Pedagogical Competency Enhancement for Engineering and Technology Teachers in Vietnamese Higher Education

Cuong Manh DO
University of Technology, Ho Chi Minh City, Vietnam
p.cuong@ipe.edu.vn

ABSTRACT

How to enhance pedagogical competency for teachers of Engineering and Technology Universities (ETU) is a big question Vietnamese higher education has to answer. What changes should we make to improve the pedagogical training courses? In an attempt to find an answer to this question, we have drawn on the training context, training courses, and participants' information analysis and then made a reference to our experience about the training courses that have been organized at the University of Technical Education (UTE) in Ho Chi Minh City. We indicate here four changes that are requisites for the improvement of the pedagogical training courses for technical and technology teachers. First, it has been found out that pedagogical competency enhancement is about the teacher's self-perception rather than a training process. Second, the teacher's philosophy of education is the most important factor that affects the teacher's learning attitude. Third, instead of presenting the pedagogical concepts system, the training courses should rather include the pedagogical competencies system where the participants may choose their favorite competencies. And last, experiential learning—that is, learning by doing—is the most effective method for those training courses. These will lead to changes in the participant's motivation, teacher's pedagogical quality assessment, content of training courses, teaching and organizing courses methods. We also propose some practical approaches as fundamental directions for the design and organization of the pedagogical training courses for engineering and technology teachers, especially focused on Vietnamese higher education.

Key words: *pedagogical training courses, technical teacher, engineering and technology teachers, pedagogical competency.*

Introduction

"Nemo dat quod non habet" – No one can give what he doesn't have. A university teacher—an engineering and technology teacher in particular—is an educator who works in the higher education environment, not just one who transmits knowledge or professional skills in the university. Inspired by A. Cencini's three pedagogical pillars of "education, formation and accompaniment" (Cencini, 2007), we can better conceive an educator at university as a person who educates his/her students by accompanying them in their training process of professional competencies,

rather than as just a person who can talk to his/her students about what he/she has read or known. As such, teachers of engineering and technology universities (ETU) should help their students acquire competencies to do what the teachers themselves are able to do, not just tell their students what they know.

This has been the perspective we had in mind in designing and organizing the pedagogical training courses for teachers at ETU.

CONTEXT

The Need for Qualified Teachers in Vietnamese Higher Education System

To begin with, it is helpful and appropriate to have a clear idea about the educational system in Vietnam where the idea of university autonomy has not become a reality yet. All schools, whether they are public (state-run) or private (non-public), are subject to the regulations of the Ministry of Education and Training (MoET) which controls all their management and activities, including the training programs, curriculums, teachers' criteria, the number of students allowed to enroll every year, updating courses for teachers, and even the maximum school fees each school is allowed to charge.

In the last decade, Vietnamese higher education has grown very fast. The number of universities has increased from 77 (in 2001-02) to 204 (in 2011-12) (Figure 1a). Correspondingly, the number of teachers has also increased from 25,546 to 59,672 (Figure 1b). At some particular moments (e.g. 2004-2005), on average, a new university made its appearance every two weeks (Figure 1a). The fast increase in the number of universities and teachers has presented a real challenge to the Vietnamese higher education system, especially regarding staff quality. The number of teachers having PhD/Masters only accounts for 14% of the total. For several reasons, many teachers usually have to teach more than 30 hours per week, resulting in insufficient time for research or updating their competencies (in specialties and pedagogy).

As a remedy, two conditions are required by the Vietnamese Ministry of Education and Training (MoET) for anyone who wants to teach at university:

- having a Masters or PhD in specialty science; and
- having a Pedagogical Certificate (the curriculum promulgated by MoET).

MoET (and perhaps also the management of all universities) believes that a shortage of PhDs/Masters might be the main cause of the quality limitation of higher education teaching. To solve the teacher's quality problem, MoET has therefore proposed a project to train 20,000 PhDs for the period 2008 – 2020 with a total budget of about 700 million dollars.

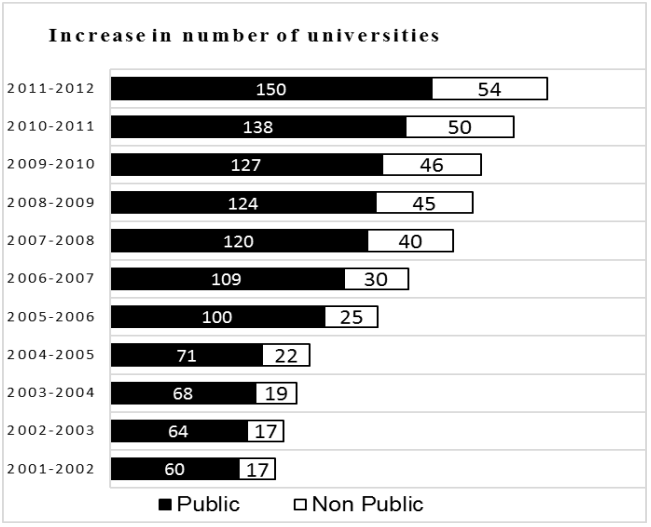

Figure 1a: Increase in number of universities

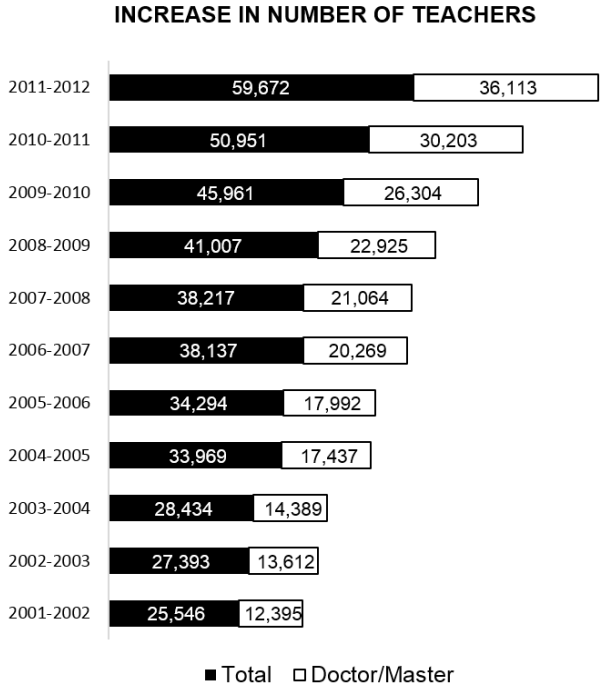

Figure 2b: Increase in number of teachers

To enhance the teachers' pedagogical quality, MoET promulgated two pedagogical curriculums, the first in 1993 and the second in 2007. The point was that it should take an extended time to complete a Masters/PhD program, while only a reasonable time was enough for one to obtain a pedagogical certificate and be able to fulfill his/her teaching mission in a university.

The Pedagogical Training Curriculum for Teachers of ETU

MoET has a unique pedagogical training curriculum for all university teachers, whatever their specialties are.

The first curriculum (Table 1) was promulgated in 1993 with 22 credits and including 8 subjects: psychology, educational science, teaching methods, scientific research methods, organizing and managing the training process, logic, didactic practice, and curriculum development.

Table 1. The pedagogical curriculum for teachers in university (level I & II), by MoET 1993 (1st curriculum)

	Subjects	Credits	Note
1	**Psychology**	**4**	
2	**Educational Science**	**4**	
3	**Teaching Methods**	**4**	
4	**Scientific Research Methods**	**2**	
5	**Organizing and Managing the Training Process**	**2**	
6	**Logic**	**2**	**Not required**
7	**Didactic Practice**	**2**	
8	**Curriculum Development**	**2**	
Total:		**22 credits**	

The second curriculum (Table 2) was promulgated in 2007 with 15 credits (10 required, 5 optional) and 10 subjects including: Vietnamese & Worldwide Education, Educational Psychology for Higher Education, Didactic and Teaching Methods for Higher Education, Curriculum Development and Training Process Organization, Assessment in Higher Education, Using Media and Technology in Higher Education, Teaching Model and Renovating the Teaching Methods, Teaching Methods for Specialties, E-Learning in Distance Learning, and Applying ICT in Education.

Table 2: The pedagogical curriculum for teachers in university, by MoET 2007 (2nd curriculum)

	Subjects	Credits	Note
1	Vietnamese & Worldwide Education	2	required
2	Educational Psychology for Higher Education	2	required
3	Didactic and Teaching Methods for Higher Education	2	required
4	Curriculum Development and Training Process Organization	1	required
5	Assessment in Higher Education	2	required
6	Using Media and Technology in Higher Education	1	required
7	Teaching Models and Renovating the Teaching Methods	2	Optional
8	Teaching Methods for Specialties	2	Optional
9	E-Learning in Distance Learning	2	Optional
10	Applying ICT in Education	2	Optional

The MoET however does not provide any teaching materials for this curriculum. It is up to the institution to decide on them.

Evaluating the Pedagogical Training Quality for Teachers of ETU

There have been many evaluations and comments on the pedagogical training programs for teachers of ETU and on their results. Most of the evaluations were convergent on the following:

- It was clear that these curriculums focused on the transmission of pedagogical knowledge to learners, instead of emphasizing their pedagogical competency. Or in Biggs's words, the curriculums and their intended learning outcomes (ILO) give learners only declarative, not functioning, knowledge (Biggs & Tang, 2007). With such curriculums, the learners can at most answer the pedagogical question "what it is", but not the question "what to do and how to do". The results will be all the more limited if the class is large (the number of learners for a class being usually 60 and above for budget reasons).
- Learners will be granted a certificate if they pass all of the subjects. Consequently, most learners only focused on passing the final test of each subject. Nothing therefore would guarantee that the learners had the necessary pedagogical competency on completion of their training course. And it was for this reason that the learners' motivation was only of an external or social character.

Today, the need for improving the teacher's pedagogical competency is deeply felt in many universities. Nevertheless, the budget problem is a real barrier to the organization of the institutions, and the lack of a criterion for the assessment of the teacher also reduces the learner's motivation. In December 2012, the School of Economics and Law of the National University of HCM City asked IPE to design a special pedagogical training curriculum for them because, as they said, many teachers could not teach effectively although they had all the required pedagogical certificates. This was not a particular case but a common problem for many Vietnamese universities.

ENHANCING PEDAGOGICAL COMPETENCY FOR ENGINEERING AND TECHNOLOGY TEACHERS AT UTE

Teaching Staff's Quality and Need for Training

Being the oldest university of technical education in Vietnam, the University of Technical Education (UTE) in Ho Chi Minh City in the last decade has greatly developed in size. It has become a college for multi-discipline, multi-area, and multi-level training. UTE not only educates technical teachers for the professional education system, but also trains technicians and engineers for technology and economics Faculties. The number of students has grown dramatically (around 30,000), and the training Faculties also have expanded.

Statistics showed that the number of newly enrolled teachers in the past ten years (especially in the last five years) was quite high (Figure 2). Among the new teachers, approximately 50% were graduates with grade A from UTE and were retained in the same university to teach, while the rest were enrolled from other universities (mostly from the HCMC University of Technology). The new teachers who were enrolled from other universities or institutes other than IPE (and also the engineers graduated from UTE) were required to take the training courses for a pedagogical certificate as prescribed by MoET. These courses were organized by UTE and the lecturers were also chosen from UTE's teachers.

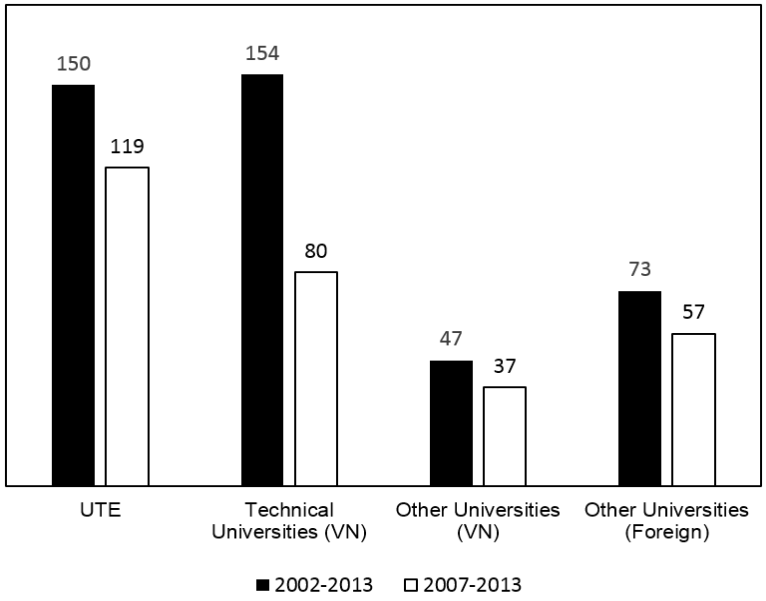

Figure 2: Number of newly enrolled teachers in 10 recent years at UTE

To assess the new teachers' competency, UTE made two review sessions:

- Session I: June 7, 2010 — June 16, 2010, assessing twenty one lessons taught by the teachers of eleven Faculties of the University.
- Session II: May 9, 2011 — May 22, 2011, assessing thirty lessons taught by the teachers of fifteen Faculties.

As a result, the academic board gave these general remarks:

- Application in learning and in practice with a view to getting a certificate in specialties rather than improving pedagogical competency;
- Good professional knowledge but limited professional competency (due to a split from the production reality after teaching);
- Insufficient pedagogical competency to help the students learn better.
- Limited use of educational technology. The technology facilities were used chiefly as a 'teaching tool', not as a 'learning tool';
- Limited effectiveness of the pedagogical training courses.

The common flaws that the teachers made were: they did not know how to design a lesson; they could not identify the relevant intended outcomes of the lesson/curriculum; they focused more on teaching theoretical knowledge than on helping their students attain relevant competency; their teaching style was chiefly by listening-writing or seeing-writing, giving piecemeal knowledge/concepts without connecting them to a context/system.

From this reality, the UTE's Management Board entrusted the Institute for Research and Development of Professional Education (IPE) with devising a pedagogical enhancement program for the school's teachers. All teachers who had been enrolled within 5 years (from 2007), whether they had the MoET required pedagogical certificate or not, had to attend this program.

Under the conditions of both undertaking the courses and getting experience, IPE used the action research approach to fulfill its task.

What is a "Good Technical Teacher"?

In designing the curriculum and organizing the training courses, we were inspired by two famous sayings, the first being a Vietnamese idiom, "miệng nói tay làm" ("speaking while also doing"), and the second was a comment of Pope Paul VI, "modern man listens more willingly to witnesses than to teachers, and if he does listen to teachers, it is because they are witnesses."

A "good technical teacher" may be defined as a person who is able not only to help his/her students understand technical concepts and know how to do technical tasks, but also to do by himself/herself what he/she teaches others to do. He/she should also be a living example in their specialization. Educating/teaching is for them not so much a means of living as a mission on which they put the values of their lives. The program of pedagogical competency enhancement for teachers should aim at helping them have a good relationship with their students in this perspective.

There are several specific criteria to become a good technical teacher, but the following three criteria are essential:

- Having sufficient professional capacity and identifying oneself with it in practice;
- Having sufficient pedagogical competency to educate, form and accompany one's students;
- Having a personal educational philosophy and living it in the context of the institution.

The pedagogical competency enhancement program for UTE's teachers as designed and implemented by IPE was chiefly based on the latter two criteria.

Basic Ideas for the Design

IPE's curriculum design was based on the following basic ideas:

- One may need just a short time to learn some teaching skills, but to become an educator in the university environment, one needs a long and at times arduous process to perceive and transform oneself. Consequently one needs to give priority to those basic pedagogical competencies that can guarantee the fulfillment of the most common tasks of teachers and to introduce them in the first program of enhancement. Other competencies will be reserved for the ongoing training during their teaching in the institution.
- Participants are teachers enrolled from different contexts with various experiences and consequently also having different needs. The program therefore must be adapted as much as possible to each course. The best way is to build a list of topics pertinent to the required pedagogical competencies, and the learners have the right to suggest and agree on the choice of the most suitable program for each course (in the time limit prescribed of not more than 10 credits).
- The lessons are undertaken in the experiential learning approach. Teachers have to choose and construct typical pedagogical situations to stimulate the students' experience and participation in the solution finding. These situations are the sources from which emerges the value of the knowledge presented, and a constructive environment is created for the students to engage themselves in the activities, leading to the formation of real competencies. Learning activities are chiefly those that help solve a pedagogical situation and are then condensed into pedagogical theories with the help of the teacher. These also are the principal activities of the lesson.

Curriculum Design

To design the curriculum, IPE held a seminar to analyze the tasks of the technical teachers. There were seven participants who were senior teachers and who were acknowledged as good teachers of UTE (that is, teachers who were entitled 'national elite teachers', or who had had a long teaching career and were currently pedagogical and technical specialists for international education organizations, or MoET's specialists in the assessment of the teachers' pedagogical competency).

They were invited from the faculties of Information Technology, Mechanical Engineering, Automotive Engineering, Vietnam-Germany Center, and Faculty for High Quality Training. The participants had also graduated from different educative systems.

From this emerged the building of a Dacum diagram with five duties and 35 tasks (Figure 3). Based on this diagram, IPE went on to analyze the relevant factors of declarative and functioning knowledge to guarantee the implementation of the tasks.

Based on this Dacum analysis, IPE constructed the enhancement curriculum including five topics relating to the competencies that needed enhancement, with 30 detailed lessons. (See Appendix)

In the past, no universities or institutions had their mission and educational philosophy stated expressly. This lacuna has led to the teachers' view that teaching is nothing more than a job for a living and so they do not find a value for their life in a university environment. Not finding a life value from their profession, not seeing their personal role in carrying out their mission and in the educational philosophy of the institution, and not having a personal educational philosophy, it would be very difficult for a teacher to become a true educator. To compensate for this, in the IPE's curriculum there are two lessons (actually two seminar sessions) specifically designed with these essential contents: UTE's mission and philosophy of education (presented by the President) and duties of UTE's teachers (by the Training Faculty Head).

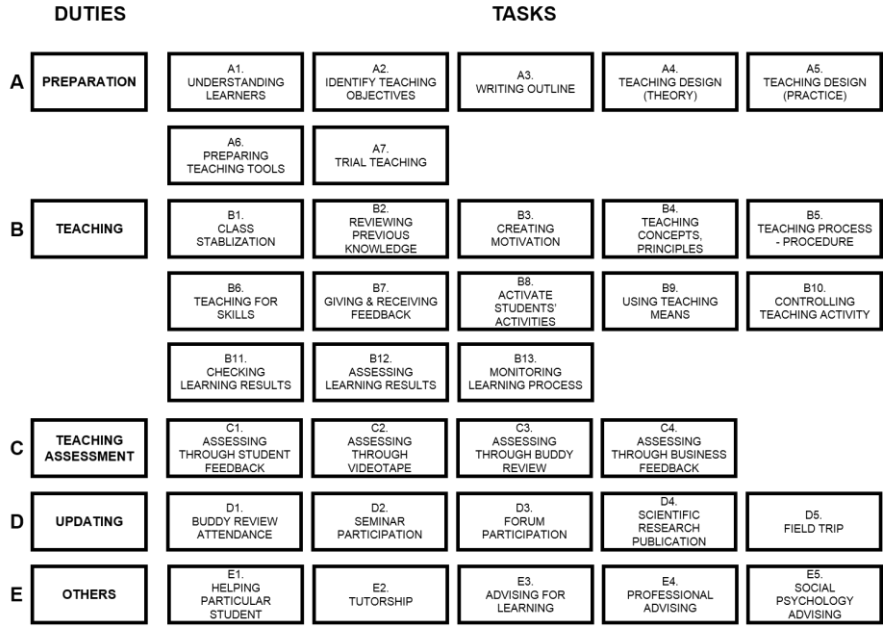

Figure 3: A Dacum diagram showing teachers' tasks at UTE

Teachers and Materials

Teachers responsible for the classes were selected from good teachers of the institution who were experienced in training young teachers. Each teacher was responsible for one topic or one section of a topic.

Learning materials were of two kinds: standard texts written or chosen by the teacher and reference materials supplied by IPE. Reference materials mainly consisted of: *Tools for Teaching* (Barbara Gross), *Teaching for Quality Learning at University* (John Biggs), Teaching Handbooks (from Universities such as Stanford, Ohio, Florida, Indiana, North Carolina, etc.).

Collecting Feedback from Learners

Feedback information for an assessment of the course and curriculum was collected from:

- The students' applications;
- Results of the tests on the students' problem solution;
- The teacher's daily remarks on each session (result, students' participation, eventual transformation of some students);
- Questionnaires to students on various aspects (also used as scales): course management, contents of curriculum, contents of each topic, teaching methods, application effect, effect of self-perception and consequent transformation. Each of the first five scales was assigned a maximum 5 points (according to 5 positive signs of the respective scale). In addition, the questionnaires also suggested that learners provide feedback on: the most interesting contents, the most useful, and contents they would like to learn more about;
- The change of the environment from the beginning to the end of the course;
- At the end of the course, UTE held a meeting between participants and the human resource board to hear the learners' feedbacks on the course, while IPE also had to submit to UTE an evaluation report of the course.

Curriculum Alignment

Based on the survey's result and assessment of the teachers and learners on the course, IPE analyzed and aligned the curriculum on both aspects: curriculum structure and contents of each subject (topic). This helped to improve the teaching quality of the next courses.

Results

Between 2010 and 2012, IPE organized four training courses in the new program framework to 75 new enrolled teachers of the institution.

The results of these four courses are shown in Figure 4:

	Class 01	Class 02	Class 03	Class 04
Organization	4.217	4.733	**4.700**	4.647
Curriculum	3.043	4.000	4.300	3.529
Contents	4.478	4.667	4.800	4.706
Teaching	4.609	4.600	4.900	4.824
Effect	4.696	4.800	4.850	4.765

Figure 4: Results from students' feedback assessing the course

In a 0 to 5 scale, five quality levels were distinguished: 0-1 = very bad; 1-2 = bad; 2-3 = average; 3-4 = rather good; 4-5 = good. The expectation was that the assessment results on all aspects should be rather good and above.

The data and diagram in Figure 4 showed a difference between different courses. Whether this difference was really significant needed a statistic verification of the hypotheses.

Therefore the alternative hypothesis H_1 was that the program actually achieved positive results of rather good (>3.0) and above. We used test t to verify the alternative hypothesis for all four courses. Means values (X), standard deviations (S) and t values were given below (Figure 5):

	Average	Standardize	t
Organization	4.547	0.599	22.3466
Curriculum	3.680	1.210	4.8674
Contents	4.653	0.707	20.2528
Teaching	4.733	0.577	26.0000
Effect	4.773	0.452	33.9452

Figure 5: Data for test t

In alpha meaning level $\alpha = 0.05$ and degree of freedom df = 74, from the table we got t = 1.67. This was a one-tailed test, so the rejection region H_0 is t>.67. It was concluded that the result allowed us to reject the null hypothesis H_0 and to affirm H_1; in other words, the program made a remarkable quality improvement to the courses (rather good level and above).

From the graph above (Figure 4), it was shown that, from class 01 to class 04, the scales got ascending values, and the scale for the program structure quality in particular showed striking improvement, while the program became more and more appropriate.

Class attendance register showed a sharp difference in learners' application between the courses at IPE and other courses. Almost no learners dropped classes. The learners were actively engaged in the activities organized by the teachers.

After-course interviews with the participants showed that there was visible transformation in the learners' perception of the school's educational mission and of their personal values as educators. The learners also said they became more aware of their limitations and deficiencies but they felt more confident in their teaching task and could better direct their efforts in further studies.

CONCLUSION

After all the four courses were conducted, through an action research in their organizing process, the survey data and assessment showed that the results were reliable, and they actually were. By looking at the implementation process and by comparing with programs and results of other training courses based on MoET's program that had been organized by UTE of Ho Chi Minh City, we arrived at the following conclusions:

- To enhance pedagogical competency for teachers is not merely to equip them with pedagogical knowledge and understanding, but to form educators with the technical qualifications, pedagogical competency and life values of an educator. Therefore pedagogical enhancement is not just efforts made once and for all, but a continuous process that should be made year after year; learners should be made aware of their duty to carry out their mission and embody the school's educational philosophy in their teaching activities; and the school leaders should accompany the learners (teachers).
- For learners to have the proper motivations, the formation process needs to become a process of personal discovery and adjustment by the teachers. The organizing unit and the teachers should create a learning environment satisfying this need.
- The enhancement program framework should not merely be a list of knowledge to acquire, but a catalogue of pedagogical competencies to be formed. The curriculum of each specific class should be established with

flexibility according to the choice and needs of the learners and the exchange and discussion between teachers and learners.

- It should be suitable to the characteristics of older people, using the competency-based training approach, and the implementation of the courses should be in the form of experiential learning. If a good learning environment (e.g. the constructive environment as proposed by Jonassen) is created, it will be one of the important factors that greatly contribute to the increase of the effectiveness of the courses.

After the positive results obtained from the enhancement courses under this new program, UTE decided that all newly enrolled teachers— whether or not they had national standard pedagogy certificates as prescribed by MoET—must take the pedagogical competency training course at IPE under the designed curriculum. This has demonstrated the strong assertion that IPE is on the right track in pedagogical competency enhancement for technical teachers in Vietnamese higher education.

REFERENCES

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university*. Maidenhead: Open University Press/McGraw-Hill Education.

Bộ Giáo Dục-Đào Tạo (2011). *Luật Giáo Dục Đại Học Việt Nam*. Hà Nội.

Cencini, A. & Manenti, A., (1992). *Psychology and formation: structures and dynamics*. English translation of Sr. Plathara, A. & Mattappallil, A. Bombay: St. Paul Publications.

Cencini, A. (2007). *Éduquer-Former-Accompagner*. Une pédagogie pour aider une personne à réaliser sa vocation. 2e édition. Traduction française de Maria Zurowska. Nouan-le-Fuselier: Éditions des Béatitudes.

Davis, B.G. (2009). *Tools for teaching*. San Francisco: Jossey-Bass.

Do M.C. (2010). *Báo cáo đánh giá năng lực sư phạm giảng viên trẻ của trường ĐH Sư Phạm Kỹ Thuật năm 2010.*

Do M.C. (2011). *Báo cáo đánh giá năng lực sư phạm giảng viên trẻ của trường ĐH Sư Phạm Kỹ Thuật năm 2011*.

Do M.C. (2012). *Báo cáo đánh giá năng lực sư phạm giảng viên trẻ của trường ĐH Sư Phạm Kỹ Thuật năm 2012*.

Filene, P. (2005). *The joy of teaching*. University of North Carolina Press.

Stanford (2007). *Teaching at Standford: an introductory handbook for faculty. academic staff, and teaching assistants* (2007). Stanford, CA: Center for Teaching and Learning.

Appendix

TOPICS FOR ENHANCEMENT COURSES

TOPIC		TIME	CHOICE
I.	HELPING STUDENTS LEARN	4 credits	
1.	Surveying learning styles	10 periods	☐
2.	Helping students with deep learning approach (active)	10 p.	☐
3.	Developing integral competency	20 p.	☐
4.	Guiding in reading — taking notes	5 p.	☐
5.	Helping students to write overview & scientific report	5 p.	☐
6.	Guiding to write essay, dissertation	10 p.	☐
II.	ENHANCING TEACHING COMPETENCY	6 credits	
1.	Learning contents in higher education and learning level of students	5 periods	☐
2.	Methods of teaching concepts and principles	5 p.	☐
3.	Methods of teaching skills	5 p.	☐
4.	Methods of teaching process — procedure	5 p.	☐
5.	Process of experiential teaching	5 p.	☐
6.	Teaching self-perception skill	5 p.	☐
7.	Basic teaching skills	45 p.	☐
	Include the following skills: *Table presentation – Group work – Presentation – Brainstorming – Slides projection and slides designing – Modelling – Questioning – Using technology in teaching*		
8.	Skills supporting active teaching	25 p.	☐
	Include the following skills: *Creating motivation – Designing learning facts/situation – Designing and organizing learning projects – Choosing and building case study – Choosing and building research problem classes – Teaching large classes*		
III.	PREPARING FOR TEACHING	5 credits	
1.	Writing syllabus	5 p.	☐
2.	Study/Understand the learners	5 p.	☐
3.	Collecting documents, materials	2.5 p.	☐
4.	Making concepts map	2.5 p.	☐
5.	Designing computer-aided learning environment	5 p.	☐

IV.	TEST – LEARNING ASSESSMENT	2 credits	
1.	Measuring and assessing learning	5 p.	☐
2.	Assessing understanding	5 p.	☐
3.	Assessing skills	5 p.	☐
4.	Assessing competencies	5 p.	☐
V.	ORGANIZING CLASS	1 credit	
1.	Building class environment	5 p.	☐
2.	Building teacher-student relationship	5 p.	☐
3.	Applying experiential learning–reflection & attendance	5 p.	☐