



Teachers' Pedagogical Reasoning and Action in Technical and Vocational Education

Mohamad, M.M^{1*}, Yee, M.H.², Tee, T.K.³, Ibrahim Mukhtar, M.⁴, Ahmad, A.⁵

^{1*,2,3,4} Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor. MALAYSIA

⁵ School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, 81310 Skudai, Johor. MALAYSIA

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Abstract: Model of Pedagogical Reasoning and Action (MPRA) is a model of effective teaching where teaching activities are aimed at understanding, transformation, evaluation and assessment, and reflection on teaching of new knowledge which supports competency of teachers. The aim of this study is to identify the extent to which teaching practices of technical and vocational teachers are aligned with the process proposed by MPRA. The specific objectives of the study were to identify the level of knowledge and competencies of teaching, differences in practices between teachers of different technical and vocational subjects and also in their relationships to teachers' demographic information such as teaching experiences, courses attended and skills' certificate. The respondents were 160 teachers of technical and vocational education from eight subjects are as who were selected using the convenience sampling method. The findings indicate that the competency and knowledge of teachers are at a high level. Differences in teaching practices are found according to vocational field and significant relationship between competency and knowledge with teaching experience. In conclusion, teachers are able to apply their knowledge and skills in teaching and use their working experience in industry to contribute to a broader interpretation of knowledge and teaching to produce effective strategies for technical and vocational education field.

Keywords: Pedagogical reasoning, pedagogical approach, knowledge, competency, skills

1. Introduction

Teaching and learning innovation in technical and vocational education (TVE) has been implemented through competency-based education modules in curriculum requirements. The challenge faced by teachers in TVE is training for future curriculum in Technical and Vocational Education and the Training (TVET) required very comprehensive content to strengthen the process of producing TVET graduates especially from vocational colleges and primary schools aligned with nation transformation agenda. Pedagogical approach will be changed to fulfil the learning outcome of TVE curriculum. The changes in pedagogy or pedagogical shift are defined as a description of reasoning and action which teachers need for a shift from initial comprehension to a new comprehension (Shulman, 1987). Pedagogical shifts are characterized by a teacher's transformation of content knowledge into forms that are pedagogically powerful and adapted to suit the student. Shulman's Model of Pedagogical Reasoning and Action (MPRA) suggested reasoning by teachers includes the process of developing understanding, transformation, instruction, evaluation, reflection and new knowledge which can lead new comprehension. The stage of reasoning and action in pedagogical context through shifting initial states of comprehension to new comprehension provide convincing conceptual framework for exploring practice-based teaching. Thus, this study was conducted to seek information on the implementation of MPRA in TVE curriculum in specifically their level of knowledge, competencies and relationship between these aspects with teachers' background.

*Corresponding author: mimi@uthm.edu.my

1.1 Pedagogical Reasoning

Shulman's (1987) model of pedagogical reasoning and action was proposed as basis for teaching reform. It was designed for pedagogical content knowledge for effective practices in teaching. The model described actions that a teacher takes during the teaching process including; comprehension of subject knowledge, transformation of subject knowledge into teachable representations, instruction, evaluation of students' learning and teacher's performance, reflection, and improvement form of understanding. Fig.1 illustrates the process of reasoning in MPRA developed by Shulman. Each element described the phase of teaching in delivering knowledge to students.

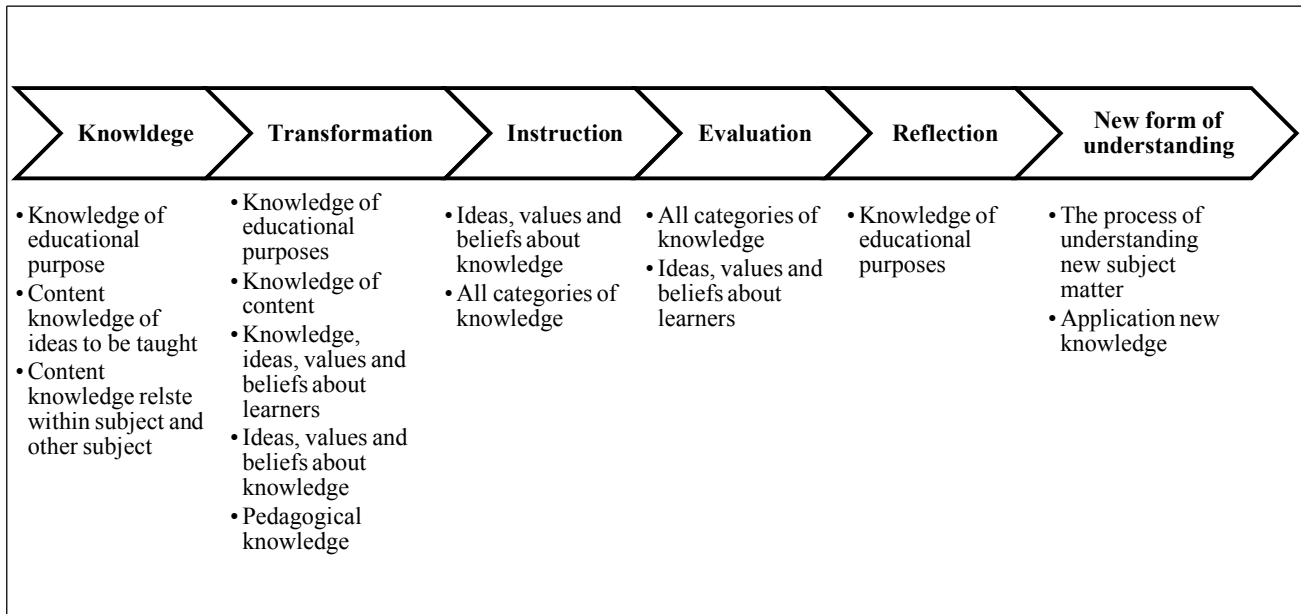


Fig. 1 -Model of Pedagogical Reasoning and Action by Shulman (Webb, 2002)

Teacher can transform understanding, performance skills or desired attitudes into pedagogical representations and actions. These are ways of talking, showing, enacting or any presentation of ideas so the understanding of knowledge can be comprehensive and discerning. Thus, teaching necessarily begins with a teacher's understanding of what is to be learned and how it is to be taught. In promoting comprehensive understanding among students, teachers should have knowledge base and the categories of knowledge base suggested by Shulman are:

- i. Content knowledge
- ii. General pedagogical knowledge with special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter
- iii. Curriculum knowledge with particular grasp of the materials and programs that serve as tool for teachers
- iv. Pedagogical content knowledge that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding
- v. Knowledge of learners and their characteristics
- vi. Knowledge of educational contexts, ranging from working of classroom, governance and financing
- vii. Knowledge of educational ends, purpose and values

2. Competency in Technical and Vocational Education Curriculum

Competency in technical and vocational education (TVE) is learned by carrying out tasks that help a person acquire employable skills. The teaching and learning processes tend to be more student-centred. A person who has the competency is able to apply knowledge and skills and demonstrate attitudes associated with the practices of the intended job (Tubsree & Bunsong, 2013). Tubsree and Bunsong (2013) also suggested where the competency elements can be referred to in the curriculum standard:

- i. The learning objectives, content and the means required for meeting the learning objectives of the curriculum
- ii. Performance level, essential knowledge and task performed skills standard that are required
- iii. Occupational standard that refers to statements of duties and tasks related to a specific occupation and to its practice in similar jobs

- iv. Assessment standard which refers to statements of learning outcomes to be assessed and the methodology to be used

The principles of competency based curriculum in TVET includes student centred, task based and competence oriented. According to Jones and Voorhees (2002) and Okoye (2015), student centred is an active player generates the learning goals and is responsible for student learning activities while task based are directed toward performing the professional task or job oriented and competence oriented is formulated to develop competencies needed by professional task for future working environment.

This study was conducted to achieve three objectives as follows:

- i. To identify teachers' knowledge in implementing reasoning and action teaching practices.
- ii. To assess the competency level of teachers in implementing pedagogical content knowledge.
- iii. To determine the relationship between competency and knowledge keeping in mind the demographical factors among TVE teachers

3. Research Methodology

This study used the survey research design by using quantitative approach. Survey research is used widely to answer various kinds of research questions concerning issues and problems that exist. It is also useful in explaining attitudes, views, beliefs and behaviours (Chua, 2016). A set of questionnaires was distributed to 160 teachers (respondents) from Vocational Colleges and Secondary Schools. Convenience sampling technique was applied to get voluntary teaching participants in this survey. Teachers who teach technology courses in Vocational Colleges and teachers who teach Technology Design in Secondary Schools were involved in this research. Questionnaires were developed by the researcher based on knowledge and competency as proposed by MPRA. Questionnaires were distributed using various media; online via face book and email, face to face and ordinary mail. More than 170 sets were distributed, 165 were returned, and only 160 were complete which were subsequently analysed. The reliability estimates for the knowledge and competency items were .91 and .88 respectively.

4. Findings and Discussions

4.1 Teachers' knowledge in implementing reasoning and action in teaching practices

Research identified knowledge in implementing reasoning and action using the elements of MPRA. The results in Table 1 show that for understanding, knowledge desire has the highest mean ($M=4.38$; $DS=.63$) compared to multiple concept, syllabus understanding and knowing terminologies in skills and technologies. The result for the instruction construct which was represented by three items; applying into real situation, facts and thinking concept and sharing ideas with peers indicates sharing ideas with peers is preferred by teachers as an instructional method ($M=4.24$; $SD=.59$). Teachers tend to encourage students when evaluating them ($M=4.26$; $SD=.66$). It is reflecting the literature analysis that TVET teachers conduct integrated teaching combining theoretical and practical aspect to enhance at the student's interaction (Lipsmeier, 2013). After evaluation process, reflection part is important for teachers to plan and improve their next teaching strategies. Interaction with student has the highest mean score ($M=4.20$; $SD=.62$) in reflection process. Strategy improvement shows mean score, $M=4.11$; $SD=.69$, in transformation of MPRA and new simulation method indicate $M=4.22$; $SD=.65$, respondents' response in new form of understanding.

The study provides information about the level of knowledge in the implementation of the process of reasoning and action based on MPRA. Mostly the feedback from respondents are in high mean score and the highest score is in knowledge desire (understanding element). The knowledge cluster is related in cognitive level connected with learning outcome. Shulman & Shulman (2004) mentioned attributes a cognitive cluster which includes discerning, understanding and analysing. In TVET, teaching involves the competency models for defining skill, knowledge and attitude for job requirement. Knowledgeable TVET graduates will develop competent workforce (Ridzwan et.al, 2017). TVE curriculum contains specialised knowledge to focus more on job orientation. Specialized knowledge is related to the specific discipline or field of study such as terminology, tools, and technologies related to that field, principal features, core theories and practices (Disraeli & Raymond, 2016).

Table 1- Knowledge in reasoning and action

Items	Understanding	M	SD
1.	Knowledge desire	4.38	.63
2.	TVET multiple concepts	3.92	.74
3.	Syllabus understanding	3.85	.76
4.	Skills & technology of terminologies	3.97	.68
Instruction		M	SD
5.	Applying into real situation	4.16	.68
6.	Facts and thinking concept	4.06	.74
7.	Sharing ideas with peers	4.24	.59
Evaluation		M	SD
8.	Encourage students	4.26	.66
9.	SCL	4.07	.64
Reflection		M	SD
10.	Curriculum standard	4.01	.76
11.	Interaction with student	4.20	.62
12.	Motivation	4.14	.65
Transformation		M	SD
13.	Strategy improvement	4.11	.69
14.	Courses attended	3.99	.89
15.	New sources	4.01	.70
New understanding		M	SD
16.	New simulation method	4.22	.65
17.	Improve teaching quality	4.21	.70

N=160

4.2 Competency level in implementing pedagogical content knowledge

The concept of Pedagogical content knowledge (PCK) was introduced by Shulman (1986). PCK as specific form of knowledge for teaching refers to transformation of subject knowledge in the context of facilitating student’s understanding. Knowledge in TVET is refer to specialized knowledge required to perform a specific type of job (Clarke & Hollingsworth, 2002; Junnaina, Husin & Hazri,2012). The important of TVET instructors to produce alternative instructional methods to gained student’s knowledge and competencies. In this study, the content knowledge investigated based on nine items. The items contained sharing experience, learning with articles and journals, students’ ability, student centered learning (SCL), various strategies in teaching, students’ competency record, reflection and improvement of existing practices. PCK results showed students’ ability had the highest mean score (M=4.19;SD=.55) and teaching with various strategies is chosen by respondents with (M=4.22;SD=.65). However, all results in this section indicated high mean score numbers and described most respondents applying the items asked. Table 2 illustrates the findings.

Table 2-Competency in pedagogical content knowledge and teaching methods

Items	Pedagogical content knowledge	M	SD
1.	Sharing experience	4.11	.65
2.	Articles & journals	3.91	.78
3.	Student’s ability	4.19	.55
Teaching methods		M	SD
5.	SCL	4.13	.67
6.	Various strategy	4.22	.65
7.	Student’s competencies record	4.06	.64
8.	Reflection	4.11	.59
9.	Improvement existing practices	4.01	.67

PCK is at the intersection between subject content and pedagogy. Hence, it is elsewhere a curriculum content and teaching strategies separation from one another. PCK signifies the blending of content and pedagogy into accepting of how particular aspects of subject matter are organized, adapted and represented for instruction (Mishra & Koehler, 2006). This study investigated nine items containing PCK and teaching methods in TVE curriculum. The items were developed based on practices aligned with learning outcome in curriculum standard. The focus of PCK and teaching methods in this study was more on student centred learning. It showed high mean score for students’ ability and also for all teaching

methods related items in range of high mean scores. It is supported by Mishra and Koehler (2006), PCK is concerned with making the concepts of teaching easier to learn and comprising the teaching methods that integrate conceptual representations to address student’s difficulties. Videotaping teaching and analysing lessons through technology have gained popularity and can be effective ways to gain insight into teaching and learning (Lewis, Perry, Friedkin, & Roth, 2012). To sum up both the findings of knowledge and competencies level among teachers the overall mean was calculated. Table 3 explains the mean scores representing each construct from both variables in research objective one and two.

Table 3-Knowledge and competencies

Knowledge of reasoning and action		Competencies	
Understanding	4.03	Pedagogical content knowledge	4.07
Instruction	4.15	Teaching methods	4.11
Evaluation	4.17		
Reflection	4.12		
Transformation	4.04		
New form of understanding	4.22		

4.3 Relationship between competencies and knowledge with demographical factors among TVE teachers

The demographical factors are related to influencing factors from the past studies conducted in several aspects of knowledge gained across gender, teaching experience, specialization and age (Koh, Chai & Tsai, 2010; Shin & Cummings, 2010). The finding shows there is no significant difference detected between age and teaching experience. However, based on Harris and Hofer (2011), knowledge influenced by cultural, socio-economics and organizational factors. While Mclaughlin and Bracey-Sutton (2008) professional development is the factors of critical success in to develop skilled instructors. Therefore, this study chooses to identify the demographical factors and the relationship between knowledge and competencies. Table 4 shows the relationship between competencies with teaching experience and academic qualification. Results indicate that there is significant relationship between teaching experience and competencies ($r=.18; p=.03$). While in academic qualification aspect it shows there is no significant relationship between competencies and academic qualification ($r=-.04; p=.63$). Weak correlation value is calculated in this aspect. In other aspects of qualifications are skills, qualification and courses that teachers attended. The results showed the negative correlation with significance value less than .05 meaning that there is significant correlation between this aspect and competencies.

Table 4-Relationship between competency and teachers’ demography

Competency	N	Correlation (r)	Sig.(p)
Competency*	160	.18	.03
Teaching experience			
Competency*	160	-.04	.63
Academic qualification			
Competency* Skills/courses attended	160	-.18	.03

Table 5 shows correlations between knowledge and demographical factors among TVET teachers. The result indicates that there is significant relationship between knowledge and teaching experience ($r=.21; p=.01$) however, the result contradicts in academic qualification; there is no significant relationship between academic qualification ($r=.03; p=.72$), skills or course attended ($r=.09; p=.26$) and knowledge level in pedagogical reasoning and action.

Table 5-Relationship between knowledge and teachers’ demography

Knowledge	N	Correlation (r)	Sig. (p)
Knowledge *	160	.21	.01
Teaching experience			
Knowledge*	160	.03	.72
Academic qualification			
Knowledge*	160	-.09	.26
Skills/course attended			

Using pedagogical reasoning and action in practice-based for teachers’ professional development as reported by Pella (2015), the basic goal is providing learning experiences that promote the types of pedagogical shifts which can enhance

students' learning. By connecting and engaging pedagogical reasoning and action, teachers can shift initial understandings of content to developing content knowledge. The criteria of investigating demographical information in this research is related to courses that teachers attended and also the other skill qualifications they have. Teachers also can design and develop various methods using pedagogical reasoning and pedagogical content knowledge in teaching strategies. It also can apply over designing professional courses for teachers. Anke (2010) stated that professional education requires knowledge in terms of pedagogical knowledge or pedagogical content knowledge of what students learned. Understanding pedagogy is the teachers' responsibility to ensure students are engaged intellectually regardless of background (Mohd. Hashim & Abu Bakar, 2017). The education nowadays is not just academic learning, it also involves the development of professional and vocational skills, highly soft skills that will allow to produce effective and productive teaching (Mohamad, et.al., 2017 and Wijensingha, 2010). However, as a challenge in teaching strategies are concerned in curriculum alignment, the availability of teaching materials, intended learning outcome and assessment. The transformation of design teaching strategies is planning the act of teaching, teaching as deliberate reflection and the culmination of pedagogical reasoning (Shulman, 1987, Do-Yong & Chanphorn, 2017). Thus, the concern of MPRA is developing the transformative of level in effective teaching and the relationship between TVET competency curriculum will derive the teaching strategies towards future students' working environment.

5. Conclusion

The 21st century education demands teachers who have high level of competencies and knowledge to promote human resource development in our country. The complexity of teacher's knowledge and competencies in TVET need to be more dynamic to face the challenges in preparing TVET graduates in early age. The continuous improvement based on internal motivation to gain knowledge and strengthen competencies will make the cycle of teaching completely competent. MPRA is one of the basics in systematic pedagogical approaches to support teachers designing their own teaching. The structured pedagogical method should be planned as continuous short courses of teachers to maintain and strengthen the pedagogical delivery instead of courses related to content subject matter. This research has the potential to make the following contribution to knowledge and practice. These contributions include to provide the knowledge for teachers training as fundamental for pedagogical practices and expand the existing knowledge with competency based content for TVET pedagogy. This research also will provide an understanding as what influences the development of pedagogical content and teaching methods and provide a greater understanding of teacher professional development focused on pedagogical stages improvement.

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References

- Anke, L. (2010). *Modelling and Measuring Knowledge and Competencies of Teachers: A Threefold Domain-specific Structure Model, exemplified for Mathematics Teachers, Operationalized with Computer- and Video-based Methods*. Germany: Waxmann Verlag GmbH.
- Chua YianPiaw. (2016). *Mastering Research Methods 2nd Edition*. Kuala Lumpur : MacGraw-Hill Education.
- Clarke, D., & Hollingsworth, H. (2002). *Elaborating a Model of Teacher Professional Growth*. [doi: 10.1016/S0742-051X(02)00053-7]. *Teaching and Teacher Education*, 18(8), 947-967.
- Disraeli M.H., & Raymond A.D (2016). *Technical and Vocational Education and Training (TVET) and its Integration into General Education at The University Level*. *Caribbean Curriculum*. 24, 100-126
- Do-Yong Park & Prommas, C. (2017). *Development of Thai Teachers' Pedagogical Reasoning by Utilizing Metacognitive Reflections in STEM Professional Development*. *Journal of Education and Human Development*. 6 (3), 137-152
- Harris, J. B., & Hofer, M. J. (2011). *Technological Pedagogical Content Knowledge (TPACK) in Action: A Descriptive Study of Secondary Teachers' Curriculum-Based, Technology-Related Instructional Planning*. *Journal of Research on Technology in Education*, 43(3), 211-229.
- Lewis, C. C., Perry, R. R., Friedkin, S., & Roth, J. R. (2012). *Improving Teaching Does Improve Teachers: Evidence From Lesson Study*. *Journal of Teacher Education*, 63, 368-375.
- Junnaina, Husin, Chua & Hazri (2012). *Factors Influencing the Technological Pedagogical Content Knowledge (TPACK) among TVET Instructors in Malaysian TVET Institution*. *Procedia-Social and Behavioral Sciences*, 69,1539-1547
- Koh, J. H. L., Chai, C. S., & Tsai, C. C. (2010). *Examining the Technological Pedagogical Content Knowledge of Singapore Pre-Service Teachers with a Large-Scale Survey*. [Article]. *Journal of Computer Assisted Learning*, 26(6), 563-573.

- Lipsmeier, A. (2013). Approaches Towards Enhanced Praxis-Oriented in Vocational Teacher Education (VTE). In: TVET@Asia, Issue 2, 1-18. Online: http://www.tvetonline.asia/issue2/lipsmeier_tv2.pdf (retrieved 12.09.2019)
- Mishra, P., & Koehler, M.J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108 (6), 1017-1054
- Mohamad, M.M, Yee, M.H, Tee, T.K., Ibrahim Mukhtar, M., & Ahmad, A., (2017). Soft Skills in Pedagogical Practices with Different Curriculum for Engineering Education. *IOP Conf. Ser.: Mater.Sci Eng.* 226 012191
- Mohd. Hashim, M.H., & Abu Bakar, B. (2017). The Availability of Electronic Courses Using ICT Infrastructure in Teaching and Learning among Teachers in Nigeria's TVET Institutions. *Pertanika Journal of Social Sciences and Humanities*, 25 (S), 17-28
- Okoye Micheal K.R.E (2015). Enhancing Technical and Vocational Education and Training (TVET) in Nigeria for Sustainable Development: Competency Based Training (CBT) Approach. *Journal of Education and Practice*. 6 (29), 66-69
- Ridzwan, C. R., S. Malik, Zaliza Hanapi, Suriani Mohamed, Mohd Azlan Hussain & Shafeeqa Shahrudin (2017). Skills and Knowledge Competency of Technical and Vocational Education and Training Graduate. *Asian Social Science Journal*, 13 (4), 66-77
- Pella, S (2015). Pedagogical Reasoning and Action: Affordances of Practice-Based Teacher Professional Development. *Teacher Education Quarterly*. 42 (3) 81-101
- Shulman, L. S. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*, 15 (2), 4-14.
- Shulman, L. S., & Wilson, S. M. (2004). *The Wisdom of Practice: Essays on Teaching, Learning, and Learning to Teach*. Jossey-Bass.
- Shulman, L. (1987). Knowledge and Teaching: Foundations of the New Reform. *Harvard Educational Review*, 57(1), 1-22
- Smart, V., Sim, C., & Finger, G. (2014). *Proposing a Model of Pedagogical Reasoning with Technology*. Adelaide.
- Webb, M.E., (2002). Pedagogical Reasoning: Issues and Solutions for Teaching and Learning of ICT in Secondary Schools. *Education and Information Technologies*, 7 (3). 237-255
- Wijesingha R. (2010) Towards Productive Higher Education Daily News (Speech on the Adjournment Motion on University, May 20 Parliament) Reforms, Tuesday May 2010; p.12.
- Zigmond, N., Jenkins, J., Fuchs, L.S., Deno, S., Fuchs, D., Baker, J.N., Jenkins, L., & Couthino, M. (1995). Special Education in Restructured Schools: Findings from three multi-year studies. *Phi Delta Kappan*, 76, 531-54