

VALIDITY AND RELIABILITY OF ICT UTILIZATION AND TECHNOLOGICAL BELIEFS INSTRUMENT FOR TEACHERS

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Abstract

The aim of this paper is to disseminate findings related to the validity and reliability of the instruments to measure the utilization of Information and Communication Technology (ICT) and Technological Beliefs among expert teachers. The instrument was developed based on literature review and existing measurements. The instrument consisted of 77 Likert scale items measuring demographic information, technological beliefs (teacher beliefs toward the use of ICT in teaching and learning) and ICT utilization from the aspects of general, exploration, and social and communication uses. The instrument was validated by two Educational Technology experts, whereas reliability was obtained through a pilot study involving 32 expert teachers from seven secondary schools. Based on the pilot study, the reliability of the ICT utilization scale was 0.94, while for the ICT utilization scale 0.943. This finding demonstrates that the instrument has content validity and reliability to measure ICT utilization and technological beliefs among expert teachers.

Keywords: Validity, Reliability, ICT utilization, Technological beliefs

Background

Computers and information technologies in today's organization have expanded dramatically worldwide. Information technology has opened wide opportunities for educators to integrate technology-supported materials in teaching-learning process and also to improve the achievement of students. Teachers' use of technologies is the key determining factor for improved student performance in knowledge acquisition and skills development enable by technology (North Central Regional Educational Laboratory, 2002). It is important to note that teachers need to be computer literate, and be prepared to use information technology in schools (D'silva, 2007).

Undoubtedly, ICT can increase the quality of education and also help make teaching and learning more effective. If ICT is utilized properly in teaching and learning, it can be very beneficial (Strampel & Oliver, 2007). Thus, the use of ICT in education also has many advantages for teachers and students. Technologies facilitated activities can change the traditional role of teacher which is the main source of information into a facilitator of learning (Barak, 2006). According to Tinio (2003) "ICT supported learning encourages interaction and cooperation among students, teachers and experts regardless of where they are". ICT also provide opportunities for learner to work with other people around the world from different cultures which can help them to enhance their communication skills (Tinio, 2003).

Governments and educational agencies have made investment in the integration of technology in curricula to increase the effectiveness of instructions. In the context of Malaysia, one of the first initiatives was the Computer Literacy Pilot Project (CLPP) introduced by the Ministry of Education (MOE) in 20 schools in 1986. That was in line with the government's effort under the Eighth Malaysian Plan to re-engineer the country's education system and align it with its Vision 2020. In the process of implementation ICT in education, in 1997 the MOE leads the execution of Smart School Flagship, one of the seven Flagships Application of MSC Malaysia. Realizing the importance of the use of ICT in education, the MOE provides many facilities and equipment with the aim of increasing the ICT literacy among teachers and technology usage in education, which include providing notebooks to teachers, set up the wireless LANs at all school, providing school computer laboratories and computers in classroom (Kumar, Che Rose & D'Silva, 2008).

The Malaysia MOE has made the effort to bring ICT into schools, however it is still depending on the schools administration and teachers to make it a success. There is still the question to what extent the teachers are using ICT for teaching and learning and whether they belief that using ICT can assist them in teaching. The utilization of ICT in teaching and learning process will have a little impact if teachers are not actively involved in every steps of their integration, (Hepp, Hinojosa, Laval, Rebbein, 2004). There is also evidence that teachers are the main factors in any initiative aimed at improving teaching and learning process (Hepp et al.,

2004). Thus, a major obstacle in utilizing technologies in teaching and learning is the lack of teacher's beliefs and lack of teachers who feel comfortable in using technology in classroom.

Problem Statement

In the context of Malaysia, several researches related to ICT usage and integration among teachers had been conducted over the years. Nonetheless, not as many when compared to the West. Previous studies had focused on teachers' ICT utilization in teaching and learning among mathematics and science teachers (Bakar & Hadi, 2011; Surif, Ibrahim, Hassan, 2012; Ahmad Zanzali & Kassim@Aziz, 2010), whilst Mohamad (2011) examined ICT utilization among vocational education teachers. Jasmi, Ilias, Tamuri, Hamzah (2011) conducted a study on the use of teaching aids among expert teachers. In another study, Alavi, Sail, A.Mutalib, Ahmad, Trajo & Razak (2012) explored the emotional intelligence and social intelligence of expert teachers, while Hamid (2011) examines teachers' beliefs towards benefit and the integration of ICT in teaching and learning in Smart School. Thus, a review of related literature has shown that not many of the local researches examine the utilization of ICT and technological beliefs among expert teachers. In other words, these teachers' beliefs toward the use of ICT in teaching and learning have not been much explored. It is critical to determine the expert teachers' beliefs and ICT utilization because they are actually the 'role models' in schools as they are officially acknowledged as experts and exemplary teachers in their respective fields or subjects.

Therefore, the objectives of this study were to (i) establish the validity of the instrument that measures teachers' ICT utilization and technological beliefs, and (ii) examine the reliability of the instrument using Cronbach's Alpha coefficient.

Literature Review

The definition of ICT is the combination of information technology with other, related technologies which specifically communication technology (UNESCO, 2002). Technology integration is the affiliation of software and hardware together to improve learning (Shelly, Cashman, Gunter, Gunter, 2004). But according to Roblyer and Doering (2010) technology utilization in education focuses on the "process of applying tools for educational purposes and the tools and materials used". It is not only a collection of machines, devices or software but a way of acting with them into education. It is believed that the use of technology in education can increase access to learning opportunities and help to enhance the quality of education. This can be achieved by improve learning outcomes and enable reform of education system (UNESCO, 2009). According to Doering, Beach, & O'Brien (2007), technologies that offer interactivity, and learner control such as word processing, multimedia, hypermedia, tutorials, animation and Webs allow students to identify the concepts, practice skills and also acquire greater sense of pride in their achievement. Thus, with the utilization of ICT in the classroom, the educators can increase productivity and gain students attention more with higher motivation in teaching and learning process, and also make teaching and learning more interesting and fun. On top of that, technology is very useful in teaching and learning process when it use wisely (Shelly, Cashman, Gunter & Gunter, 2004).

According to Calderhead (1996), teacher beliefs have the same meaning as teacher knowledge and teacher thinking which comprise the same concept of teacher cognition. According to Kagan (1990), the term teacher cognition varies which refer to teachers' thought during lesson planning, teachers' interactive thought during instruction, beliefs about students, classrooms and learning and also their own reflection about their own teaching performance. Thus, teachers belief refer to what the teacher's beliefs in his/her own capabilities in teaching.

In the process of transforming teaching method through the use of technology, teacher's beliefs about teaching and learning is one of the important roles (Bai, Ertmer, 2008). Teachers' attitude toward using technologies is also one of the factors that influence technology usage in teaching and learning (Yildirim, 2000). According to Pajares (1992) teachers' beliefs have an influence on teachers' instructional decisions and classroom practices. Hence, teachers who hold more traditional beliefs about teaching and learning tend to use more didactic instructional methods such as lecturing in classroom and more teacher-centered practices, while teachers who

hold more constructivist beliefs about learning tend to use more student-centered, inquiry based methods (Niederhauser & Stoddart, 2001).

In order to implement a new effective teaching method in using technologies into teaching and learning, it “requires teacher knowledge change, teacher beliefs change and teacher culture change” (Ertmer&Ottenbreit-Leftwich, 2010). It is important that teachers believe in their own abilities to implement the changes within their school culture and they have to change their pedagogical beliefs to adopt this new method and have to gain knowledge and gain confidence to implement it. According to Fullan & Stiegelbauer (1991), some changes are required in order for teacher to use technology to facilitate learning which are (a) beliefs, attitudes or pedagogical ideologies; (b) content knowledge; (c) pedagogical knowledge of instructional practices; and (d) altered instructional resources, technology or materials. This shows that the success of using ICT for teaching and learning not only rely on the type and amount of ICT, but more importantly, the teachers’ beliefs of how ICT will influence and enhance their own teaching and their students’ learning.

Research Method

Sampling

The pilot study involved 32 secondary teachers who were nominated as expert teachers from seven different schools in Selangor and Wilayah Persekutuan Kuala Lumpur. The participants were 16 teachers from Selangor and 16 from Wilayah Persekutuan Kuala Lumpur.

Instrument

In this study the instrument used to obtain data was in the form of a questionnaire. The questionnaire measured two different variables which were teachers’ technological beliefs and ICT utilization among teachers in teaching and learning process. The questionnaire was divided into three parts: the first part included items related to demographic information (i.e. gender, years of working experience, subjects taught, and importance of technology in their everyday life). The second part included 26 Likert scale items of the teachers’ beliefs towards the benefit of using technology in teaching and learning process. This measure was adapted from McIntyre (2011), Chang (2008) and Eteokleous (2004). Lastly, the third part contained 34 Likert scale items related to the teachers’ frequency in utilizing technology in teaching and learning process. This measure was adapted from Lei (2010), McIntyre (2011) and Moila (2006). The technological beliefs measure used five-point Likert rating scales i.e. 1. Strongly disagree; 2. Disagree; 3. Neutral; 4. Agree; 5. Strongly agree). On the other hand, the ICT utilization measure rated usage in five point frequency rating scale (i.e. 1. Never; 2. Once in a while; 3. Sometimes; 4. Often; 5. Very Often).

Validity and Reliability

According to (Halim, Halim, Meerah & Osman, 2010), the validity process of any research instrument normally has five phases which are: expert panels’ validation, modification of instrument, pilot study, and reliability analysis and instrument finalization.

Phase 1: Expert panel validation.

In this study, the questionnaire was validated by a panel of judges who are experts in the educational technology field, apart from the supervisory committee. In this stage of validation, panels of expert evaluated the instrument for content validity where all these experts validated the items and suitability of the questionnaire to measure the research constructs. The panel consisted of two lecturers at University Putra Malaysia who were selected based on their experiences in the field of educational technology. The main goal of this stage is to “finalize the substantive content of the questionnaire so the construction process can be undertaken” (Dillman, 2000). The panel also validate the content-related and relevancies of the instrument with the main objectives of this research.

Phase 2: Modification of instrument.

After the validation from the panels of expert, the researcher made relevant modification and improvements based on the comments. The modifications were made in order to make the

instrument relevant with the objectives of this research. The result of the panels of expert validation showed that 18 items were redundant or did not measure the intended quality of the instrument. Thirteen of the items had to be modified in accordance with the constructs to be measured. Finally, the questionnaire consisted of 77 items that would be ministered in the pilot study.

Phase 3: Pilot Study.

The goal of this phase is to obtain the reliability of the instrument. The participant involved in this pilot study was 32 expert teachers. The questionnaires were distributed to seven different schools in Selangor and Wilayah Persekutuan Kuala Lumpur. The instruments were distributed by hand to the participants and a duration of one week was given to them to complete it. Personal information and responses of the participants were kept confidential.

According to Table 1, demographic analysis from the pilot study using Statistical Package for Social Science (SPSS 16.0). This table indicated that the majority of the sample was female (84.4%) rather than male was only (15.6%). 90.6% of the participants is Malay and only 9.4% is Chinese. The qualification of teachers that participate in pilot study consist of 84.4% have degree qualification and 15.6% have masters.

Table 1: Demographic Profile of Sample

Gender		
Male	5	15.6
Female	27	84.4
Race		
Malay	29	90.6
Chinese	3	9.4
Qualification		
Master	5	15.6
Degree	27	84.4

Phase 4: Reliability analysis. In this phase, reliability of the instrument assures the possibility of replication which means if the same method are used with the same kind of sample, within a certain limit of experimental error, then the results should be the same. The reliability of this instrument was analysed using Cronbach's Alpha to determine the coefficients of the instrument. Cronbach's Alpha coefficient is the most common formula of reliability in educational research (McMillan and Schumacher, 2010). Data collected during the pilot test were computed using the SPSS, version 16. Pallant (2010) indicated that the general Cronbach's alpha value of scale should be higher than 0.70. In this study, the acceptable value of Alpha level is in between 0.70 to 0.90. DeVellis (2003) has recommended a set of alpha ranges on reliability to serve as a guideline for acceptable degree of reliability.

The reliability value of every scale in pilot test is presented in Table 2. The range of the Cronbach's alpha coefficient for this instrument ranged from 0.856 to 0.944. Based on the Alpha range that suggested by DeVellis (2003), the consistency of the questionnaire is acceptable because the alpha range is higher than 0.70. The ICT Utilization scale had the highest Alpha coefficient (0.944) which was very high value. The Teachers Beliefs towards the use of ICT in Teaching and Learning has 0.943 alpha coefficients which was also high value. Table 2 also shows the alpha coefficient value for each subscale. The Alpha coefficient of the ICT utilization for general use was 0.856 and for ICT utilization for exploration use was 0.914. Additionally, ICT utilization for social-communication use was 0.908. Generally, all the Cronbach's alpha coefficient reported were higher than 0.70.

Table 2: Reliability of the Instrument

Part	Scale	Pilot test (n = 32)
(B)	Teachers Beliefs towards the Use of ICT in Teaching and Learning.	0.943
(C)	ICT Utilization	0.944
	Technology for General Use	0.856
	Technology for Exploration Use	0.914
	Technology for Social-Communication Use	0.908

Phase 5: Instrument finalization. In this phase, the instrument was finalized based on the pilot study and analysis of reliability result. Based on the result of reliability shown in Table 2, the value of Cronbach's alpha coefficient is acceptable. The item and content of the instrument remains seventy seven items without further modification. These items measure the technological beliefs and ICT utilization in education.

Conclusion

Based on the five phases of validation it is found that the research instrument has its content validated by the panel of experts and its alpha coefficient which is within the acceptable range. Therefore, it can be concluded that all the items are valid in measuring teachers' technological beliefs and ICT utilization in education. The result of reliability analysis also shows that this instrument is reliable to be employed in the actual study.

Reference

- Ahmad Zanzali, N.M., & Kassim@Aziz, N. (2011). Penggunaan Ict Dalam Pengajaran Dan Pembelajaran Matematik Di Kalangan Guru-Guru Pelatih UTM. Universiti Teknologi Malaysia, http://eprints.utm.my/10133/1/Noraziah_binti_Kassim@Aziz.pdf
- Alavi, K., Sail, R.M., Mutalib, L.A., Ahmad, A., Trajo, S.S., Abdul Razak, N.E. (2012). Emotional Intelligence and Social Intelligence among Excellent Teachers of Islamic Education in Enhancing Student's Performance. *Journal Of Social Science And Humanities*, 7(1), 094-104,
- Bai, H. & Ertmer, P.A. (2008). Teacher Educators' Beliefs and Technology Uses as Predictors of Preservice Teachers' Beliefs and Technology Attitudes. *Journal of Technology and Teacher Education*, 16(1), 93-112.
- Bakar, M.N. & Hadi, A.H. (2011). Pengintegrasian ICT Dalam Pengajaran Dan Pembelajaran Matematik Di Kalangan Guru Matematik Di Daerah Kota Tinggi. *Journal of Science and Mathematics Educational*, volume 2 Jun 2011, Pages 1-17/
- Barak, M. (2006). Instructional principles for fostering learning with ICT: Teachers' perspectives as learners and Instructors. *Educational Information Technology* (2006) 11: 121-135
- Calderhead, J. (1996). Teachers: Beliefs and knowledge. In D. Berliner, & R. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 709-725). New York: Macmillan Library Reference.
- Chang, C.L. (2008). Faculty perceptions and utilization of a Learning Management System in higher education (Doctoral dissertation, Ohio University). From ProQuest Dissertations & Theses. (AAT 3319031)
- DeVellis, R. F. (2003). *Scale development: Theory and Applications*, 2nd edn. Newbury Park, CA: Sage Publications.
- Dillman, D. A. 2000. *Mail and Internet surveys: The tailored design method*. New York: Wiley.
- Doering, A., Breach, R. & O'Brien, C. (2007). Infusing multi modal tools and literacies into an English education program. *English Education*, 40(1) , 41-60.

- D'silva, J.L. (2007). Determinants of actual usage of computer among math, science and English language teacher in secondary schools in Selangor, Malaysia. Doctoral Dissertation. Universiti Putra Malaysia.
- Ertmer, P.A. & Ottenbreit-Leftwich. (2010). Teacher Technology Change: How Knowledge, Confidence, Beliefs, and Culture Intersect. *Journal of Research in Technology in Education*, 42(3), 255–284
- Eteokleous, N.P. (2004). Computer Technology Integration In Cyprus Elementary Schools. Unpublished Doctoral of Philosophy, The Pennsylvania State University
- Fullan, M., & Stiegelbauer, S. M. (1991). The new meaning of educational change (2nd ed.). New York: Teachers College Press
- Halim, A., Halim, L., Meerah, S.M., & Osman, K. (2010), Pembangunan Instrumen Penyelesaian Masalah Sains. *Jurnal Pendidikan Malaysia* 35(1) , 35-39
- Hamid, R.H. (2011). Teachers' Beliefs and Use of ICTs in Malaysian Smart Schools: a case study. In G. Williams, P. Statham, N. Brown & B. Cleland (Eds.), *Changing Demands, Changing Directions*. Proceedings ascilite Hobart 2011. (pp.522-525).
- Hepp, K.P., Hinostraza, S.E., Laval, M.E. & Rehbein, F.L. (2004). Technology in Schools: Education, ICT and the Knowledge Society. Retrieved October 11, 2012, from http://www.sca2006.ticeduca.org/archivos/modulo_1/sesion_1/ICT_report_oct04a_Pedro_H_epp.pdf
- Jasmi, K.A., Ilias, M.F., Tamuri, A.H., Hamzah, M.I. (2011) Amalan Pengajaran Bahan Bantu Mengajar Dalam Kalangan Guru Cemerlang Pendidikan Islam Sekolah Menengah Di Malaysia. *Journal Of Islamic And Arabic Education* 3(1), 2011, 59-74
- Kagan, D. M. (1990). Ways of evaluating teacher cognition: Inferences concerning the Goldilocks principle. *Review of Educational Research*, 60, 419–469.
- Kumar, N., Che Rose, R. & D'Silva, J.L. (2008). Factors Influencing the Effective Use of Technology Among Malaysian Teachers. *European Journal of Social Science*, 6(4), 108-124
- Lei, J. (2010). Quantity versus Quality: a new approach to examine the relationship between technology use and student outcomes. *British Journal of Educational Technology*, 455-472
- McIntyre, B.K. (2011). Teachers' Beliefs And Practices Regarding The Role Of Technology In Literacy Instruction: A Mixed Methods Study. Unpublished Doctoral of Philosophy, The University of North Carolina
- McMillan, J., and Schumacher, S. (2010). *Research in education evidence-based inquiry* (7th ed.). New Jersey: Pearson Education, Inc.
- Mohamad, B. (2011). Teknologi Komunikasi dan Maklumat dalam Program Pendidikan Khas Aliran Teknik dan Vokasional di Malaysia. *ATIKAN*, 1(1) 2011
- Moila, M.M. (2006). The use of Educational Technology in mathematic teaching and learning: an investigation of a south African rural secondary school
- Niederhauser, D. S., & Stoddart, T. (2001). Teachers' instructional perspectives and use of educational software. *Teaching and Teacher Education*, 17, 15-31.
- North Central Regional Educational Laboratory, (2002). Breaking down the digital walls: Learning to teach in a post-modern world. [online]. Educational Technology. Available: www.ncrel.org/sdrs/areas/issues/methods/technology/tel000.
- Pajares, M.F (1992). Teachers' Beliefs and Educational Research: Cleaning Up a Messy Construct. *Review of Educational Research Fall 1992, Vol. 62, No. 3, pp. 307-332*
- Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using SPSS* (4th ed.). New York, NY: Open University Press
- Roblyer, M.D., Doering, A.H. (2010). *Integrating educational technology into teaching*. (5th Edition). Boston, USA: Pearson Education Inc.
- Shelly, G.B., Cashman, T.J., Gunter, R.E., Gunter, G.A. (2004). *Teachers discovery computers: integrating technology in the classroom*. Third Edition. Boston, USA.
- Strampel, K. & Oliver, R. (2007). Using Technology To Foster Reflection In Higher Education. In *ICT: Providing Choices For Learners And Learning*. Proceedings ascilite Singapore 2007. <http://www.ascilite.org.au/conferences/singapore07/procs/strampel.pdf>

- Surif, J., Ibrahim, N.H. & Abu Hassan, R. (2012). Tahap Amalan Dan Pengintegrasian Ict Dalam Proses Pengajaran Dan Pembelajaran Sains. http://www.medic.com.my/medic/seminar_medic/fromCD/pdf/130.pdf
- Tinio, V. (2003) ICT in Education, United Nations Development Programme. Retrieved February 12, 2013 from http://www.saigontre.com/FDFiles/ICT_in_Education.PDF
- UNESCO. (2002). Information and communication technology in education: a curriculum for schools and programme of teacher development. UNESCO, Paris.
- UNESCO. (2009). Guide to measuring information and communication technology (ICT) in education. UNESCO, Canada.
- Yildirim, S. (2000). Effects of an Educational Computing Course on Preservice and Inservice Teachers: A Discussion and Analysis of Attitudes and use. *Journal of Research on Computing in Education*, 32(4), 479-495.