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Exploring Academician Perceptions on Technology Competency: Preliminary Insights from Technical University

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Abstract: Education sector plays an important role in the development of human capital. In university education shapes the quality of students not only from the aspects of academic, co-curriculum and personality but also as a paradigm shift in enhancing human capital quality through innovation and intellectual capabilities. This research will look into the baseline of the teaching and learning process and activities in the Malaysian Technical Universities (MTUN) focusing on technology competency among the academicians. Technology competency refers as the ability to handle a wide range of computer applications for various purposes which can be achieved through the process of learning, acquisition of knowledge and development of skills in using technology. The advance of technology that we receive today has changed the teaching style, learning approaches, access to information in which the use of digital technology in improving the delivery of education has helped to raise standards and increase employability. In terms of methodology, a confirmatory factor analysis was utilized to assess the adequacy of the components of technology competency. This study may be instrumental to guide the university's top management particularly the academic managers of the university to plan and conduct the intervention programmes to further enhance the quality of teaching and learning of the university.

Key words: Education, ICT competency, technology competency, teaching and learning, increase employability

INTRODUCTION

Education sector plays an important role in the development of human capital. According to Campbell and Oblinger (2007) educational attainment is strongly correlated with higher income and other economic that will benefit individuals along with improvement on social conditions and benefits to the colleges and universities. Othman and Mohamad (2014) highlighted that the role of education especially in university is to shape the quality of students not only from the aspects of academic, co-curriculum and personality but also as a paradigm shift in enhancing human capital quality through innovation and intellectual capabilities. Due to this involvement from universities is needed to help in producing human capital with high thinking skill, good personality, creativity, innovativeness and competitiveness.

Numerous researches in the areas of teaching and learning showed association between how faculty teach and how students learn. Emanating from these findings are results that showed connection how students learn and its impact on learning outcomes achieved (Brookfield, 1986). One of the more pressing issue affecting higher education is the realization that despite much advances in both classroom pedagogical strategies and classroom learning theories yet effective teaching practices are still much to be desired. Notable researches attempting to achieve these examples like: "lasting learning" (Mentkowski, 2000) "self-directed learning" (Brookfield, 1986) and "transformative learning" (Kitchenham, 2008) fall short in explaining the current problems in achieving deep learning as opposed to surface learning. Further, researchers dealing with topics such as improving what is learned in universities are elaborated by Brennan *et al.* (2010), Coffield *et al.* (2008) and David *et al.* (2009).

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In this study, the term technology competency focus on the usage of ICT competency. According to Brckalorenz *et al*. (2013), technology competency refers as the ability to handle a wide range of computer applications for various purposes which can be achieved through the process of learning, acquisition of knowledge and development of skills in using technology. In their study, technology competency represents behaviors which can be measured in order to assess the degree to which a student has achieved technology competence according to the relevant categories. Thus, this research will look into the baseline of the teaching and learning process and activities in the Malaysian Technical Universities (MTUN) focusing the competency of ICT among the academicians in Universiti Teknikal Malaysia Melaka (UTeM).

In the context of engineering and technical education (Passow, 2012) interpreted technology competency as the perception of skills, abilities, knowledge and other characteristics displayed by students. Technology competency is also considered as the most important skill that should be acquired by the engineering graduates before they enter the workforce. This is important, since the students are expected to deal with and be involved in technical skills while in the workforce which require them to handle and utilize a wide array of technologies and machines (Male *et al*., 2010).

Looking in a glance at the international trends in higher education institution, technologies have and will continue to give great impact on the educational landscape in this decade. Certain conditions are necessary for higher education institution to effectively use technology for learning, teaching, educational management and producing successful learning activities. This is to remind that educational reform in teacher education stress the need for innovative teacher education restructuring to ensure that preserve teachers not only should understand how to use a computer but also how to design high quality technology enhanced lessons (Angeli, 2005). It shows that the technology that we receive today is not only perceived as a catalyst for change but also change in teaching style, change in learning approaches and change in access to information in such that the use of digital technology in improving the delivery of education helped to raise standards and increase employability (Watson, 2001).

Based on Gonçalves and Pedro (2012) views e-Learning programs were introduced to the universities due to the fast expansion of the web and related advancements in technological equipment in conjunction with limited budgets and social demands for improved access to higher education. For example, the development of Learning Management Systems (LMS) in higher education institutions were used to stimulate distance learning initiatives and used as a supplementary support to face-to-face classroom learning and on developing blended or fully online courses. However, in such that there are lecturers who may be reluctant to change their teaching styles and habits and may feel so threatened by technology that they want to distance themselves from it rather than embrace it. Nevertheless, these lecturers require additional motivation and incentives to participate actively in professional development activities. Thus, the consistency on using LMS integration in each lecturers teaching practice may due to the lecturer's perceptions of their attitudes perceptions, previous beliefs and values considering technology-integration in today's teaching and also faculty's motivation in the increasing technology integration skills among the staff.

According to Gulbahar (2008) the importance of access to technology, technology-competency and effective integration of technology, an understanding of how instructors and preservice teachers in a faculty of education perceive technology can help institutions of higher education to successfully integrate in relation with the current ICT usage and suggest recommendations regarding to the effective utilization of technology.

In addition, to increse professional development for technology among lecturers, Carlson and Gadio (2002) highlighted some essential components as such the goal of teacher professional development is to improve student achievement using direct connection to student learning; hands-on technology use which requires development of core technology competencies and skills and actual application of skills in the classroom curriculum-specific applications in which teachers need to see a direct link between technology and the curriculum for which they are responsible; new roles for teachers should be as facilitators and guides for students and not simply as lecturers or instructors; active participation of teachers and collegial learning and professional development as an ongoing process.

Moreover, teachers need to learn a wide variety of tools to carry out their goal oriented teaching activities with a range of net-based synchronous and asynchronous activities not limited to video, audio computer conferencing, chats or virtual world providing rich environments for acquisition. IT is not only perceived as a catalyst for change but also change in teaching style change in learning approaches and change in access to

information (Watson, 2001). Thus, actions that can be measured for ICT competency among lecturers are such as having high level of understanding in using ICT for teaching and learning; believes that effective teaching using ICT; direct assignment of students to send documents using ICT; evaluate students as quizzes or tests using ICT; save documents using cloud technology such teaching onedrive, Dropbox and others; diversify the use of ICT to enhance their credibility and the quality of teaching; produce learning resources and teaching using ICT as an instructional video simulations animations and slide notes; practice innovations that involve teaching ICT as flipped learning/MOOCs; provide teaching and learning materials such as Youtube, URL to students in advance or before class starts have knowledge of using technology as a learning management system, social network, device or web teaching tools and use the following technologies in teaching and learning as a student or an alternative communication tool to share knowledge as learning management system, social network, device or web teaching tools.

MATERIALS AND METHODS

The main purpose of the study reported in this section is to investigate and seek responses to questions about the manner in which teaching and learning is implemented in UTeM based on ICT or technology competency.

This study employed a quantitative method of data collection. A total of 158 UTeM lecturers participated in this study, 80 males and 78 females. The instrument used in the study was a questionnaire which consisted of 109 items. Approximately, 10 items were for the subject's demography and 99 items were for the perception of lecturers on teaching competencies in UTeM. A five point Likert scale (Scale 0 denoting 'Irrelevant', Scale 1 denoting 'Strongly Disagree', Scale 2 denoting 'Disagree', Scale 3 denoting 'Agree' and Scale 4 denoting 'Strongly Agree' were used in describing the perception of lecturers on teaching competencies were using.

The items for this instrument were validated by a group of experts identified from UTeM as well as other Malaysian public university. Then, the instrument was piloted to 30 samples. Subsequently, the collected data was analysed using SPSS to determine its validity. The final version of the questionnaires consists of 109 items from 154 items.

Other than determining reliability of the instruments and asking the respondents for feedback to identify ambiguities and difficult questions in the questionnaires the time taken to complete the questionnaire was also recorded. The respondents took approximately 15-20 min to answers all the items in the questionnaire and most of them agreed that the language used in the questionnaires was clear and easy to be understood. Data collected during the pilot test was computed using the IBM SPSS Statistics (SPSS) version 23.0 to obtain the Cronbach's alpha value. According to Pallant (2013) the general Cronbach's alpha value should be higher than 0.70. A commonly accepted rule of thumb for describing internal consistency using Cronbach's alpha is depicted in Table 1. The Cronbach's alpha coefficient for the questionnaire ranges from 0.838-0.924 for each section. This questionnaire showed an excellent internal consistency.

Table 1: Recommended alpha range

Alpha range	Internal consistency
Below 0.60	Unacceptable
Between 0.60 and 0.65	Undesirable
Between 0.65 and 0.70	Minimally acceptable
Between 0.70 and 0.80	Respectable
Between 0.80 and 0.90	Very good
Above 0.90	Excellent

RESULTS AND DISCUSSION

The Confirmatory Factor Analysis (CFA) is the first step conducted prior the SEM analysis (Hair *et al*., 2010). Here, the CFA was meant to define the individual constructs and was employed for three major purposes namely to test for model fit, convergent validity and construct reliability (Rencher and Christensen, 2012).

For the model fit test, two criteria were being considered; the fit indices and the individual factor loadings of each item in a construct. As shown in Table 2 is the set of criteria for fit indices and their recommended value.

According to Rencher and Christensen (2012) in the model fit test, the standardised factor loadings must be between 0.5 and 1.0 and should be positive. The indicators that do not meet these criteria shall be deleted. The concentration should be given more to an indicator or item that associated with high Modification Index (MI). Other considerations that need to be considered are referring to the previous literatures on the importance and significance of the items in the questionnaire. If the item(s) is/are to be considered as important, it should be retained in the model (Byrne, 2013).

The next test is the convergent validity test. This test is meant to identify the validity of each item that presumes

Table 2: Fit indices and recommended value for CFA

Fit indices	Recommended value
CMIN/df	≤5.0
Relative χ^2	≤5.0
CFI	≥0.90
IFI	≥0.90
RMSEA	≤ 0.80
Factor loadings	Between 0.5-1.0 Positive

to measure a construct. The convergent validity could be tested using the Average Variance Extracted (AVE). The AVE value which is ≥0.5 indicates a high convergent validity (Hair *et al*., 2010). The final test in the CFA is the Construct Reliability test (CR). The construct reliability test is a measurement of the internal consistency of the observed indicator or variables. If the construct reliability is ≥0.7, the item is considered reliable.

It is worth to note that once the three tests were conducted in the CFA, the number of items for each constructs was expected to be reduced and there might be or might be not a model that will be found to be unfit. So, if there was only one model identified unfit, the construct was considered as unreliable and ought to be omitted from the model. However, if there were more than one unfit model, the models should be combined and renamed as a new construct.

Here, the findings and descriptions on the CFA to construct technology competency among the academicians is presented. In Fig. 1, there were nine items in measuring the technology competency as one of the teaching competencies. The initial model displayed a poor fit (CFI = 0.799; IFI = 0.802; RMSEA = 0.166). To improve the model, the items with factor loadings that were <0.5 were deleted as shown in Fig. 2. The test was conducted again and it showed a very good fit (CFI = 0.994; IFI = 0.994; RMSEA = 0.039). Therefore, only five items were determined as the most appropriate items measuring the construct.

For technology competency, five items have been identified as important which are G2, G5, G6, G7 and G9. Item G2 ask academician if they believe that effective teaching by using ICT. Item G5 ask if academician keep teaching documents using cloud technology such as OneDrive, Dropbox and others. Item G6 diversifying the use of ICT to enhance academician's credibility and the quality of teaching. Item G7 ask if academicians have produce learning resources and teaching using ICT such as instructional videos, simulations, animations, slide note and others. Meanwhile, G9 ask if academician

Table 3: Technology utilisation level

	Utilisation level/frequency/percentage		
Characteristics	Low	Moderate	High
Gender			
Male	2	45	33
Female	1	50	27
Age			
<40	1	59	45
>40	2	34	17
Field			
Engineering field	1	52	28
Non-engineering field	2	43	32

Minimum score = 110; Maximum score = 198

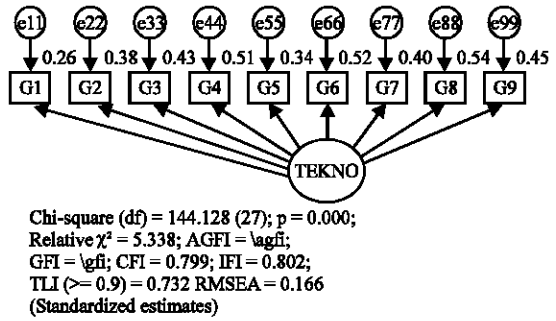

Fig. 1: Test model fit of technology competency before CFA

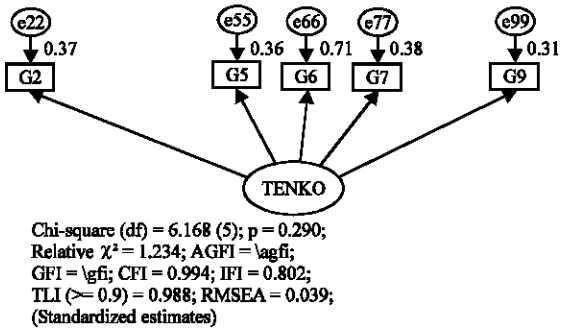

Fig. 2: Test model fit of technology competency after CFA

have provide teaching and learning materials such as Youtube, URL to students, sooner or before class starts.

Results from the Confirmatory Factor Analysis (CFA) above confirmed that all the items in technology competency category were suitable in representing the teaching and learning competencies. Table 3 shown the overall competency level of technology utilisation among the academic staff in UTeM.

With reference to Table 4, the overall mean in using technology for teaching and learning was high (M = 3.11). This indicated that academic staff were able to use technology competently.

Table 4: Technology cometency

Items	Frequency/Percentage Na	TD	D	A	TA	Mean	
Believe that effective teaching using ICT	-	3 (2%)	30 (19%)	75 (48%)	50 (32%)	3.09	0.760
Store documents such as cloud technology teaching OneDrive, Dripbox and etc	1 (0.6%)	5 (3%)	17 (11%)	75 (47%)	60 (38%)	3.19	0.799
Diversify the use of ICT to improve themselves and the quality of teaching credit	-	2 (1%)	16 (10%)	81 (51%)	59 (37%)	3.25	0.684
Produce learning resources and teaching using ICT (such as teaching videos, simulations, animations, slide notes)	-	2 (1%)	16 (10%)	81 (51%)	59 (37%)	3.20	0.796
Provide teaching and learning materials such as Youtube, URL to students, early or before classes start	5 (3%)	6 (4%)	29 (18%)	73 (46%)	45 (29%)	2.93	0.952

NA: Not Applicable; TD: Totally Disagree; D: Disagree; A: Agree; TA: Totally Agree

CONCLUSION

The involvement from universities is needed to help in producing human capital with high thinking skill, good personality, creativity, innovativeness and competitiveness. Thus, numerous researches considering various factors in improving teaching and learning are significant. In general, our study to improve teaching and learning covers elements such as pedagogy content knowledge, instructional quality, classroom climate, classroom management, mind set and value, technology competency and technical competency.

With the results from the Confirmatory Factor Analysis (CFA), the overall mean in using technology for teaching and learning shows an indication that academic staff in UTeM were able to use technology competently.

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