills). Lack of employability skills is one of the weaknesses of university graduates in Indonesia. One possible cause is that students and teachers have different perceptions of what employability skills are.

In this study, vocational technology education students’ perceptions of employability skills were assessed, and the results were compared with their lecturers’ perceptions. Data was obtained by distributing questionnaires to lecturers and final year undergraduate students. The questionnaire was designed in the form of a Likert scale with five options, and then analyzed.

A moderate correlation was found between lecturers’ and student’s perceptions with respect to the relative priorities of different employability skills. Skills such as problem-solving, using technology/computer, and oral communication scored higher than team-work, making decisions, and learning ability, while working under pressure and written communication were given lowest priority by the students. This is somewhat different from the perceptions of lecturers where skills such as good literacy (reading and writing) and oral communication are assigned the highest priority whilst working under pressure, leadership and planning and organizational skills were given the lowest priority. The biggest difference between the perceptions of students and lecturers was found for written communication skills.

1 Introduction

According to data from Badan Pusat Statistik (Statistics Indonesia), Indonesia’s open unemployment rate\(^1\) in February 2012 was 6.32% equalling 7.61 million people. This number has decreased 6% compared to February 2011, when 8.12 million people were without work. The highest open unemployment rates are recorded for graduates from Senior High School (Sekolah Menengah Atas - SMA) and Vocational High School (Sekolah Menengah Kejuruan - SMK). The unemployment rates by highest level of education attained were: 3.69% for Elementary School (Sekolah Dasar - SD), 7.80% for Junior High School (Sekolah Menengah Pertama - SMP), 10.34% for SMA, 9.51% for SMK graduates, 7.50% for Diploma I/II/III holders, and 6.95% for university graduates. Statistical data shows an increase of employment in the formal sector, a shift from agriculture to industry, a decline in the number

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\(^1\) Somebody who is not working but is looking for work is considered unemployed. For Indonesia’s official statistics the concept of working means activity intended to earn income by doing work or helping to do work at least one hour continuously during the reference week (including unpaid family worker/s for any economic activity). The unemployment rate is the number of people unemployed as a percentage of the labour force.
of low educated workers (SMP and below) and a bigger number of high-educated workers (diploma and university).

One of the reasons why many students continue their studies at university is to enhance their employment prospects. However, while good academic qualifications are highly valued, they no longer seem to be sufficient to secure employment (Yorke 2006). Due to technological developments and the expanding international orientation of many companies, labour market demands have changed. Traditional ‘hard’ selection criteria like educational background still count, but are not sufficient anymore. Many argue that individual, ‘soft’ personality characteristics have become increasingly important, because the workers need to be more flexible to keep up with the continuous changes and developments (Semeijn et al. 2000:1). This leads to changes in the personnel selection process where progressively the emphasis is put on so-called soft factors like communication skills and certain personality traits (Spencer & Spencer, 1993).

Also in Indonesia, one of the problems higher education is facing is the lack of employability skills of graduates. Many employers complain about the lack of graduates’ employability skills. As quoted in Kompas Daily, Friday (11/02/2011), Senior Marketing Communication of PT JobStreet Indonesia, Ade Wisnu Brata said, many companies in Indonesia complained about the lack of employability skills of job applicants, such as leadership, communication skills, confidence, and responsibility. Many employers think that colleges aren’t preparing students adequately for jobs.

In Indonesia, students are prepared in dedicated university programs to become vocational teachers. Teachers seem to play an important role in the learning process in the classroom, especially in helping learners to develop a positive attitude to learning, develop curiosity, independence and accuracy of intellectual logic, and in creating the conditions for success in learning. Government Regulation (PP) No. 19 Years 2005 on national education standards states that educators (teachers) in early-childhood, elementary and secondary education, the latter including vocational education, should be competent as agents of learning. Competence as learning agent includes pedagogical, personal, professional and social competencies, the later containing the so-called employability skills. Therefore, the students’ perception of employability skills and the understanding of the importance of teacher competence should be directed and prepared early by the lecturers so that the students can become qualified teachers after they graduate from the college.

Lack of employability skills is one of the weaknesses of university graduates in Indonesia, from both educational and non-educational universities. One possible cause is that students’ and lecturers’ perceptions on employability skills do no coincide. In this study, vocational technology education students’ perceptions about employability skills were assessed, and the results were compared with the perceptions of their lecturers.

2 Employability Skills

2.1 Terms and Definitions

There are various definitions of employability skills, and a number of different terms are used. “Generic skill” is the term used for employability skills in most countries, but what is meant by this term varies between countries (see table 1).

York (2006) defines employability skills as “a set of achievements — skills, understandings and personal attributes — that make graduates more likely to gain employment and to be successful in their chosen occupations, which benefits themselves, the workforce, the community, and the economy.”

The UK Commission for Employment and Skills report ‘The Employability Challenge’ (2009) has drawn on the most commonly used definitions of employability: “We take employability skills to be the skills almost everyone needs to do almost any job. They are the
skills that must be present to enable an individual to use the more specific knowledge and technical skills that their particular workplaces will require”.

Table 6: Terms used in various countries to describe generic skills

<table>
<thead>
<tr>
<th>Country</th>
<th>Terms used</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>Core skills, key skills, common skills</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Essential skills</td>
</tr>
<tr>
<td>Australia</td>
<td>Key competencies, employability skills, generic skills</td>
</tr>
<tr>
<td>Canada</td>
<td>Employability skills</td>
</tr>
<tr>
<td>United States</td>
<td>Basic skills, necessary skills, workplace know-how</td>
</tr>
<tr>
<td>Singapore</td>
<td>Critical enabling skills</td>
</tr>
<tr>
<td>France</td>
<td>Transferable skills</td>
</tr>
<tr>
<td>Germany</td>
<td>Key qualifications</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Trans-disciplinary goals</td>
</tr>
<tr>
<td>Denmark</td>
<td>Process independent qualifications</td>
</tr>
</tbody>
</table>


2.2 Important skills and capabilities when recruiting higher education graduates

Table 2 gives an impression about the skills and capabilities needed by companies today when recruiting university graduates, according to a survey conducted by the Flash Eurobarometer in 2010 in the 27 EU Member States involving 7036 companies.

Table 2: Importance of various skills and capabilities when recruiting higher education graduates

<table>
<thead>
<tr>
<th>Skills</th>
<th>The Degree of Importance (% of answer)</th>
<th>Very important</th>
<th>Rather Important</th>
<th>Rather unimportant</th>
<th>Not important at all</th>
<th>Don’t Know /No Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamwork skills</td>
<td></td>
<td>67</td>
<td>31</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sector-specific skills</td>
<td></td>
<td>62</td>
<td>29</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Communications skills</td>
<td></td>
<td>60</td>
<td>36</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Computer skills</td>
<td></td>
<td>60</td>
<td>35</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ability to adapt and act in new situations</td>
<td></td>
<td>60</td>
<td>37</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Good reading/writing skills</td>
<td></td>
<td>59</td>
<td>36</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Analytical and problem-solving skills</td>
<td></td>
<td>58</td>
<td>37</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Planning and organisational skills</td>
<td></td>
<td>53</td>
<td>42</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Decision-making skills</td>
<td></td>
<td>46</td>
<td>45</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Good with numbers</td>
<td></td>
<td>40</td>
<td>48</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Foreign language skills</td>
<td></td>
<td>33</td>
<td>34</td>
<td>22</td>
<td>11</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Flash Eurobarometer (2010)

In terms of rating certain skills and capabilities as being “very important,” recruiters were most likely to highlight the importance of teamwork (67%), followed by sector-specific skills, communication skills, computer literacy, being able to adapt to new situations, first-class ability in reading/writing, and analytical and problem-solving skills (all 58%-62%). When asked about the skills and capabilities that would be most important for future higher-education graduates (in 5 to 10 years henceforth), more than 4 in 10 (45%) employers
selected sector-specific skills, and a similar proportion (43%) mentioned basic capabilities, such as having good numeracy, literacy and computer skills. About 4 in 10 (39%) respondents felt that communication skills would be important for future higher-education graduates, and 37% said the same about teamwork skills. The data is given in Table 3.

Table 3: Opinions about the skills and capabilities that higher education graduates should have in the next 5 to 10 years

<table>
<thead>
<tr>
<th>Skills</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector-specific skills</td>
<td>45</td>
</tr>
<tr>
<td>Basic skills such as being good with numbers,</td>
<td>43</td>
</tr>
<tr>
<td>good reading and writing skills, computer skills</td>
<td></td>
</tr>
<tr>
<td>Communication skills</td>
<td>39</td>
</tr>
<tr>
<td>Teamwork skills</td>
<td>37</td>
</tr>
<tr>
<td>Analytical and problem-solving skills</td>
<td>32</td>
</tr>
<tr>
<td>Foreign language skills</td>
<td>31</td>
</tr>
<tr>
<td>Ability to adapt to and act in new situations</td>
<td>25</td>
</tr>
<tr>
<td>Planning and organisational skills</td>
<td>22</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>DK/NA</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Flash Eurobarometer (2010)

2.3 International Perspectives on Employability

In her paper, Little (2003) discusses employability in an international perspective. The purpose of this paper was to draw together information and data from a number of different countries that have a bearing on issues relating to graduate employability and from which lessons may be learned in the context of current ‘employability’ developments in the UK. Table 4 lists the 10 most highly-rated competencies possessed by UK, European and Japanese graduates at time of graduation.

Table 4: The top ten competencies possessed at time of graduation (graduates’ own ratings)

<table>
<thead>
<tr>
<th>UK</th>
<th>Europe</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning abilities</td>
<td>Learning abilities</td>
<td>Loyalty, integrity</td>
</tr>
<tr>
<td>Working independently</td>
<td>Power of concentration</td>
<td>Power of concentration</td>
</tr>
<tr>
<td>Written communication skills</td>
<td>Working independently</td>
<td>Adaptability</td>
</tr>
<tr>
<td>Working in a team</td>
<td>Written communication skills</td>
<td>Getting personally involved</td>
</tr>
<tr>
<td>Working under pressure</td>
<td>Loyalty, integrity</td>
<td>Learning abilities</td>
</tr>
<tr>
<td>Accuracy, attention to detail</td>
<td>Field-specific theoretical knowledge</td>
<td>Field-specific theoretical knowledge</td>
</tr>
<tr>
<td>Power of concentration</td>
<td>Getting personally involved</td>
<td>Fitness for work</td>
</tr>
<tr>
<td>Oral communication skills</td>
<td>Critical thinking</td>
<td>Initiative</td>
</tr>
<tr>
<td>Problem-solving ability</td>
<td>Adaptability</td>
<td>Tolerance</td>
</tr>
<tr>
<td>10 = Initiative,</td>
<td>10 Tolerance</td>
<td>10 Working in a team</td>
</tr>
<tr>
<td>10 = Adaptability</td>
<td>10 Tolerance</td>
<td></td>
</tr>
<tr>
<td>10 = Tolerance</td>
<td>10 Tolerance</td>
<td></td>
</tr>
</tbody>
</table>

3 Methodology

The study presented in this article aimed to examine Indonesian students’ and lecturers’ perceptions with respect to employability skills at the Electrical Engineering Education Study Programme, Indonesia University of Education (UPI). Data was obtained by distributing questionnaires to 22 lecturers and 82 undergraduate students. The questionnaire was designed in the form of a Likert scale with five options representing different levels of importance. Finally, the collated data was analyzed quantitatively using statistical methods. Skills attributes used in the questionnaire are shown in Table 5.

<table>
<thead>
<tr>
<th>Code</th>
<th>Skills</th>
<th>Code</th>
<th>Skills</th>
<th>Code</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Good with numbers</td>
<td>H</td>
<td>Critical thinking</td>
<td>O</td>
<td>Self-management</td>
</tr>
<tr>
<td>B</td>
<td>Good reading/writing</td>
<td>I</td>
<td>Adaptability</td>
<td>P</td>
<td>Learning abilities</td>
</tr>
<tr>
<td>C</td>
<td>Foreign language</td>
<td>J</td>
<td>Decision-making</td>
<td>Q</td>
<td>Loyalty, integrity</td>
</tr>
<tr>
<td>D</td>
<td>Computers</td>
<td>K</td>
<td>Working in a team</td>
<td>R</td>
<td>Power of concentration</td>
</tr>
<tr>
<td>E</td>
<td>Oral Communication</td>
<td>L</td>
<td>Working under pressure</td>
<td>S</td>
<td>Leadership</td>
</tr>
<tr>
<td>F</td>
<td>Written Communication</td>
<td>M</td>
<td>Planning and organizing</td>
<td>T</td>
<td>Sector-specific</td>
</tr>
<tr>
<td>G</td>
<td>Problem Solving</td>
<td>N</td>
<td>Initiative</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 Results and Discussions

In this study, the perception level of students and lecturers about employability skills was measured in a 5-point Likert scale: Very important, important, neutral, not important and not important at all. Figure 1 shows the perceptions of students about the importance of the different employability skills.

Figure 1: The perceptions of students of the importance of employability skills
When the answers belonging to the first two categories of the 5-point Likert scale are grouped as ‘important’, while those belonging to the last two categories are grouped as ‘not important’, it seems that all of these employability skills attributes are considered important. Of the 20 attributes, the most important skills, based on the perception of students, are problem solving, using computers and oral communication; while working under pressure and written communication were given lowest priority. This is somewhat different from the perception of lecturers (see Figure 2), where skills such as good literacy (reading and writing) and oral communication are rated most important while working under pressure, leadership and planning and organizational skills were given the lowest priority. The highest score difference between students’ and lecturers’ perceptions was found for written communication skills.

![Figure 2: The perceptions of lecturers about the importance of employability skills](image)

When assigning numerical values to the answers, namely 5 for very important, 4 for important, 3 for neutral, 2 for unimportant, and 1 for not at all important, a mean value can be calculated for each attribute. The result is listed in Table 6. A scatter plot of students and lecturers mean scores for the importance of the various skills showed a moderate positive linear correlation. The correlation coefficient was 0.685 (Figure 3).

Overall there was a rather good agreement between the students and the lecturers about relative importance of employability skills, although a few interesting differences were found. The highest score differences between the perceptions of students and lecturers was found for written communication skills, numerical skills, literacy (reading and writing), working under pressure and critical thinking. Figure 4 shows the differences in the mean score for the attribute skills.

Students in technology and vocational education study programs are educated and prepared to become vocational teachers. Teachers should have competencies as agents of learning. Competence as a learning agent includes pedagogical, personal, professional and...
social skills as already mentioned in the introductory section. By considering the data obtained, there are some issues that need to be highlighted:

- There is a considerable difference between the perceptions of students and lecturers on written communication skills, numerical skills and literacy (reading and writing). Since ideally, a teacher should have good written communication skills, numerical skills and literacy skills, teacher educators should pay special attention to this issue.
- The ability to work under pressure is considered as relatively little important by lecturers and students. Lecturers and students might be thinking that a teacher should not be under pressure in the teaching process. Results of research conducted in the UK showed that also there the importance of students from education courses being able to work under pressure was rated relatively low (Little, 2003). But in reality teacher must be able to work in stressful situations, under pressure, and to deadlines. The teaching profession is not an easy one; not only is it difficult because of the amount of interaction occurring daily, also working hours are long. Teaching hours may be approximately 5-8 hours per day, but there are additional, hidden hours in a teacher’s work day.

Table 6: Mean scores of students’ and lecturers’ perceptions of different skills

<table>
<thead>
<tr>
<th>Code</th>
<th>Skills</th>
<th>Mean</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Students</td>
<td>Lecturers</td>
</tr>
<tr>
<td>A</td>
<td>Good with numbers</td>
<td>4.15</td>
<td>4.64</td>
</tr>
<tr>
<td>B</td>
<td>Good reading/writing</td>
<td>4.26</td>
<td>4.73</td>
</tr>
<tr>
<td>C</td>
<td>Foreign language</td>
<td>4.12</td>
<td>4.55</td>
</tr>
<tr>
<td>D</td>
<td>Computers</td>
<td>4.59</td>
<td>4.64</td>
</tr>
<tr>
<td>E</td>
<td>Oral Communication</td>
<td>4.50</td>
<td>4.73</td>
</tr>
<tr>
<td>F</td>
<td>Written Communication</td>
<td>4.05</td>
<td>4.55</td>
</tr>
<tr>
<td>G</td>
<td>Problem Solving</td>
<td>4.67</td>
<td>4.55</td>
</tr>
<tr>
<td>H</td>
<td>Critical thinking</td>
<td>4.18</td>
<td>4.64</td>
</tr>
<tr>
<td>I</td>
<td>Adaptability</td>
<td>4.34</td>
<td>4.45</td>
</tr>
<tr>
<td>J</td>
<td>Decision-making</td>
<td>4.43</td>
<td>4.55</td>
</tr>
<tr>
<td>K</td>
<td>Working in a team</td>
<td>4.48</td>
<td>4.64</td>
</tr>
<tr>
<td>L</td>
<td>Working under pressure</td>
<td>3.27</td>
<td>3.73</td>
</tr>
<tr>
<td>M</td>
<td>Planning and organizing</td>
<td>4.09</td>
<td>4.27</td>
</tr>
<tr>
<td>N</td>
<td>Initiative</td>
<td>4.28</td>
<td>4.45</td>
</tr>
<tr>
<td>O</td>
<td>Self-management</td>
<td>4.39</td>
<td>4.55</td>
</tr>
<tr>
<td>P</td>
<td>Learning abilities</td>
<td>4.41</td>
<td>4.55</td>
</tr>
<tr>
<td>Q</td>
<td>Loyalty, integrity</td>
<td>4.41</td>
<td>4.36</td>
</tr>
<tr>
<td>R</td>
<td>Power of concentration</td>
<td>4.33</td>
<td>4.36</td>
</tr>
<tr>
<td>S</td>
<td>Leadership</td>
<td>4.41</td>
<td>4.18</td>
</tr>
<tr>
<td>T</td>
<td>Sector-specific</td>
<td>4.26</td>
<td>4.36</td>
</tr>
</tbody>
</table>
Figure 3: Scatter plot showing correlation between skills priorities of students and lecturers

Figure 4: The mean score of the perceptions of students and lecturers for each attribute skills (Difference = Lecturers – Students)

Overall, the results of this study indicate that there is a need for a closer agreement between students and lecturers on employability skills. With coefficient of determination 0.4686 (see Fig. 3), 46.86% of the total variation in students’ perception can be explained by the linear relationship between lecturers’ perception and students’ perception (as described by the regression equation). The other 53.14% of the total variation in students’ perception remains unexplained.
5 Summary

There was a rather good agreement between the students and the lecturers about relative importance of employability skills. Skills such as problem-solving, using technology/computers, and oral communication scored higher than team-work, making decisions, and learning ability, while working under pressure and written communication were given lowest priority by the students. This is somewhat different from the perceptions of lecturers where skills such as good literacy (reading and writing) and oral communication scored highest while working under pressure, leadership and planning, and organizational skills were considered less important. The highest score difference between students’ and lecturers’ perceptions was found for written communication skills.

References


The Implementation Of Animation as A Mechanism of Pneumatics Component Learning Media

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Abstract

Poor learning outcome is one of the reasons why animation is increasingly used as a media for teaching and learning pneumatics. The study presented in this paper aimed to compare the achievements of students who used animation as learning media in a semi individual learning setting with those of students who were exposed to pictures in a classical presentation-oriented teaching setting to learn about the mechanisms of pneumatic components. A quasi experiment method with pre-test and post-test design was applied. There were 30 students in the experimental group using animation as media and semi individual learning, while the control group consisted of 35 students who learned in a classical teaching setting with pictures. Both groups, experimental and control, showed improvements. However, students who used animation as a learning media in average achieved less improvement than those who used pictures.

1 Introduction

Although learning is an individual achievement teachers, as a part of the formal learning environment, have to act as facilitators who support students in their learning process. In classroom environments they determine the learning method and provide learning media. In pneumatics, one of the problems observed in Indonesia’s vocational schools is the lack of supporting media to be used in learning pneumatics. The classical, verbal method has become the most popular. Underachievement of students, however, suggests increasing the media support in the learning process. Previous research by Purnawan (2006:120) suggests that standardized symbols (DIN ISO 1219 and 5599) are not sufficiently representative to be able to explain realistically how pneumatic components actually work, so that their exclusive usage leads to restricted students’ learning experiences.

Animation as a pneumatics learning media is increasingly used to enhance students’ visual experiences, but not in an optimal manner. Students tend to become passive learners and to easily get bored. However, the use of animation for learning can be developed into semi individual learning, where students study independently using computer-based animation. Here, the teacher’s role is only that of a facilitator who provides the computer with the respective software program. These considerations lead to the decision to run a study to identify the effectiveness of the different media and to compare the learning success which can be achieved by applying the two methods.

The study presented in this paper aimed at (1) investigating the students’ achievements in learning pneumatics when pictures are used as media, (2) investigating the students’ achievements when animation is used as media, and (3) comparing the learning achievements of students who use pictures with those who use animation in learning pneumatics.

The results of the study were intended (1) to provide teachers with some evidence, whether animation is a viable option to be used as learning media in the classroom, (2) to find out whether using pneumatics animation media can improve the learning achievements
of students, (3) to initiate consideration of innovation in school, especially with respect to the usage of learning media, and (4) prepare the grounds for further investigations on the subject.

2 Method

For the study a quasi experimental method with pre-test and post-test design was used (Sugiono 2010:79). Two parallel students’ classes were observed, the experimental class using animation media for learning, the control class being exposed to the classical teaching method using pictures.

In the experimental class semi individual learning was implemented using animation as a media. Students were required to do self-study. They were given access to computers with the animation media installed. The animation media used provided separated material about symbols and mechanisms of pneumatic components. Consequently, interaction between students and teacher was quite rare, since teachers just provided the animation and some additional teaching aids. Most of the time students worked independently with learning aids and the animation.

For the control group the classical teaching method was applied. Teachers explained the relevant symbols and pneumatics components’ mechanisms using a text book and displaying related pictures. In this group there was considerably more interaction between students and teachers by asking and answering questions about the material.

To measure achievements pre-tests and post-tests were run with both groups. Both tests consisted of 40 multiple choice questions with four answer options each. The questions have already been validated before. To classify students’ achievement improvements the Normalized Gain (N-Gain) is calculated using the equation (Hake 1998:3)

\[ N - Gain = \frac{(Posttest score - Pretest score)}{(Maximum score - Pretest score)} \]

where an N-Gain value between 0 and 0.29 represents low, between 0.3 and 0.69 medium, and between 0.7 and 1 high achievement improvement.

The test persons were twelve grade students of SKM Al Falah, Bandung, whose major is Teknik Pemeliharaan Mekanik Industri (industrial mechanical maintenance). 65 students from two classes participated, 35 of them in the control class and 30 students in the experimental class.

3 Results Discussion and Analysis

The pretest was run before the learning experiment started. It was run with both groups to measure students understanding about pneumatics components symbols and mechanisms. After the two groups have been exposed to the different learning settings, the, posttest was employed to measure students’ achievements. Test scores range between 0 for no correct answer to 100 for all questions answered correctly. The pretest and posttest data was used to calculate the N-Gain according to the above formula. The results are summarized in table 1.
Table 1: Summary of experiment results

<table>
<thead>
<tr>
<th>Score</th>
<th>Control group</th>
<th>Experimental group</th>
<th>N-Gain</th>
<th>N-Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
<td></td>
<td>Pretest</td>
</tr>
<tr>
<td>Highest</td>
<td>71</td>
<td>100</td>
<td>1</td>
<td>67</td>
</tr>
<tr>
<td>Lowest</td>
<td>21</td>
<td>42</td>
<td>0.13</td>
<td>25</td>
</tr>
<tr>
<td>Average</td>
<td>45.8</td>
<td>78.7</td>
<td>0.62</td>
<td>44</td>
</tr>
<tr>
<td>Variance</td>
<td></td>
<td></td>
<td>0.048</td>
<td></td>
</tr>
</tbody>
</table>

As the data displayed in table 1 show, the average pretest scores of both groups are relatively similar, although the control class scored a little bit higher than the experimental class. This indicates that students’ understanding about the pneumatics components’ symbols and mechanisms is relatively similar at the beginning. So, it is assumed that students’ change of understanding is due to the learning process they went through. The students’ average posttest score is considerably higher for the control group than for the students of the experimental group. The posttest result represents the actual achievement of students after being exposed to the respective learning arrangement. Considering that according to the test design a score of 70 represents the minimal passing grade, the control group in average achieved the learning goal while the experimental group did not. The calculated N-Gain values show, that according to the range definition both groups showed medium improvements. However, the experimental group showed only little better than low improvement in average, while the control group was not too far away from achieving high improvement. To summarize, students’ achievement improvements in the class where classical teaching methods with pictures were employed were considerably higher than in the class where students were exposed to semi individual learning with animation media.

The posttest data is considered to represent students’ performance after going through the learning process. This data is used by teachers to decide whether students have passed the learning unit on pneumatics components’ symbols and mechanisms. Those who get a score of 70 or more in the posttest are considered to have passed. Those who get a score of less than 70 need to take a remedial and after that have to go through another test.

Figure 1 shows the posttest distribution data.

![Figure 1: Passing grades of control and experimental group members](image)

As figure 1 shows most of the students of the control group scored above the passing grade, about a third of them with excellent achievement, and only 24% of the students fail. On the other side, more than half of the experimental group students fail. Moreover, none of them reached a score higher than 89, which would be considered excellent. This indicates that in learning pneumatics components’ symbols and mechanisms, students who are exposed to
the classical learning method using pictures have better achievements compared to students exposed to with animation media supplied. Thus, students’ passing rate in the control group is higher than in the experimental group.

The distribution of students’ normalized-achievement (N-Gain) is displayed in Figure 2. Samples with N-Gain less than 0 are included in the low category. As can be seen in figure 2, quite a number of students in the control showed high improvements. For the experimental group, however, the number of students with medium improvements was highest. Having high improvements is the goal of each learning process and therefore would be considered a success. In other words, the data shows that what has been applied to the control group, to some extent, has been more successful than what was applied to the experimental group. In the experimental group there even appeared a case of no improvement at all, which is indicated by the fact that a participant scored slightly lower in the posttest than in the pretest (N-Gain less than 0, see table 1).

![Figure 2: Comparison of N-gain for control and experimental groups](image)

The result of this study seems to contradict the assumptions on the relation between the usage of learning media and students’ achievements: learning using concrete media gives students deeper experience, so that, it leads to better learning achievements. In this case, applying concrete media in the experimental group goes in line with poorer students’ achievements than in the control group where more abstract media (pictures) were used.

However, it must be considered that there are many additional factors that can affect learning processes and their results. Especially for this study, the following factors must be mentioned in this regard.

The first factor is the learning method used for the two groups, control and experimental. In the control group, although the learning process employs the classical method with pictures, interaction between teacher and students happens. The teacher provides the opportunity to students to ask about material they do not apprehend, and in the same time the teacher has the opportunity to evaluate students’ understanding by asking questions before the learning session ends. By doing so, students are able to re-construct their understanding about the material in order to achieve better results.

In the experimental group where the semi individual learning method is applied using animation as a media, interaction between teacher and students is less likely to happen. The teacher understands his function as a facilitator, who only explains the technical usage of the learning aid installed on a computer. Students exposed to this method somehow find it difficult to re-construct their understanding. Thus, their achievement is suboptimal. This problem in the layout of the study can probably be avoided if both groups use the same
learning method. An earlier study by Fewana (2011: 77) indicated, that “the use of animation as an effective media for learning pneumatics increased students’ achievement scores more than the use of pictures in “vocational basics in mechanical engineering” (Mata Pelajaran Dasar Kompetensi Kejuruan Teknik Mesin). Fewana’s findings are based on the assumption that the teacher still is part of the learning arrangement by guiding the students. So it can be said that the teachers’ support is still needed in learning pneumatics, and that the narrow understanding of the role of a “learning facilitator” applied in the study presented here is not appropriate.

The second factor is related to the students. For applying the individual/semi individual learning method, especially supported by computer, it should be considered in advance whether the students are familiar with operating a computer, whether they are intrinsically motivated to do self-study, and whether they are used to this style of learning. With respect to the study presented here, there was no related pilot project run involving the experimental group students, so there is no data available that could provide related information. Yet, from the observation during the learning session, it can be concluded that students had little responsibility with respect to self-study.

The third factor refers to the learning media itself. In the control group, the learning media used (pictures) was embedded in a text book. Because of that, the teacher can deliver the material in a comprehensive and interconnected manner even though the teacher explains the material orally and visualizes things with the help of motionless pictures. It is very likely that when information is served well-ordered, it leads to better results. For the experimental group, on the contrary, the learning material and the learning media (animation) were separated. A text book was used as material while the animation was installed on the computer. The self-directed use of those two separated media most likely affected the order of information perceived, and students had problems getting the information connected. Such a situation can inhibit students’ learning experience and affect their achievements.

4 Conclusions and Recommendations

Considering the results of this study on the comparison of the use of animation and the use of pictures as learning media for students’ achievements in learning pneumatics, some conclusions are proposed: (1) The increase of students’ achievements in the control group; using pictures and applying the classical learning method, can be classified as medium with an N-Gain average of 0.62, (2) the increase of students’ achievements in the experimental group; using animation and applying a semi individual learning method, also can be classified as medium with an N-Gain average of 0.35, and (3) students’ achievements in the experimental group was lower than in the control. To some extent, the result is caused by the suitability of the learning method for both groups. It seems that to teach pneumatics components’ symbols and mechanisms in vocational school, the classical learning method is more suitable to be applied.

In addition, some suggestions toward the result of this study are proposed as follow: (1) The teacher’s role as instructor is still relevant for learning pneumatics components’ symbols and mechanisms in vocational school. The use of animation as a media might be more effective if it is applied as visual media only in order to support the classical learning method. The application of animation as a learning media in semi individual learning has to consider both requirements and students as a prerequisite. (2) Integrated learning aids with embedded theory material, media and evaluation is needed. Once such learning aids are available it might be possible to improve learning processes and their results.
References


Report on the Workshop:
TVET Teachers: Educators? Trainers? Or Master Craftsmen?

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This workshop aimed to explore a range of views and issues about the educational role and qualifications necessary for TVET teachers. A briefing paper introduced a range of issues to initiate and stimulate the workshop discussion. The presenters facilitated a discussion on these and additional issues, topics and dilemmas and sought inputs from the Indonesian and International perspectives of participants to suggest a “manifesto” for what would be necessary for the education and qualifications of TVET teachers.

The aim of the Workshop was

− to discuss TVET Teaching,
− to develop a “manifesto” about TVET teachers and teaching,
− make recommendations for improvement of TVET teaching internationally.

A range of issues already identified were presented to those attending the workshop. The issues identified are:

− Apprenticeship models and needs of the 21st century TVET areas.
− Teachers and qualifications for TVET teaching.
− Educators or trainers?
− Educational institutions or on the job?
− Work-based, workplace learning for work, about work or through work?
− Skills or learning?
− Advanced TVET education through universities through to professional doctorates and research.

A series of questions were raised with the participants.

− Does TVET require the preparation of educators or trainers? And what is the difference?
− In considering the development of skills: Where is best to learn them? On the job? At a college?
Much is expected of the Technical Vocational Education and Training Sector (TVET) internationally. Countries establish goals of achieving a highly skilled workforce to improve their national economies, and their international competitiveness. Australia, for example, emphasizes the need to have a more highly skilled workforce with higher levels of qualifications, and that attention needs to also be paid to those with lower level skills and to local needs. [Skills Australia, 2010]

Indonesia has identified needs for attention to both theoretical and practical skills development of the national workforce.

Against such goals, TVET is contested, with a gap between the rhetoric and reality appearing to widen. For example, the current situation in one state in Australia, the State of Victoria has raised concerns as to the future and viability of publically funded TVET programmes with $300m being cut from the 2012 budget. Courses, staff and campuses are being cut back considerably [Malloch, 2012]. In such difficult times, it is pertinent to question the prevailing models for VET of training for all different levels of operation for all people, young and older, employed, unemployed, in paid and unpaid employment.

We are also concerned as to the preparation of those who teach and train in VET. The Australian approach is to establish a minimal qualification, the Certificate IV in Training and Assessment, which emphasises the assessment of trainee competencies in VET programmes delivered with varying attention to quality and education. Such a low base line raises our concerns for the future generations of VET teachers/trainers and the quality of the learning experiences of their students/trainees. The question of their professional identification is raised: are they VET teachers, trainers, assessors or a combination of these? The location of their professional preparation is also an issue, as to whether conducted in an educational institution, in the workplace or in a combination.

The global financial crisis has contributed to increased youth unemployment; especially evident in Europe where Spain for example has a youth unemployment rate of 50% [Marhuenda, 2012]. It is a common strategy to provide VET training programmes for the young and unemployed, however these need not necessarily lead to employment opportunities. This contributes to questions as to the models for apprenticeships and training programmes provided and their relevance for now and the future.

Other aspects to consider are how our TVET systems approach ‘Work-based, workplace learning for work, about work or through work?’ How do we conceptualise work and how do we address the relationship between learning in a work place and learning in an educational facility?

We also need to consider whether what we are doing in our TVET systems is encouraging the development of Skills or Learning.

A recent addition to the discussion of issues facing TVET is the provision of Advanced TVET education through Universities through to Professional Doctorates. Are we able to see a progression and pathways through TVET?

What research is relevant for us to encourage and engage in to support the international development of TVET?

This brief input was presented to participants who then were provided with an opportunity to raise issues of concern, discuss these in small groups and then present to the overall group. A Manifesto – a set of recommendations was then developed from the workshop deliberations.
An example of a Manifesto and Recommendation (Contoh Manifesto) was provided:

- There is a serious international need for workers with more skill.
  (Adalah kerperluan internasional yang barat bagi pekerja dengan keahlian lagi.)
- This means there is a serious need for skilled TVET teachers.
  (Maksud ini ada kerperluan yang barat bagi guru TVET keahlian.)
- Teaching in TVET is not just about transmission of trade knowledge.
  (Mengajar di TVET tidak hanya tentang pengiriman kejuruan pengetahuan.)
- Developing skilled trade people requires skilled and expert teachers who are also experts in their trade.
  (Memperkembangkan pedagang keahlian memerlukan guru keahlian dan ahli yang juga ahli di kejuruan mereka.)
- This meeting of TVET educators calls on all nations and governments to see TVET as a fundamental key of the social and economic future.
  (Rapat ini pendidik TVET datang mengambil semua negeri dan pemerintah ke melihat TVET sebagai pokok fundamental ke sosial dan ekonomik masa depan.)
- Very high standards of qualification and technical skills are needed for TVET teachers.
  (Sangat standar tinggi qualifikasi dan ahli teknikal keperluan di semua guru TVET.)
- Major areas of expertise needed are
  - content (trade) knowledge,
    (pengetahuan kadar kejuruan,)
  - pedagogical knowledge,
    (pengetahuan pedagogi mengajar,)
  - pedagogical content knowledge.
    (pengetahuan kadar pedagogi.)

Recommendations
(pujian rekomendasi)

Each group of participants provided their ideas on the issues. These were taken by the presenters and crafted into a Manifesto, which is printed in the first section of these proceedings.

References


Skills Australia, (2010), Australian workforce futures: a national workforce development strategy, Commonwealth of Australia, Canberra