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Green Skills in Vocational Teacher Education – a model of pedagogical competence for a world of sustainable development

Abstract

The reform of TVET systems all over the world as well as in Asia is an essential request in a time of fast-change and sustainable development. Securing quality in vocational teacher education plays an important role in achieving the supply of adequately skilled workers in this context. To make sure that vocational teachers have the necessary competencies to fulfil the requirement in the new era and to facilitate the process of vocational teacher education, the professional profile of vocational teaching profession needs to be reviewed and consolidated. On the basis of literature review and considering features of "the greening of technical and vocational education and training", we propose a model of pedagogical competence of vocational teacher in the context of sustainable development. This model represents a system of essential competencies within their cross – influences, based on necessary knowledge, which vocational teachers should acquire or continue to develop throughout their whole careers not only to meet the requirements of profession in fast – change world, but also to contribute to building ecologically sound economies. The model presented in graphical form helping users to capture quickly its key features was established to support the professional development of vocational teaching staff based on clearly defined competencies in accordance with tendency of sustainable development.

Keywords: *sustainable development, green skills, VTE, vocational teacher education, pedagogical competence, didactics, pedagogical content knowledge, professional expertise, educating competence, self-reflection competence, dual system*

1 The relevance of a model of pedagogical competence for greening TVET

Climate change has had a significant impact on human lives all over the world with many severe consequences such as melting ice, rising sea levels, heat waves, an increase of the number, duration and intensity of tropical storms and droughts, alarming global warming etc. Locating in regions regarded as the workbench of the world, many countries in East and Southeast Asia are suffering from social, economical, and ecological problems caused by climate change. Vietnam is one of the countries, which suffers most from natural catastrophes and climate change. *Vietnam Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (SREX Vietnam 2015) shows that Vietnam is suffering from six to seven tropical storms every year on average as a results of climate change; from 1990 to 2010, there were 74 floods in the river systems of Vietnam; severe drought, salinization, landslides, and other natural disasters have been hindering the develop-

ment of Vietnam (MoRE & UNDP 2015). According to statistics, in the last 50 years, the average annual temperature of Vietnam has increased about 0.5 to 0.7 degrees Celsius. Also over this period, the sea level in Vietnam rose 20 cm. Annually, the damage caused by natural disasters in Vietnam is equivalent to 1.5% of gross domestic product (GDP) (MoRE & DoWRM 2015). Vietnam government has launched some relevant strategies to support green growth, such as becoming the first country in the world releasing a special report (SREX Vietnam 2015) based on framework SREX (*Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*) of Intergovernmental Panel on Climate Change (IPCC 2012 a,b), establishing Vietnam Panel on Climate Change (VPCC), which includes many leading scientists in field of environmental science in Vietnam, who will give advices on policies and scientific basis to government to gradually enhance climate change adaptation and to build ecologically solid economy. Green economy also requires a highly skilled workforce supplied by high quality vocational education and training system in accordance with tendency of sustainable development. The quality of vocational teacher affects the achievement of vocational learners directly. Therefore, it is important to build a model of pedagogical competence of vocational teacher in the world of sustainable development to contribute to building sustainable vocational education and training system not only for Vietnam, but also for other countries in East and Southeast Asia as well as in other regions in the world.

The proposal for a model of pedagogical competence of vocational teachers aims to:

- provide an instrument to reflect the quality of professional performance of vocational teachers, the quality of vocational teacher education, even the quality of engineer education and training on the basis of a common understanding of pedagogical competence of vocational teachers, especially in era of sustainable development.
- contribute to shaping the initial and in-service vocational teacher education, particularly in setting the objectives of vocational teacher education and training.
- promote the establishment and improvement of policies in terms of technical and vocational education and training (TVET), in particular the policies facilitating the initial establishment and development of TVET dual systems in vocational education and training, as well as the greening of vocational education.
- suggest a tool to vocational teachers to self-evaluate, to control and enhance their competencies as well as to set their professional goals in a rapidly changing world, in which the sustainable development is vital and urgently required.
- contribute a theoretical foundation for further discussions in the field of TVET and to provide a basis which can support the establishment of standards for vocational teacher as well as standards for the vocational teacher education (VTE) in new era.
- consolidating the profile of vocational teaching profession in accordance with the requirement of a sustainable development.

2 The international discussion on competence models in VTE

Through the literature analysis, we considered some theoretical foundations providing the useful knowledge on competencies of teacher in general and of vocational teacher specifically.

Košinár cited the idea of Frey that competences are always solid due to broad knowledge, which is classified by Kunter and other German authors into professional declarative and procedural knowledge (Košinár 2014, 31; Frey 2006, 163; Kunter et al. 2011, 14). Declarative knowledge as mentally propositional represented understanding can be described by semantic networks. Someone is aware of the knowledge and can verbalize it. Procedural knowledge is embodied knowledge: how to do something successfully. Terhart added action routines and forms of reflection to this competence domain, competence of teacher therefore relies on "scientifically sound knowledge, situationally flexible applicable routines, and on specially professional ethics representing the action-guiding standards of value" (Terhart 2000, 55; Košinár 2014, 32; Carle 2002,10). Before that, the famous American educator Shulman classified knowledge of teaching profession into five main dimensions: (1) general pedagogical knowledge relating to broad principles and strategies of classroom management and organization, (2) subject-matter content knowledge, (3) pedagogical content knowledge, (4) curricular knowledge, (5) other knowledge with reference to knowledge of educational context, knowledge of learners and their characteristics, knowledge of educational purposes, values and their philosophical, historical grounds (Shulman 1986, 1987; Košinár 2014, 32-33). Other authors added consulting knowledge as the sixth dimension into this classification (Kunter et al. 2011, 29; Košinár 2014, 33).

National Board for Professional Teaching Standards (a nonpartisan, nonprofit organization, which was founded in 1987 in the United State, dedicated to promoting excellence in education) pointed out that professional competence of teacher should comprise:

- "specific declarative and procedural knowledge (competence in the narrower sense: knowledge and skills);
- professional values, beliefs, subjective theories, normative preferences and objectives;
- motivational orientations and metacognitive abilities and skills of professional self-regulation"

(NBPTS 2002, cited by Baumert & Kunter 2006, 481; Hopf 2012, 19)

Baumert, Kunter and their colleagues in framework of their COACTIV-study for PISA 2003 developed a heuristic model of professional competence for teacher, in particular teachers for mathematics, drawn on Schulman's theory and combined with idea of NBPTS 2002.)The competence of teacher in this model includes *personal dispositions* (beliefs, values, goals, motivational orientations, self-regulation), *knowledge and skills* based on five professional knowledge areas (subject-matter knowledge, pedagogical content knowledge, pedagogical psychological knowledge, knowledge of organization and consulting knowledge), each area is continuously classified into many other facets (Baumert & Kunter 2011, 32; Košinár 2014,

50). This model was adopted, discussed, and even criticized by other authors. The main commentary arising concentrated on the fact that there is no interconnection between the competence facets, in addition, the concrete relation between these competencies and classroom were not pointed out. (Lehmann-Grube & Nikolaus 2009, 61; Košinár 2014, 50-51).

Some other authors focused on the competence of teachers relating to classroom activities. Bauer (2005) introduced his model "Taxonomy of educational skills" with emphasis on pedagogical basic competence concerning teaching competence including six dimensions: (1) Clarifying of teaching objectives and structuring content; (2) building social structures of classroom; (3) controlling interaction; (4) communicating and informing; (5) designing of learning environments, (6) implementing of background work (planning and organization) (Bauer 2005, 20, Košinár 2014, 51).

Hopf (2012) also built in her dissertation four following competence groups of vocational teacher relating to teaching competence:

(1) Professional competence (Fachkompetenz) refers to the ability of vocational teachers to master the professional knowledge to be learned and taught;

(2) method competence (Methodenkompetenz) refers to abilities of vocational teachers to clearly structure the teaching contents, to clearly build the concrete teaching content, to master the diversity of teaching methods and to give the performance diagnostics;

(3) relational competence (Beziehungskompetenz) refers to ability of vocational teachers to well build and maintain the relationship with vocational learners;

(4) controlling competence (Kontrollkompetenz) refers to ability of vocational teachers to guide the vocational learners. (Hopf 2012, 60-62).

To build four above competence groups, Hopf considered Weinert's and Klippert's ideas about competence of teacher. According to Weinert (2000), teachers need four competence areas to have good teaching performance: (1) Expertise; (2) diagnosis competence; (3) didactic competence; (4) competence of guiding learners in classroom. According to Klippert (2004), teachers need ten following competencies to effectively teach: (1) Expertise; (2) diagnosis competence; (3) didactic competence; (4) method competence; (5) instruction competence; (6) moderation competence; (7) consulting competence; (8) emotional competence; (9) competence of guiding learners in classroom; (10) cooperation competence.

Nevertheless just competencies concerning teaching ability are not adequate for determining of competence of teacher. It can be noted, that above concepts have not taken the relations between school and social context into consideration yet. Nieke (2012) added this factor when he gave another model, in which the competence of analysis of social context was added. According to Nieke's model, teacher's pedagogical competence consist of two parts: *professional actions* standing in center, including five phases ((1) determining of teaching objectives, (2) analyzing action situation, (3) planning, (4) implementing of teaching action

with direct interaction, conveying of teaching content and action in organization, (5) evaluation) based on *"background" competencies* including competencies of analysis of social context (Gesellschaftsanalyse), self reflexion (Selbstreflexion) and diagnosis of situation (Situationsdiagnose). (Nieke 2012, 51; Košinár 2014, 54). This model of Nieke was appreciated due to the consideration of social context. However, as most of above theories, this structure faced to the commentary, that the interconnection among competencies was not taken into account (Košinár 2014, 53). Besides, the competence of vocational teacher specifically has not been analyzed in a concrete and systematic manner yet.

Soysouvanh and his colleagues, when developing a framework of competence standards of vocational teacher for Lao PDR, sketched five following competence areas: (1) Competence area of Acting in an exemplary manner; (2) competence area of Teaching, (3) competence area of Educating, (4) competence area of Assessment, (5) competence area of Self-Development and Innovation (Soysouvanh et al. 2013). These competence areas were built in consideration of concrete situation of Lao PDR and serve the actual situation in Lao, however can be used as a reference on the way to finding a common understanding of competence of vocational teacher in common sense. While doing their research, Soysouvanh and his colleagues based their research on a broad variety of international scientific literature, one of those is Hartmann's notion about competence of vocational teachers (Soysouvanh et al. 2013).

In oder to contribute to providing an insight into competences of vocational teachers, Hartmann (2012) thoroughly developed a profile of vocational teacher profession with a diversified description of competences of vocational teachers based on the German experience. In this picture, the competences of vocational teachers were classified into two groups: competences relating to framework conditions and competences relating to professional activity content. In group of *competences relating to framework conditions*, Hartmann pointed out some relevant competences of vocational teachers, such as:

- analytical competence relates to the ability of vocational teachers to analyze the teaching content, the prerequisites of learners, the institutional teaching environment and the time structure;
- didactic pedagogical competence, which means that vocational teachers must master many diversified teaching methods to apply them appropriately in accordance with institutional conditions of vocational school and teaching objectives;
- negotiation competence, which describes that vocational teachers must be able to cooperate with colleagues to carry out her/his pedagogical duties in the context of school organization and for the common development of school;
- innovation competence refers to the fact that vocational teacher should be able to recognize her/his own needs of advanced training and improve her/his deficits.
- etc.

In group of *competences relating to professional activity content*, Hartmann emphasized many necessary competencies of vocational teacher, for examples:

- ability to analyse the picture of profession (which is learned and taught) and curriculum;
- ability to choose, structure the teaching content and to determine the teaching procedure in accordance with tendency of competence-oriented teaching as well as in consideration of working and learning places in dual system (cooperation between vocational school and factory/ company);
- ability to capture the fast changing technologies, to grasp processes of work in the real workplaces, to link real work processes with professional learning processes;
- etc.

A series of concrete competencies in each group was presented and discussed in a practical manner, analyzed adequately in detail (see Hartmann 2012, 79-118), that expressed the complexity and diversity of competencies of vocational teacher in real professional context.

Respecting the idea that competence of vocational teacher is still a complex, ill-structured domain facing the fast-change world with the tendency of sustainable development, we suggest a model of pedagogical competence of vocational teacher with a coherent structure and the clear interconnection among competence areas that might help accommodate this complexity and reach a common understanding of this object for a new era of sustainability in development.

3 Model of pedagogical competence of vocational teacher as a basis for VTE with special respect to the Greening of TVET

The proposed model of pedagogical competence for vocational teachers builds on the six competency domains, that have the close relations with each other, affect and enhance each other, rely on (or are influence by) the pedagogical basic knowledge as well as the additional knowledge/ skills. An overview of this model is illustrated by the following graphic:

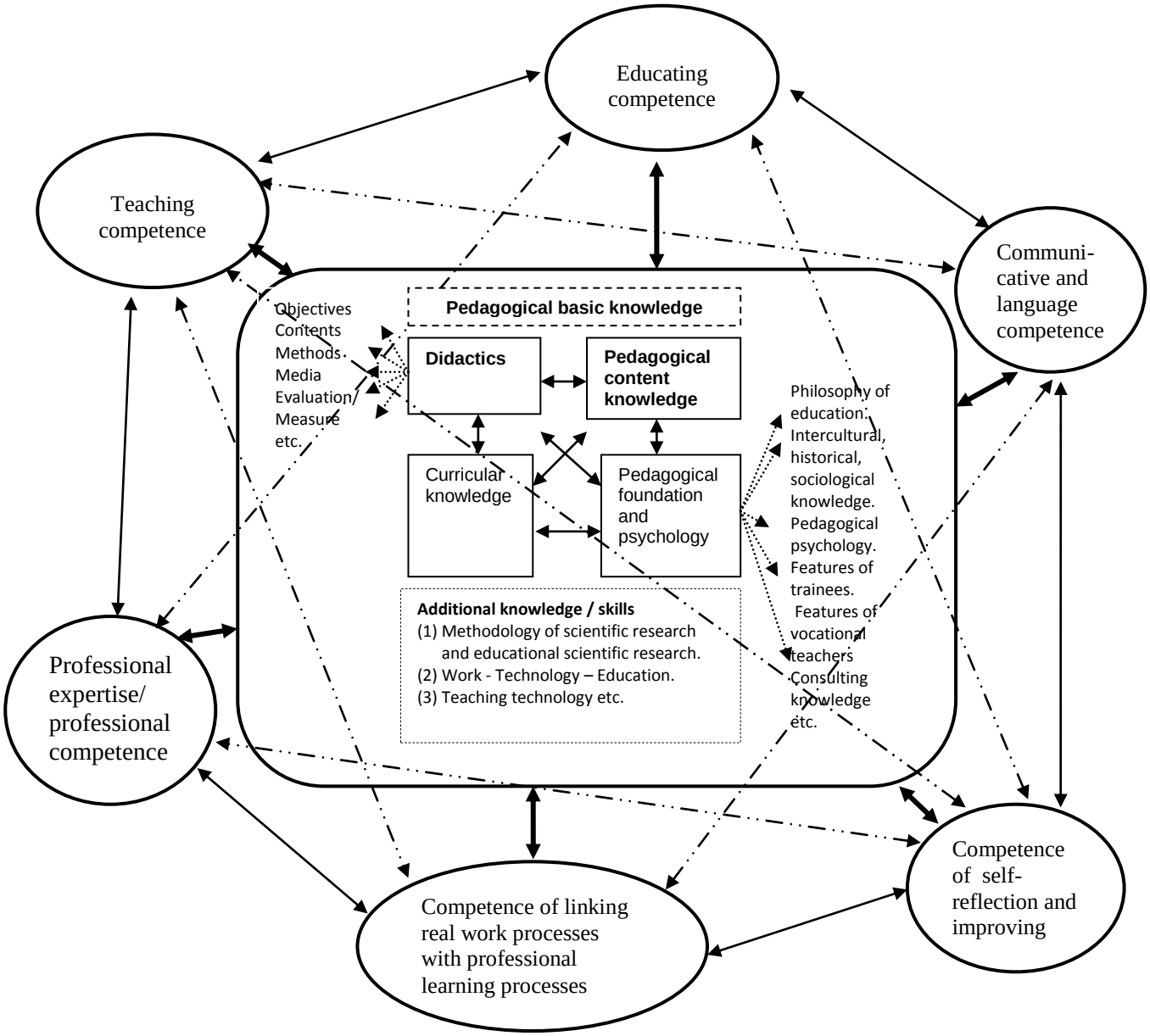

Figure 1: Model of pedagogical competence for vocational teachers

More detailed descriptions of all components as well as the interactions among these components in the model are provided in the below section.

A. Six competence domains:

Teaching competence refers to the ability of teachers to carry out theoretical, practical or integrated instruction in the implementation of their teaching duties successfully. Teachers have to be able to determine learning objectives and teaching content on the basis of considering individual properties of vocational learners (e.g. their existing background, their social/ family/ personal characteristics, their needs etc.), as well as on the basis of the philosophy of education and training, the curricula and the corresponding link with the real work processes.

Vocational teachers also have to capture, master many different teaching methods, and can choose the appropriate teaching methods for the lesson and the relevant measures for evaluating of learning results in accordance with learning objectives, learning content as well as with the tendency of pupil-centered teaching. Teaching competence also refers to the fact that the teachers can plan lessons, design a suitable and optimized learning and working environment, control and coordinate the learning process in the classroom flexibly, design interesting activities and relevant learning tasks to motivate the vocational learners, manage the learners as well as groups of learners, interact with vocational learners suitably and dominate teaching materials/ media/ tools. The vocational teachers are also expected to be sensible and creative enough to facilitate the learning processes of vocational learners, promote their active learning and their creativity, stimulate their intellectual development and help them in enhancement the professional skills and in achieving their learning goals.

Educating competence relates to the ability of teachers to support the vocational learners to improve their personality traits, e.g.: Through the teaching methods, the advice and the way of organization of work processes / learning processes, teachers can help the vocational learners in establishing the scientific worldview, practicing the discipline style, building awareness of occupational safety, environmental protection, as well as the awareness of saving (saving energy, fuel, material, etc.), the honesty, the cooperation etc. The teacher is also a role model, a good example for the vocational learners in terms of moral virtues such as: honesty, fairness, dependability, responsibility, etc. Especially, nowadays human beings have to face the ongoing climate change as well as risks of health problems and difficulties of living condition due to rapidly changing environmental conditions such as changing precipitation, melting snow and ice, altered hydrological systems and water resources, the warming and local changes in temperature etc. (Intergovernmental Panel on Climate Change - IPCC 2014, 4,6) as the consequences of human activities altering the atmospheric composition, that is the pressing issue of our time. The alarming climate change like the global warming requires the solutions urgently, and it can be noted that today sustainable development plays a very important role in all fields of the life including TVET. For this reason, it must be emphasized that vocational teachers in general and the technical vocational teachers in particular have to take responsibility to *educate* the vocational learners about the awareness of environmental protection. This competence should be considered as an important competence of vocational teachers nowadays and should be compiled and emphasized in professional profile of vocational teacher profession. The teachers should introduce the vocational learners to the environmentally friendly production processes and environmentally friendly technologies. It requires the modern, progressive knowledge and skills in terms of *professional expertise* of vocational teachers. The teachers must therefore always update and evolve their knowledge and skills, capture the changing technologies in order to be able to implement this educating duty. Additionally, it may be noted that the educating processes take place through the teaching processes/ during the teaching processes. That is why the *educating competence* has the close connection with the *teaching competence, communicative and language competence*, and other competencies, in particular with *professional expertise.*

Professional expertise/ professional competence concerns the abilities of teachers to master the subject-matter content/ scientific and occupational content, to keep it up to date and to use it appropriately, adequately within the classroom. Knowledge and skills differ greatly between professional fields, and vocational teachers must possess the deep knowledge and solid skills of the occupational field in which they teach in the flow of technology changes. Professional expertise is critically important to vocational teachers because the fact that vocational teachers have inadequate fundamentals of content knowledge and work skills definitely leads to the fact of providing the labour market with insufficiently skilled workers. For that reason, the vocational teachers should constantly develop their professional competence, in this case, the *competence of self-reflection and improving qualifications* and *competence of linking real work processes with the professional learning processes* along with knowledge on *methodology of scientific research* are very necessary and useful for the teachers to consolidate and expand their expertise. And the expertise certainly affects on the *teaching competence* and on *educating competence*, for example, if the teacher wants to educate the vocational pupils/ students about the awareness of environmental protection, it requires the specialized knowledge, skills in terms of environmentally friendly technologies, or when a vocational teacher wants to carry out a lesson, he/ she must coordinate the technical occupational content, so he/she definitely needs the expertise beyond teaching skills. So it can be stated that the professional expertise / professional competence is tightly connected with other competencies: it supports greatly other competencies and is strengthened by other competencies. Furthermore, nowadays humans have to cope with the quick-change world, the technology is changing rapidly, the industrialization occurs in many regions all over the world, especially in developing countries as well as in Asia**,** causes the environmental and health problems not also in Asia but also throughout the world, so it requires that the vocational teachers be able to keep their expertise up to date in the flow of technology changes, capture the new technologies, especially green technologies regarding renewable energies as well as green solutions for occupation to be learned and taught to contribute to environment protection and sustainable development.

In a broader sense, considering *professional expertise* as a critically vital competence of vocational teachers to compile and emphasize this competence in vocational profile of vocational teaching profession can also contribute to promoting of establishing the relevant policies relating to the investment for TVET field including adequate providing of modern machines, instruments, equipment for vocational schools, as well as increasing of vocational teachers' salary in many countries, especially in developing countries with emerging economies and institutional voids. As we know, with low wages and obsolete equipment making vocational teachers lack appropriate experience, it is so difficult for vocational teachers to improve their expertise and to catch up new technologies.

Competence of linking real work processes with professional learning processes describes the ability of teachers to integrate real work processes into vocational learning processes. It requires vocational teachers to consider the cooperative learning places and the content of the curriculum, which should contain vocational knowledge and skills in a practical manner. Teachers need to understand the processes of work in the real workplaces (factories, compa-

nies, businesses etc.) and be able to analyze the work processes. They need knowledge of job/work analysis in the field of vocational education and curriculum development. On the basis o results of job/work analysis, the teachers choose appropriate contents for curriculum and design the learning tasks in accordance with work duties, work tasks for vocational learners. In addition, teachers must try to find the possibilities of cooperation with other learning places beyond vocational school such as companies/ factories and try to exploit the chances of in-company training with these possibilities of cooperation. They also can use the opportunities of cooperation with colleagues from the other learning places. In countries that have the dual system in vocational training, such as Germany, it is easier for the teachers to find the cooperation with other factories/ companies, but in many other countries, particularly in developing countries (such as Vietnam, Laos, Cambodia, Malaysia etc. .), where there is no dual system, it requires the vocational teachers to make efforts to find the possibilities of cooperation with other factories / businesses/ companies. For this reason, the vocational teachers need to have the *communicative competence* and the flexibility to establish the personal relationships as well as the working relationships with colleagues in other working and learning places, with people in co-partners (companies, factories).In fact, there is a pressing issue in TVET field in developing countries, that the TVET graduates often have skill shortages or inappropriate skills and have to be trained again by the employer units. To contribute to shaking off this status, the *competence of linking real work processes with professional learning processes* of vocational teachers needs to be added, compiled in vocational profile of vocational teaching profession. When the teachers possess this competence, they can help vocational learners acquire real skills or necessary work experience to meet the needs of employers and catch up new technologies in the companies/ factories, especially when the industrial companies nowadays constantly upgrade their technologies and have tendency to become environmentally friendly to attain the goal of sustainable development. With competence of linking real work processes with professional learning processes, the vocational teachers are able to contribute not only to supplying the adequately qualified workers for recruitment, but also to promoting the dual system in their country. This competence also supports, consolidates *professional expertise (professional competence), teaching competence* and helps teachers constantly review the status of occupation to be learned and taught in flow of fastly rearranged work processes, update their knowledge and skills and through that, enhance their *competence of self-reflection and improving qualification*.

Communicative and language competence involves the ability of teachers to use language and communicative skills to convey the learning content logically and attractively, to convince and to advice the vocational learners to educate them as well as to help them in learning processes, to moderate in the organization of open learning processes, to communicate effectively with parents of learners, with the colleagues as well as with the local and international co-partners (companies, factories, other vocational schools, regional or international organizations). This competence is an especially important competence for a teacher including the vocational teacher, because teachers always have to interact with other people/stakeholders (e.g. trainees, colleagues, businesses, factories, social services etc.). The interaction with the vocational learners happens in the process of conveying learning contents, controlling the

classroom, consulting the learners. The communicative and language competence, therefore, supports the *teaching competence* and *educating competence* greatly. Knowledge of professional educational psychology and didactics along with the *competence of self-reflection* is very useful for the vocational teachers in improving this competence. In addition, the organization of teaching as well as the concrete curriculum is often determined in a collaboration with colleagues, in other words, in agreement with teaching staff, so the vocational teacher should be able to interact effectively with colleagues to co-make decisions and to share the instructional strategies to each other. The cooperation with other learning places (businesses, factories, companies) to *link real work processes with professional learning processes* also requires the negotiation skill of the vocational teachers. In a broader sense, nowadays the tendency of global cooperation plays a relevant role in all fields including TVET, for that, the vocational teachers should be able to use foreign languages besides communication skills to join in the international projects as well as to have international cooperative relationships to exchange the experiences and information, especially information about the technology changes as well as the new environmentally friendly technologies in field of TVET, through that they can improve their *professional expertise.* Thus, it can be stated that the *communicative and language competence* makes impacts on other competencies (in particular directly on the *teaching competence* and *educating competence)* and the vocational teachers need this competence to carry out their professional duties.

Competence of self-reflection and improving the qualifications refers to the abilities of teachers to reflect their own professional performance, the self-images, the professional goals, the professional ethics and/in order to improve the qualifications and professional quality. Vocational teachers should reflect on one's own teaching result on the basis of analyzing and interpreting the pupils learning outcomes and the external results of the evaluations. Teachers should constantly control their *professional competence (professional expertise), teaching competence, educating competence, communicative and language competence, competence of linking real work processes with professional learning processes* to improve these competencies during the process of execution of professional duties. They have to practice continuously and keep themselves up to date on new pedagogical theories, new technologies, especially the environmentally friendly technologies, as well as on the world of work. Lifelong learning is unavoidable task of vocational teachers, especially technical vocational teachers.

According to the above analysis, it can be stated that the pedagogical competence of vocational teachers is produced by the connection of all above networked competency domains that make impacts on each other and develop their effects with each other. These competency domains are based on (or influenced by) the below pedagogical basic knowledge as well as the additional knowledge and skills.

B. Educational basic knowledge:

Didactics *(knowledge of teaching and learning process)* supplies the deep knowledge of teaching objectives along with strategies of lesson planning, teaching contents, teaching methods (including concepts, concrete methods and teaching techniques), teaching materials,

media, measures and processes of evaluation/ assessment, as well as the knowledge of learning process (learning theories, cognitive development, learning motivation, etc.).

Pedagogical content knowledge *(PCK)* relates to the application of didactics and pedagogical knowledge for teaching of a particular subject/ discipline/ occupation in consideration of the characteristics of this subject/ discipline/ occupation as well as the prior knowledge of learners and other matters of teaching and learning such as diversified teaching strategies, curriculum, instructional materials etc. PCK is compatible with Shulman's theory (1986) about how the teacher can transform the subject matter into teaching (Schulman 1986; Koehler, Mishra 2009; Košinár 2014), but it should be emphasized, that this PCK relies not only on characteristics of scientific discipline but also on characteristics of vocational field.

Curricular knowledge refers to teacher's deep knowledge not also about choosing and compiling of teaching program and teaching materials (Shulman 1986, Košinár 2014), but also about the developing vocational curriculum in consideration of the relationships between a vocational field and other relevant vocational fields, especially based on job analysis (also known as work analysis) accomplished by many different methods, such as DACUM (Collum 1985), observation of workers' performance, interview and procedural review (Cascio &Aguinis 2005; Wilson 2007), job analysis worksheets; surveys, work assessments, JASP (Hartley, 1999) etc.

Pedagogical foundations and psychology cover the understanding of the philosophy of education and training; the intercultural, historical, sociological knowledge in terms of education; pedagogical psychology (developmental psychology, cognitive psychology, work psychology, features of trainees, features of vocational teachers such as ethics, skills, mission, interests, etc.), and consulting knowledge.

C. The additional knowledge and/or skills

Methodology of scientific research and educational scientific research: can help vocational teachers in doing research to improve their expertise.

Work - Technology – Education: provides theoretical basis in terms of relationships between work, technology and education.

Teaching technology: relates to knowledge and skills to teach with technology, from low-tech tools to high-tech tools such as presentation software, online learning etc.

etc.

The additional knowledge can be added and expanded according to the needs in reality.

4 Implications for the development of TVET-systems as a basis for the enhancement of the Greening

Technical vocational teachers contribute to producing worker resource in technical fields. The industrial wastes, the emission from obsolete technologies and the use of fossil fuels cause many serious environmental problems, so when the technical workers do not master new technologies and cannot operate their job in an environmentally friendly manner, they can contribute to causing environment pollution and climate change. Therefore, the training of highly skilled workforce with adequate capabilities and perception of protecting environment is very necessary. This goal cannot be achieved without eligible vocational teachers because the quality of vocational teachers affects the attainment of vocational learners directly. Along with above suggested model, some following initial implications at macro, meso and micro level are offered:

4.1 In terms of policies

At macro level, the governments should have the appropriate public funding for vocational education and training because vocational education plays a significant role when society today needs not only elite school but also mass school. This investment should include increasing vocational teacher's salary (especially in developing countries, where the vocational teachers often do not have motivation to improve their competencies due to low salary which does not meet the needs of their life) to draw talented people into the field of vocational teaching, providing modern machines, equipments for vocational schools to facilitate efficient work regarding green technologies, renewable energy, new material etc. In addition, in developing countries, it is necessary to have efforts to improve institutional voids to compel industrial companies to comply with regulations regarding environment protection and to encourage these companies to cooperate with vocational schools to gradually build the dual system in field of TVET.

4.2 In terms of scientific research in vocational education

Using knowledge of methodology of scientific research and educational scientific research (mentioned as *additional knowledge/skills* in the above suggested model), the vocational teachers should do research in their subject frequently, besides carrying out their teaching duties, to master the up-to-date technologies with solutions of saving energy, protecting environment. On the other hand, the positive results of scientific research (at the companies, at the universities, in the institutes, etc.) regarding the green technology need to be transferred into vocational schools and the vocational teachers need to be coached based on these results of scientific research.

4.3 In terms of school administration and organization

School administrators should support vocational teachers to enhance their effective performance through providing them more pedagogical autonomy, helping them find relationship with companies/ factories on behalf of school/ institution, giving them opportunities/condi-

tions to upgrade their expertise (for example: organizing professional advanced courses for frequently training vocational teachers, expanding the domestic and international cooperation so that vocational teachers have chances to update and exchange knowledge and experience of new technologies, especially environmentally friendly technologies, equipping with modern machinery as much as possible to facilitate process of working and cultivating of teachers etc.). Each vocational school should make efforts to build eligibility criteria to recruit teachers as well as to build accordant systems to control teacher's competences, e.g. through feedback from pupils/ students, from enterprises or through controlling out-come quality. In addition, to organize competitions, movements and conferences regarding green technology and sustainable development in field of vocational teaching should be appreciated and expanded.

4.4 In terms of vocational teacher education

Applying the suggested model of competences with strengthened structure as an instrument, vocational teachers in the present era should be aware of their essential competences in order to be effective in the classroom as well as to fulfill new requirements of vocational teaching profession in the rapidly changing world in which the tendency of sustainable development is critical and unavoidable. With an insight into necessary competences, which they should or must acquire, vocational teachers should have cognizance of their own duties and responsibilities, when facing the world with fatal climate change and global warming. They should constantly self - reflect their performance to recognize their own strengths and weaknesses among the six stated competency domains to promote the strengths and improve the weaknesses to pursue their career professionally. They should commit themselves to cultivating six stated competence domains to ensure necessary capabilities to carry out their duties adequately. In vocational teacher education, the setting of training objectives should be implemented based on the accordant understanding of required competences of vocational teachers in a world of sustainable development.

4.5 In terms of engineer education and training

Securing the quality of engineer education is very significant, because vocational teachers cannot implement their main duties (teaching and educating) without their expertise, in particular when green technologies always require updated knowledge and skills from vocational teachers. Therefore, measures to ensure the quality of training engineers at technical universities should be built and strengthened. On the other hand, in engineer education as well as vocational teacher education and training, factors "life-long learning", "learning of learning methods" and "scientific research methodology" should be taken into account in context of the fact that knowledge of human beings develops rapidly every day. The combination of professional expertise, pedagogical competencies and awareness of duties and responsibilities concerning environment protection will help vocational teachers promote their roles in their profession adequately.

4.6 In terms of cooperation of learning venues

Building the dual system in field of TVET is very necessary to improve the negative image of TVET in East and Southeast Asia, where the TVET graduates must be often trained again by the employers due to the lack of experience and due to the inadequate curriculum, which often has no relation with real work processes. The cooperation of vocational schools and companies will help not only the vocational learners, but also the vocational teachers in improving their competence of linking real work processes with professional learning processes. The building of dual system cannot be based only on the effort of individual vocational teacher, but it also needs the support from policy system, from the strategies of school administration.

4.7 In terms of development of curriculum, development of learning materials and development of assessment materials

The curriculum for VTE needs to be compiled in respect of the green skills of vocational teachers with their cross – influences. Due to the interweaving and the ongoing interaction between these competences in a strong structure, it is required to have the certain unification in terms of content regarding the greening on different subjects (didactics, pedagogical content knowledge, curriculum development, pedagogical psychology etc.). For example:

- On the subject of *vocational pedagogical psychology*, it is essential to emphasize the roles and the interaction of the above suggested green skills when discussing features of vocational teachers;

- On the subject of *didactics* or *pedagogical content knowledge*, it is necessary to mention the greening when discussing learning objectives, learning contents, teaching methods, learning evaluations: (1) Learning objectives: It is relevant to discuss, which learning objectives (in terms of knowledge, in terms of skills, in terms of awareness) regarding the greening that the vocational learners should achieve; (2) Learning contents: It is essential to emphasize, how important it is, when the up-to-date technologies with the solutions of saving energy and environmental protection are conveyed as learning contents for vocational learners; (3) Teaching methods: Besides of discussing general teaching methods in education, it is also interesting and actual to discuss, which teaching forms could be used to wake the awareness of environmental protecttion of the vocational learners up; (4) Learning evaluations: Besides of discussing the forms and criterion to evaluate the knowledge, skills and awareness regarding expertise as the observable and measurable behaviors of vocational learners (the first factor), it is necessary to discuss the forms or criterion to evaluate the knowledge, skills and awareness regarding the greening (the second factor) of vocational learners. The development of assessment materials for vocational learners, which integrate two mentioned factors, is also a relevant theme for educators in the present era of sustainable development.

- On the subject of *vocational curriculum development*: The vocational teachers need to be conveyed the method to develop the vocational curriculum based on the results of job/ work analysis in respect of modern technology with solutions of saving energy and environmental protection in this occupation. The learning materials for vocational learners also need to be compiled based on this spirit.

5 Conclusion

In Vietnam, the awareness of environmental protection is rather low and the sector of green economy is still small. Now, there are neither the green occupations nor the requirements of green skills for green occupations in Vietnam (TVET-Vietnam Organization 2015). However, Vietnamese government has launched the Green Growth Strategy to deal with the environmental and socio-economic challenges towards sustainable development, in which, the Greening TVET is held for an important issue to develop an adequate workforce with green skills to meet the requirements of Green economy development. A series of activities on "Greening TVET" in the frame of the Vietnamese – German Programme Reform of TVET in Vietnam took place, e.g.: "Greening TVET" at the Green-Biz 2013 exhibition; The International Leadership Training (ILT) on "TVET, Climate Change and Green Job"; Seven Vietnamese young professionals graduated from GIZ-supported training on "TVET, Climate Change and Green Jobs"; "Green TVET" on a mission; Green skills development – essential for the transition to green growth; etc. (TVET – Vietnam Organization, 2015). It can be stated, that the Green Skills development for the existing occupations and for new occupations in Vietnam as well as in other countries in East and Southeast Asia is very crucial. The suggested model of pedagogical competence of vocational teachers for greening TVET and the above initial recommendations could contribute to consolidating the professional profile of vocational teaching occupation and to process of Green Skills development in the field of TVET.

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