PERSEPSI TERHADAP PENGETAHUAN TEKNOLOGIKAL PEDAGOGI ISI KANDUNGAN DALAM KALANGAN GURU SAINS SEKOLAH RENDAH DI KELANTAN

SHUKRI BIN ISMAIL

IJAZAH DOKTOR FALSAFAH
UNIVERSITI UTARA MALAYSIA
2016

Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

SHUKRI ISMAIL

calon untuk Ijazah   **PhD**
(candidate for the degree of)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

"PERSEPSI TERHADAP PENGETAHUAN TEKNOLOGIKAL PEDAGOGI ISI KANDUNGAN DALAM KALANGAN GURU SAINS SEKOLAH RENDAH DI KELANTAN"

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada : *11 Mei 2016.*
That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:
May 11, 2016.

|		
Pengerusi Viva: *(Chairman for VIVA)*	**Assoc. Prof. Dr. Yahya Don**	Tandatangan *(Signature)*
Pemeriksa Luar: *(External Examiner)*	**Prof. Dr. Mohd Majid Konting**	Tandatangan *(Signature)*
Pemeriksa Dalam: *(Internal Examiner)*	**Dr. Nurulwahida Hj Azid @ Aziz**	Tandatangan *(Signature)*
Nama Penyelia/Penyelia-penyelia: *(Name of Supervisor/Supervisors)*	**Prof. Dr. Rosna Awang Hashim**	Tandatangan *(Signature)*
Nama Penyelia/Penyelia-penyelia: *(Name of Supervisor/Supervisors)*	**Dr. Hasniza Nordin**	Tandatangan *(Signature)*

Tarikh:
(Date) **May 11, 2016**

Permission to Use

In presenting this thesis in fulfilment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the Universiti Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purpose may granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or part, should be addressed to :

Dean of Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
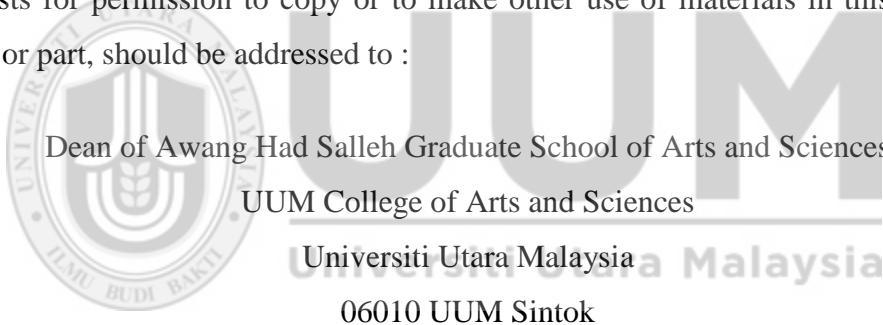
Abstrak

Kesediaan guru terhadap Integrasi Teknologi Maklumat dan Komunikasi (ICT) dalam pengajaran dan pembelajaran merupakan satu keperluan dalam abad ke-21 dan antara elemen yang terpenting dalam pendidikan Sains. Pengetahuan Teknologikal Pedagogi Isi Kandungan (TPACK) merupakan pengetahuan guru yang berkaitan dengan integrasi teknologi terhadap isi kandungan dan pedagogi. Sehingga kini, tiada definisi yang tepat tentang konstruk TPACK dan belum ada instrumen yang boleh mengukur tahap kesediaan TPACK dalam konteks guru Sains di Malaysia. Justeru, objektif kajian ini adalah untuk mendapatkan definisi TPACK secara holistik dan seterusnya mengesahkan pengaplikasian instrumen TPACK untuk guru Sains sekolah rendah di Malaysia. Tiga peringkat pembinaan instrumen terlibat: tinjauan awal terhadap 60 orang guru untuk mendapatkan konstruk dan item permulaan, tiga pusingan teknik Delphi modifikasi melibatkan 16 panel pakar untuk memperincikan dan mengesahkan item dan tinjauan terhadap 800 orang guru dalam perkhidmatan untuk mengesahkan instrumen. Data dianalisis berdasarkan median respon dan nilai sisihan antara kuartil (IQD) untuk mendapatkan kesepakatan panel pakar. Analisis Faktor Eksploratori (EFA) dan Analisis Faktor Pengesahan (CFA) dibuat untuk mengesahkan item dan konstruk TPACK. Seterusnya Analisis Regresi dijalankan untuk melihat kesahan ramalan instrumen terhadap instrumen tahap integrasi teknologi (LoTI). Jumlah item akhir adalah sebanyak 40 item yang didasari oleh enam konstruk yang sah iaitu Pengetahuan Pedagogi (PK), Pengetahuan Teknologi (TK), Pengetahuan Pedagogi Isi kandungan (PCK), Pengetahuan Teknologi Pedagogi (TPK), Pengetahuan Teknologi Isi kandungan (TCK) dan Pengetahuan Teknologikal Pedagogi Isi kandungan (TPACK). Semua konstruk ini memberikan sumbangan yang signifikan terhadap tahap integrasi teknologi. Keputusan analisis MANOVA menunjukkan terdapat perbezaan yang signifikan bagi jantina, tahap akademik dan pengalaman mengajar. Instrumen yang dihasilkan dalam kajian ini boleh digunakan untuk mentaksir tahap kesediaan guru mata pelajaran Sains sekolah rendah di Malaysia terhadap integrasi teknologi dalam bilik darjah.

Kata Kunci: TPACK, Instrumen, Model persamaan berstruktur, Sains sekolah rendah

Abstract

Teacher readiness to integrate Information and Communication Technology (ICT) in teaching and learning is crucial in the 21st century and among the most important element in Science education. Technological Pedagogical Content Knowledge (TPACK) is a form of teacher knowledge related to technology integration of content and pedagogy. To date, there is no precise definition of TPACK constructs, and there is no instrument to measure the readiness of TPACK in the context of science teachers in Malaysia. Thus, the objective of this study was to obtain a holistic definition of TPACK and to verify the applicability of TPACK instruments among primary school science teachers in Malaysia. Three stages were involved: an initial survey of 60 teachers to obtain the constructs and start-up items, a three-round modified Delphi technique involving 16-panel experts to refine and validate the items, and a survey of 800 in-service teachers to validate the instrument. Data was analyzed based on the median and interquartile deviation (IQD) to get consensus from the experts. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were run to confirm TPACK items and constructs. Next, Regression Analysis was conducted to confirm the predictive validity of the instrument with the Level of Technology Integration Instrument (LoTI). The final number of items was 40, based on six valid constructs namely Pedagogical Knowledge (PK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPACK). All constructs provide a significant contribution to the level of technology integration. Results of the Multivariate Analysis of Variance (MANOVA) showed significant differences in gender, academic level, and teaching experience. The instrument developed in this study can be used to assess the level of preparedness of primary school science teachers to technology integration in the classroom in Malaysia.

Keywords: TPACK, Instrument, Structural equation modeling, Primary school science

Penghargaan

Syukur ke hadrat Ilahi kerana dengan limpah kurnia dan hidayah Nya kepada diri penulis sehingga kerja-kerja penyelidikan ini dapat disiapkan.

Di kesempatan ini penulis ingin mengambil peluang untuk mengucapkan setinggi tinggi penghargaan dan terima kasih yang tidak terhingga kepada pihak-pihak yang telah memberikan bantuan baik secara langsung mahupun tidak secara langsung dalam menjayakan penyelidikan ini terutamanya kepada:

Pengerusi Jawatankuasa Penyeliaan iaitu Prof. Rosna bt Awang Hashim yang telah berkorban masa untuk memberi bimbingan dan tunjuk ajar sehingga ke peringkat akhir proses penyiapan tesis ini. Saya juga ingin mengucapkan penghargaan kepada penyelia bersama Dr. Hasniza bt Nordin. Komitmen yang telah diberikan adalah tidak ternilai harganya.

Bagi tujuan pemerolehan data pula, saya ingin merakamkan jutaan terima kasih kepada semua pentadbir sekolah (pengetua atau penolong kanan) serta guru-guru yang terlibat sama ada secara langsung atau tidak langsung, kerana tanpa kerjasama mereka sudah pasti maklumat yang diperlukan untuk kajian ini tidak akan diperoleh. Saya ingin mengucapkan setinggi penghargaan kepada para panel pakar yang terlibat dalam tiga pusingan Delphi. Begitu juga pihak EPRD Kementerian Pelajaran Malaysia dan JPN Kelantan yang telah memberi keizinan kepada saya untuk mendapat kerjasama daripada pihak sekolah untuk menjalankan eksperimen dan menjawab soal selidik dan mengadakan temu bual bagi tujuan kajian ini. Sesungguhnya segala sumbangan serta kerjasama yang diberikan amat saya sanjung dan hargai.

Ucapan penghargaan dan terima kasih yang tidak terhingga juga ditujukan kepada isteri tercinta, Nor 'Azura bt Arifin serta anak-anak iaitu Sarah alyaa , Syasya Aqilah dan Mohamad Aqeef Syahmi yang sangat memahami suasana dan keadaan semasa proses penulisan tesis ini. Di atas dorongan dan sokongan yang tidak putus-putus oleh mereka sekali lagi diucapkan terima kasih.

Akhir sekali kepada semua mereka yang terlibat, kejayaan ini adalah milik kita bersama dan semoga ianya mendapat rahmat dan diberkati Allah s.w.t

Kandungan

BAB SATU   PENDAHULUAN

BAB DUA   SOROTAN KAJIAN

BAB EMPAT   DAPATAN KAJIAN

BAB LIMA   PERBINCANGAN DAN KESIMPULAN

Senarai jadual

Senarai rajah

Senarai lampiran

Glosari

TPACK	-	Technological Pedagogical Content Knowledge
		Pengetahuan Teknologikal Pedagogi Isi Kandungan
PK	-	Pedagogical Knowledge (Pengetahuan Pedagogi)
TK	-	Technological Knowledge (Pengetahuan Teknologi)
CK	-	Content Knowledge (Pengetahuan Isi Kandungan)
PCK	-	Pedagogical Content Knowledge (Pengetahuan Pedagogi Isi Kandungan)
TPK	-	Technological Pedagogy Knowledge (Pengetahuan Teknologi Pedagogi)
TCK	-	Technological Content Knowledge (Pengetahuan Teknologi Isi Kandungan)
ICT	-	Information Communication Technology (Teknologi Maklumat Dan Komunikasi)
SEM	-	Structural Equation Modeling (Model Persamaan Berstruktur)
TIMSS	-	Trends In International Mathematics And Science Study
PISA	-	Program For International Student Assessment
PPSMI	-	Pengajaran Dan Pembelajaran Sains Dan Matematik Dalam Bahasa Inggeris
EFA	-	Exploratory Factor Analysis (Analisis Faktor Eksploratori)
CFA	-	Confirmatory Factor Analysis (Analisis Faktor Pengesahan)
IQD	-	Inter Quartile Deviation
LoTI	-	Level Of Technology Integration

BAB SATU

PENDAHULUAN

1.1 Pengenalan

Pengetahuan teknologikal pedagogi isi kandungan (TPACK) merupakan satu reka bentuk teori yang baharu diperkenalkan iaitu pada tahun 2005 oleh Punya Mishra dan Matthew Koehler. Secara asasnya, TPACK adalah pengetahuan guru yang berkaitan integrasi teknologi yang seharusnya diseimbangkan antara pengetahuan isi kandungan, pengetahuan pedagogi dan pengetahuan teknologi. Idea ini terhasil dari konsep pengetahuan pedagogi isi kandungan (PCK) seperti yang telah diperkenalkan oleh Lee Shulman pada tahun 1986.
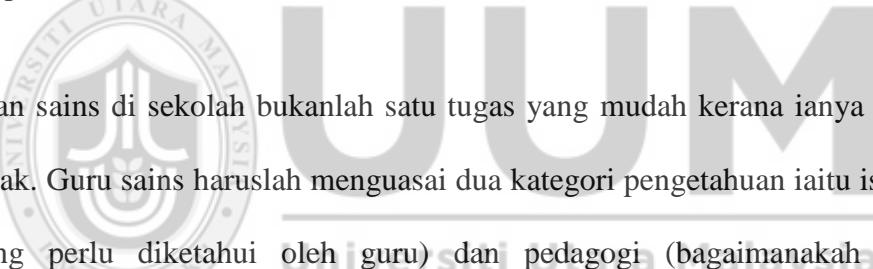
Pengajaran sains di sekolah bukanlah satu tugas yang mudah kerana ianya adalah unik dan abstrak. Guru sains haruslah menguasai dua kategori pengetahuan iaitu isi kandungan (apa yang perlu diketahui oleh guru) dan pedagogi (bagaimanakah guru boleh menyampaikannya) (Bybee & Loucks-Horsley, 2001). Pandangan ini menunjukkan dengan jelas bahawa hanya dengan mempunyai kefahaman yang mantap dalam isi kandungan subjek sains tidak menjamin seseorang guru itu dapat menjadi seorang guru yang betul-betul berkemahiran (Guzey, 2010). Guru sains juga seharusnya mempunyai pengetahuan yang khusus yang membolehkan beliau mengubahsuai pembelajaran sains mengikut keperluan individu dan kumpulan tertentu. Pengetahuan khusus ini ialah seperti yang dikatakan oleh Shulman pada tahun 1986 sebagai Pengetahuan Pedagogi Isi Kandungan (Pedagogical Content Knowledge, PCK) yang mana ianya membezakan antara seorang guru sains yang pakar dan seorang saintis (Cochran, DeRuiter, & King, 1993; Grossman, 1990, Shulman 1986; 1987). Sebaliknya juga, pengetahuan tentang

The contents of the thesis is for internal user only

RUJUKAN

.

AACTE (Ed). (2008). *Handbook of technological pedagogical content knowledge (TPCK) for educators.* New York.: Routledge.

Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics, 25*(1), 95-135.

Abbitt, J. T., (2011). Measuring Technological Pedagogical Content Knowledge In Preservice Teacher Education: A Review Current Methods and Instruments. *Journal of Research on Technology in Education; 43*, 4.

Abdul Ghafar & Mohd Najib (1999). Kemahiran Kognitif Sains dan Persepsi Pelajar: Satu kajian di Institusi Pendidikan Tinggi. *Jurnal Pendidikan UTM, 5* (1). Pp 87-95. ISSN 1394-1801. Eprint.utm.my/12255.

Abdul kadir, H. S. (2006). Strategies for Improving the Efficiency of Teachers in Jigawa State. M.Ed. Thesis, University of Nigeria, Nusukka.

Abdul Razak Idris & Saidanorlaili Ali, (2011). Koswer PPSMI dalam pengajaran dan pembelajaran matematik. *Journal of Science & mathematic Education.* Volume 4 Disember 2011, pg 1.

Abdul Wahab Ismail Gani, Kamaliah Hj. Siarap, & Hasrina Mustafa, (2006). Penggunaan Komputer dalam Pengajaran-Pembelajaran dalam Kalangan Guru Sekolah Menengah: Kajian Kes di Pulau Pinang. *Kajian Malaysia, 24* (1 & 2), 203-225.

Abusabha, R. & Woelfel, M. L. (2003). Qualitative versus quantitative methods: Two opposites that make a perfect match. *Journal of Sustainability in Higher Education 4*(2): 126-137.

Adomi, E. E. and Mordi, C. (2003). *Publication in foreign journals and promotion of academics in Nigeria. Learned Publishing*, *16*(4), 259-263.

Ahmann, J. S., & Glock, M. D., (1981). *Evaluating Students Progress. Principles of test and measurement.* Boston: Allyn and Bacon Inc.

Alazzam, A., Bakar, A. R., Hamzah, R., & Asimiran, S. (2012). Effects of demographic characteristics, educational background, and supporting factors on ICT readiness of

technical and vocational teachers in malaysia. *International Education Studies, 5*(6), 229-243. Retrieved from http://search.proquest.com /docview/ 1469698323?accountid=48462

Alshehri, K. A., (2012). The Influence of Mathematics Teachers' Knowledge in Technology, Pedagogy And Content (TPACK) on Their Teaching Effectiveness in Saudi Public Schools. Tesis Ed.D. University of Kansas.

Alsop, S., Bencze, L., & Pedretti, E. (2005). *Analysing exemplary science teaching*. New York, NY: Open University Press.

Amrein-Beardsley, A. (2008). Methodological concerns about the education value-added assessment system. *Educational Researcher, 37*(2), 65-75.

Anderson, D. G. (2007). *The influence of culture on learning styles.* (Order No. 3253624, Capella University). *ProQuest Dissertations and Theses, ,* 157-157 p. Retrieved from http://search.proquest.com/docview/ 304720950? accountid=48462. (304720950).

Anderson, D., & Nashon, S. (2007). Predators of knowledge construction: Interpreting students' metacognition in an amusement park physics program. *Science Education, 91*(2), 298-320. Retrieved from http://search.proquest. com/docview/ 194929643?accountid=48462

Anderson, K., Walker, K., & Ralph, E. (2009). Practicum teachers' perceptions of success in relation to self-efficacy (perceived competence). *Alberta Journal of Educational Research, 55*(2), 157-170. Retrieved from http://search.proquest. com/docview/758657642?accountid=48462

Angeli, C. (2008). Distributed cognition: A framework for understanding the role of computers in classroom teaching and learning. *Journal of Research on Technology in Education, 40*(3), 271-279. Retrieved from http://search. proquest.com/docview/274711427?accountid=48462

Angeli, C., & Valenides, N. (2009). Epistemological and methodological issuesfor the conceptualization, development, and assessment of ICT-TPACK: Advancesin technological pedagogical content knowledge (TPACK). *Computers & Education, 52,* 154-168.

Archambault, L. M., & Barnett, J. H. (2010). Revisiting technology pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education, 55,* 1656-1662.

Archambault, L., & Crippen, K. (2009). K-12 distance educators at work: Who's teaching online across the united states. *Journal of Research on Technology in Education, 41*(4), 363-391. Retrieved from http://search.proquest.com /docview/ 274696510?accountid=48462

Axinn, W. G. & Pearce, L. D.(2006). *Mixed method data collection strategies.* Cambridge University Press.

Aziz bin Nordin & Yang See Boon, (2008). Persepsi guru sains PPSMI terhadap masalah perlaksanaan pengajaran subjek sains (PPSMI) di sekolah rendah kawasan Skudai, Johor Bahru. Fakulti Pendidikan Universiti Teknologi Malaysia. Retreave: eprints.utm.my/11669/1

Azwan Ahmad, and Abdul Ghani Abdullah, and Mohammad Zohir Ahmad, and Abd. Rahman Hj Abd. Aziz, (2005) *Kesan Efikasi Kendiri Guru Sejarah Terhadap Amalan Pengajaran Berbantukan Teknologi Maklumat dan Komunikasi (ICT). Jurnal penyelidikan Pendidikan*, 7 . pp. 14-27

Bandura, A. (1997). Insights. Self-efficacy. *Harvard Mental Health Letter*, *13*(9), 4-6.

Bangert, A. (2006). The development of an instrument for assessing on-line teaching effectiveness. *Journal of Educational Computing Research, 35*(5), 227-244.

Baran, E., Chuang, H. H., & Thompson, A., (2011). TPACK: An Emerging Research And Development Tool For Teacher Educators. *The Turkish Online Journal of Education Technology . 10*(4), 45-47.

Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A.,…Tsai, Y. M. (2009). Teachers' mathematical knowledge, cognitive activation in the classroom and student progress. *American Educational Research Journal, 47,* 133-180.

Bedny, M., Caramazza, A., Grossman, E., Pascual-Leone, A., & Saxe, R. (2008). Concepts Are More than Percepts: The Case of Action Verbs. *Journal Of Neuroscience*, *28*(44), 11347-11353. doi:10.1523/JNEUROSCI. 3039-08.2008

Blank, R. K. (2013). What research tells us. *Journal of Staff Development, 34*(1), 50-53. Retrieved from http://search.proquest.com/ docview/1331063650? accountid =48462

Blas, N. D., Fiore, A., Mainetti, L., Vergallo, R., & Paolini, P. (2014). A portal of educational resources: Providing evidence for matching pedagogy with technology. *Research in Learning Technology, 22* doi:http:// dx.doi.org/10.3402/rlt.v22.22906

Bloem, S. (2013). *PISA in low and middle income countries.* (). Paris: Organisation for Economic Cooperation and Development (OECD). Retrieved from http://search.proquest.com/docview/1431278192?accountid=48462

Borg, W. R. and Gall, M. D. (1989). *Educatioanal Research. 5ᵗʰ ed.* New York. Longman Inc.

Bracey, G. W. (2004). Value-added assessment findings: Poor kids get poor teachers. *The Phi Delta Kappan, 86*(4), 331-333.

Bracey, G. W. (2009). Extreme rhetoric. *Principal Leadership, 10*(4), 68-71. Retrieved from http://search.proquest.com/docview/216296122?accountid=48462

Brown, F. G. (1983). *Principles of educational and Psychological Testing.* 3ʳᵈ ed. New York: Holt, Rinehart and Winston, Inc.

Brown, F. G., (1970). *Principles of educational and psychological testing.* Hinsdale Illinois: The Dryden Press Inc.

Brown, N., Morehead, P., & Smith, J. B. (2008). . . . But I love children: Changing elementary teacher candidates' conceptions of the qualities of effective teachers. *Teacher Education Quarterly, 35*(1), 169-183. Retrieved from http://search.proquest.com/docview/222853213?accountid=48462

Browne, J. M. (2007). *Evidence supporting the validity of inferences required by the intended uses of the technology integration confidence scale.* (Order No. 3270247, Brigham Young University). *ProQuest Dissertations and Theses,* , 126. Retrieved from http://search.proquest.com/ docview/304898190?accountid=48462. (304898190).

Buchanan, T., Sainter, P., & Saunders, G. (2013). Factors Affecting Faculty Use of Learning Technologies: Implications for Models of Technology Adoption. *Journal Of Computing In Higher Education*, *25*(1), 1-11.

Bull, G., Park, J., Searson, M., Thompson, A., Mishra, P., Koehler, M. J., & Knezek, G. (2007). Editorial: Developing technology

Bullock, S. M. (2011). Teaching 2.0: (re)learning to teach online. *Interactive Technology and Smart Education, 8*(2), 94-105. doi:http://dx.doi.org/10.1108/ 17415651111141812

Burke, D. (2012). Fulfilling the need for people who lead. *The Times Higher Education Supplement : THE,* (2070), 34. Retrieved from http://search.proquest. com/docview/1220739211?accountid=48462

Burns, E. R., Garrett, J. E., & Childs, G. V. (2007). A study of student performance on self-scheduled, computer-based examinations in a medical histology course: Is later better? *Medical Teacher, 29*(9), 990. Retrieved from http://search.proquest. com/docview/233249724?accountid=48462

Bybee, R. W. & Loucks-Horsley, S. (2001). National Science Education Standards as a catalyst for change: The essential role of professional development. In J. Rhoton & P. Bowers (Eds.), *Issues in science education: Professional development planning and design*. Arlington, VA: NSTA.

Byrne, B. M., (2001). *Structural Equation Modeling with AMOS: Basic concept, application, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Byrne, B. M., (2005). Factor Analytic Models: Viewing the Structure of an Assessment Instrument From Three Perspectives. *Journal of Personality Assessment. 85*(1), 17-32.

Caillods, F., Gottelman-Duret, G., & Lewin, K. (1997). *Science Educational Development* . Paris: Pergamon.

Cavanagh, R. F., & Koehler, J. M. (2013). A turn toward specifying validity criteria in measurement of technological pedagogical content knowledge (TPACK). *Journal of Research on Technology In Education. 46*, 2. 129-148.

Cavin, R. M. (2007). *Developing technological pedagogical content knowledge in preservice teachers through microteaching lesson study.* (Order No. 3301531, The Florida State University). *ProQuest Dissertations and Theses, ,* 197. Retrieved from http://search.proquest.com/docview/ 304868858?accountid=48462. (304868858).

Cennamo, K., Ross, J.D., & Ertmer, P.A. (2009). *Technology integration for meaningful classroom use: A standards-based approach* [Google Books Version]. Retrievedfrom http://books.google.com/books?id=RabIe-9ifS0C& printsec= frontcover& source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Chai, C. S., Joyce Hwee, L. K., & Chin-Chung, T. (2013). A review of technological pedagogical content knowledge. *Journal of Educational Technology & Society, 16*(2) Retrieved from http://search.proquest.com/docview/ 1355669544?accountid=48462

Chai, C. S., Koh, J. H., & Tsai, C. C. (2010). Fasillitating preservice teachers development of technological, pedagogical and content knowledge (TPACK). *Educational Technology and Society, 13*(4), 63-73.

Chamblee, G. E., Slough, S. W., & Wunsch, G. (2008). Measuring High School Mathematics Teachers' Concerns About Graphing Calculators and Change: A Year Long Study. *Journal Of Computers In Mathematics & Science Teaching*, *27*(2), 183.

Chen, Y., Thompson, M. S., Kromrey, J. D., & Chang, G. H. (2011). Relations of student perceptions of teacher oral feedback with teacher expectancies and student self-concept. *The Journal of Experimental Education, 79*(4), 452. Retrieved from http://search.proquest.com/docview/890533075?accountid=48462

Chew Cheng Meng & Lim Chap Sam (2013). Developing Pre-Service Teachers' Technological Pedagogical Content Knowledge for Teaching Mathematics with the Geometer's Sketchpad through Lesson Study *..Journal of Education and Learning;* Vol. 2, No. 1.

Chua Yan Piaw, (2009). *Statistik Penyelidikan Lanjutan, Ujian regresi, analisis faktor dan analisis SEM*. Kuala Lumpur. Mc Graw Hill Education.

Chung Hui Ying & Jamaludin Badusah (2010). Sikap Guru Bahasa melayu Terhadap Penggunaan Teknologi Maklumat dan Komunikasi (ICT) dalam Pengajaran di Sekolah-sekolah Rendah di Bintulu, Sarawak. *Jurnal Pendidikan Malaysia* 35(1), 59-65.

Clark, K. (2006). Practices for the use of technology in high schools: A Delphi study. *Journal of Technology and Teacher Education*, *14*(3), 481–499.

Clary, R. M., Brzuszek, R. F., & Wandersee, J. H. (2009). Students' geocognition of deep time, conceptualized in an informal educational setting. *Journal of Geoscience Education, 57*(4), 275-285. Retrieved from http://search.proquest.com/docview/202781806?accountid=48462

Cochran, K. F., DeRuiter, J. A., & King, R. A. (1993). Pedagogical content knowing: an integrative model for teacher preparation. *Journal of Teacher Education*, *44*(4), 263-272.

Cochran-Smith, M. (2005). Teacher education and the outcomes trap. *Journal of Teacher Education, 56*(5), 411-417.

Cohen, L., Manion, L., Morrison, K., (2011). *Research Method In Education. 7th Edition.* London & New York: Routledge Taylor & Francis Group.

Cohen, R. J., & Swerdlik, M. E. (2002). *Psychological Testing and assessment: An Introduction to Test and Measurement.* 5th ed. Boston: McGraw Hill.

Çoklar, A. N. (2014). Primary school preservice teachers' technolgical pedagogical content knowledge competency in terms of gender and ICT use phase. *Egitim Ve Bilim, 39*(175) Retrieved from http://search.proquest.com/docview /1626670818?accountid=48462

Colbert, J. A., Boyd, K. E., Clark, K. A., Guan, S., Harris, J. B., Kelly, M. A. & Thompson, A. D. (2008). *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators.* New York: Routledge.

Cox, S. (2008). A Conceptual Analysis of Technological Pedagogical Content Knowledge. Tesis Ed.D. Brigham Young University.

Cox, S., & Graham, C. R. (2009). Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge. *TechTrends: Linking Research & Practice to Improve Learning*, *53*(5), 60-69.doi:10.1007/s11528-009-0327-1

Cox, S., & Graham, C. R. (2009). Using an Elaborated Model of the TPACK Framework to Analyze and Depict Teacher Knowledge. *TechTrends. 53*(5), 35-42.

Creswell, J. W. (2005). *Educational Research.: Planning, conducting and evaluating quantitative and qualitativeresearch.* (2nd ed.). Colombus, OH: Pearson.

Custer, R. L., Scarcella, J. A., & Stewart, B. R. (1999). The modified Delphi technique:A rotational modification. *Journal of Vocational and Technical Education, 15*(2),1-8. Retrieved from http://scholar.lib.vt.edu/ejournals/ JVTE/v15n2/ custer.html.

Dalkey, N., & Helmer, O. (1963). An experimental application of the Delphi method tothe use of experts. *Institute for Operations Research: Management Science, 9*(3) 458-467. Retrieved from http://www.jstor.org/stable/2627117.

Dani, D. E. (2004). The Impact Of Content And Pedagogy Courses On Science Teachers Pedagogical Content Knowledge. Tesis Ed.D. University Of Cincinnati.

Darling-Hammond, L., & Sykes, G. (2003). Wanted: A national teacher supply policy for education: The right way to meet the "highly qualified teacher" challenge. *Education Policy Analysis Archives, 11*(33).

Davies, R. S. (2011). Understanding technology literacy: A framework for evaluating educational technology integration. *TechTrends, 55*(5), 45-52. doi:http://dx.doi.org/10.1007/s11528-011-0527-3

Dawkins, K., Dickerson, D. L., McKinney, S. E., & Butler, S., (2008). Teaching Density to Middle School Students: Preservice Science Teachers' Content Knowlege and Pedagogical Practices. *Cleraing House. 82*(1), 21-26.

Deese, W. C., Ramsey, L. L., Walczyk, J., & Eddy, D. (2000). Using demonstration assessments to improve learning. *Journal of Chemical Education,77*(11), 1511-1516. Retrieved from http://search.proquest.com/ docview/211908128? accountid=48462

Deng, Z. (2007). Transforming the Subject Matter: Examining the Intellectual Roots of Pedagogical Content Knowledge. *Curriculum Inquiry. 37*(3), 12-15.

Desimone, L., & Le Floch, K. C. (2004). Are we asking the right questions? Using cognitive interviews to improve surveys in education research. *Educational Evaluation and Policy Analysis, 26*(1), 1-22.

DeVellis, R.F. (2003). *Scale Development: Theory and Applications* (2nd ed). California: Sage Publications.

Dias, L. B., & Ertmer, P. A. (2013). Goldilocks and TPACK: Is the construct "just right?". *Journal of Research on Technology In Education,* 46, 2;103-128.

Dikkartin Övez, F. T., & Akyüz, G. (2013). The turkish adaptation of technological pedagogical content knowledge scale: A validity and reliability study. *Egitim Ve Bilim, 38*(170) Retrieved from http://search.proquest.com/docview/ 1459946397?accountid=48462

Dilworth, P., Donaldson, A., George, M., Knezek, D., Searson, M., Starkweather, K., . . . Robinson, S. P. (2012). Preparing teachers for tomorrow's technologies. *TechTrends, 56*(4), 11-14. doi:http://dx.doi.org/10.1007/ s11528-012-0581-5

Donaldson, N. L. (2004). The Effectiveness of The Constructing Physics Understanding (CPU) Pedagogy on Middle School Students' Learning of Force and Motion Concepts. Tesis Ed.D. University of Missouri-Kansas City.

Doran, H. C., & Fleischman, S. (2005). Challenges of value-added assessment. *Educational Leadership, 63*(3), 85-87.

Driel, J. H. V., Verloop, N. & Vos, W. D. (1998). Developing Science Teachers' Pedagogical Content Knowledge. *Journal of Research in Science Teaching. 35*(6), 673-695.

Driver, M. (2003). Improving group learning through electronically facilitated skillful discussions. *The Learning Organization, 10*(4), 283-293. Retrieved from http://search.proquest.com/docview/215659798?accountid=48462

Edward, G. C., & Richard, A. Z. (1979). *Relibility and Validity Assessment.* New York: Sage Publication Inc.

Eisner, E. W. (2002). *The educational imagination: On the design and evaluation of school programs* (3rd ed.). Upper Saddle River, N.J: Prentice Hall.

Elliot, L. L. (2010). Student and Teacher Perspectives of Technology Usage. Tesis Ed.D. Lindenwood University.

Ellis, M. W., Malloy, C. E., Meece, J. L., & Sylvester, P. R. (2007). Convergence of observer ratings and student perceptions of reform practices in sixth-grade mathematics classrooms. *Learning Environments Research, 10*(1), 1-15. doi:http://dx.doi.org/10.1007/s10984-007-9022-3

Elster, D. (2007). Student interests-the German and Austrian ROSE survey. *Journal of Biological Education, 42*(1), 5-11.

Enzor, S. L. B. (1990). *Questioning strategies and interactive thoughts among experienced and inexperienced secondary school science teachers.* (Order No. 9113571, Peabody College for Teachers of Vanderbilt University). *ProQuest Dissertations and Theses, ,* 93-93 p. Retrieved from http://search.proquest.com/docview/303867348?accountid=48462. (303867348).

Ertmer, P. A., & Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255-284. Retrieved from http://search. proquest.com/docview/817562634?accountid=48462

Faleye, B. A., & Awopeju, O. A. (2012). A Revalidation of Students' Evaluation of Teaching Effectiveness Rating Scale. *Ife PsychologIA, 20(2)*.

Federici, R. A., & Skaalvik, E. M. (2011). Principal self-efficacy and work engagement: Assessing a norwegian principal self-efficacy scale. *Social Psychology of Education :*

An International Journal, 14(4), 575-600. doi:http://dx.doi.org/ 10.1007/s11218-011-9160-4

Finkelstein, N. (2005). Learning Physics in Context: A study of student learning about electricity and magnetism. *International Journal of Science Education, 27*(10), 1187-1209.

Follman, J. (1992). Secondary school students' ratings of teacher effectiveness. *The High School Journal, 75*(3), 168-178.

Follman, J. (1995). Elementary public school pupil rating of teacher effectiveness. *Child Study Journal, 25*(1), 57.

Fraenkel, J. R., & Wallen, N. E. (1996). *How to design and evaluate research in education.* Ed. 3, New York: Mc Graw Hill Inc.

Fraenkel, J. R., & Wallen, N. E. (2006). *How to design and evaluate research in education.* Ed. 6, New York: Mc Graw Hill Inc.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). How to design and evaluate research in education (8th editon). New York, NY: McGraw Hill.

Friedenberg, L. (1995). *Psychological testing: Design, analysis and use.* Massachusetts: Simon & Shuster Company.

Gardner, H. (1983). *Frames of Mind: A Theory of Multiple Inteligences.* New York: Basic Book.

Gerlich, N., & Wilson, P. (2005). Distance learning and the faculty: An analysis of perceptions, concerns, and opportunities. *Academy of Educational Leadership Journal, 9.*

Gess-Newsome, J. (1999). Delivery models for elementary science education: A call for research. *Electronic Journal of Science Education. 3*(3), 1-8.

Given, B. K. (1998). Learning styles may answer meddlesome school board members. *School Administrator, 55*(5), 46. Retrieved from http://search.proquest. com/docview/219276920?accountid=48462

Goe, L. (2013). CAN TEACHER EVALUATION improve teaching? *Principal Leadership, 13*(7), 25-29. Retrieved from http://search.proquest.com/ docview/1319470661?accountid=48462

Goldhaber, D., & Brewer, D. (1997). Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity. *The Journal of Human Resources, 32*(3), 05-523.

Gonzalez, P. (2010). *A case study on the integration of internet technology with mathematics and science content for teachers*(Order No. 1477785). Available from ProQuest Dissertations & Theses Global. (604770150). Retrieved from http://search.proquest.com/ docview/604770150? accountid=48462

Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education, 57, 1953-1960.*

Graham, C. R., Burgoyne, N., & Borup, J. (2010). The decision making processes of presevice teachers as they integrate technology dalam *Proceedings of society for information Technology and Teacher Education International Conference 2010* Chesapeake, VA: AACE.

Graham, C. R., Burgoyne, N., Cantrell, P., Smith, L., St Clair, L., & Harris, R. (2009). TPACK development in science teaching: Measuring the TPACK confidence of inservice science teachers. *TechTrends, 53*(5), 70-79. Retrieved from http://search.proquest.com/docview/223120131?accountid=48462

Green, L. S. (2014). Through the looking glass. *Knowledge Quest, 43*(1), 36-43. Retrieved from http://search.proquest.com/docview/ 1561141081 ? accountid=48462

Griffith, L. A. (2009). *Professional learning communities: Teachers working collaboratively for continuous improvement.* (Order No. 3379815, Walden University). *ProQuest Dissertations and Theses,* , 190-n/a. Retrieved from http://search.proquest.com/docview/305079900?accountid=48462. (305079900).

Grossman, P. L. (1990) The making of a teacher: teacher knowledge & teacher education. New York: Teachers College Press.

Grossman, R. W. (2005). Discovering hidden transformations. *College Teaching*, *53*(1), 33-40.

Gudmundsdottir, S. (1988). *Knowledge use among experienced teachers: Four case studies of high school teaching.* (Order No. 8906673, Stanford University). *ProQuest Dissertations and Theses,* , 261-261 p. Retrieved from http://search.proquest.com/docview/303703713?accountid=48462. (303703713).

Guzey, S. S. (2010). *Science, technology, and pedagogy: Exploring secondary science teachers' effective uses of technology* (Order No. 3422550). Available from ProQuest Education Journals. (756234845). Retrieved from http://search.proquest.com/docview/756234845?accountid=48462

Guzey, S. S., & Roehrig, G. H. (2009). Teaching science with technology: Case studies of science teachers' development of technology, pedagogy, and content knowledge. *Contemporary Issues in Technology and Teacher Education, 9*(1), 25-45.

Habowski, T. A. (2012). *Improving technological pedagogical content knowledge development among pre-service science teachers* (Order No. 3540683). Available from ProQuest Dissertations & Theses Global. (1112071641). Retrieved from http://search.proquest.com/docview/1112071641? accountid=48462

Hair, J. F., Black. W. C., Babin, B. J. & Anderson, R. E. (2010). *Multivariate Data Analysis.* 7THed. Upper Saddle River, NJ: Pearson Prentice Hall.

Halim, L., & Meerah, S. M. (2002). Science Trainee Teachers' Pedagogical Content Knowledge and Its Influence on Physics Teaching. *Research in Science & Technological Education, 20*(2), 30-34.

Harlan, J. D., & Rivkin, M. S. (2014). *Science Experiences for Early Childhood Years: An Integrated Affective Approach Tenth Edition.* Pearson Education limited, Edinburgh Gate. Harlow. England.

Harrington, T. K. (2011). *The learning management system as a bruner amplifier: Defining a model of faculty engagements with an online technology.* (Order No. 3478587, The University of Alabama). *ProQuest Dissertations and Theses,* , 133. Retrieved from http://search.proquest.com/docview/ 905161075?accountid= 48462. (905161075).

Harris, D. N., & Rutledge, S.A. (2010). Models and Predictors of Teacher Effectiveness: A review of the evidence with lessons from (and for) other occupations. *Teachers College Record, 112*(3), 914–960.

Harris, D., & Sass, T. R. (2006). *Value-Added Models and the measurement of teacher quality.* Florida State University. Tallahassee.

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. Retrieved from http://search.proquest.com/ docview/858614418?accountid=48462

Harris, J., Mishra, P., & Koehler, M. (2009). Teacher's Technological Pedagogical Content Knowledge and Learning Activity Types: Curriculum-based Technology Integration Reframed. *Jounal of Research on Technology in Education, 41*(4), 391-416.

Hashweh, M. Z. (2005). Teacher Pedagogical Constructions: A Reconfiguration of Pedagogical Content Knowledge. *Teachers and Teaching: Teory and Practice. 11*(3), 273-292.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112.

Hechter, R. P., Phyfe, L. D., & Vermette, L. A. (2012). Integrating technology in education: Moving the TPCK framework towards practical applications. *Education Research and Perspectives (Online), 39*, 136-152. Retrieved from http://search.proquest.com/docview/1153259885?accountid=48462

Heneman, H. G., Milanowski, A., Kimball, S. M., & Odden, A. (2006). Standards-based teacher evaluation as a foundation for knowledge-and skill-based pay. CPRE Policy Briefs. RB- 45. *Consortium for Policy Research in Education*, 16.

Henry, A. M. (2008). *The relationship of age, gender, and personality style with the level of technology implementation at the university level* (Order No. 3324558). Available from ProQuest Education Journals. (304390056). Retrieved from http://search.proquest.com/docview/304390056? accountid=48462

Hoe, S. L., Spring (2008). Issues and procedures inadopting structural equation modeling technique. *Journal of appliied Quantitative Methods 3*(1): 76-83

Hofer, M., & Grandgenett, N. (2012). TPACK Development in Teacher Education: A Longitudinal Study of Preservice Teachers in a Secondary M.A.Ed. Program. *Journal of Research on Technology in education, 45*(1), 83-106.

Hoffman, K., & Donaldson, J. (2004). original article Contextual tensions of the clinical environment and their influence on teaching and learning. *Medical Education*, *38*(4), 448-454.

Hoi, Y. C., Bender, M., & Lonner, W. J. (2013). Self-perceived teacher efficacy around the world. *Education Research International,* doi:http://dx.doi.org/10.1155/ 2013/826945

Hopkins, K. D. (1998). *Educational and Psychological Measurement and Evaluation.* Boston: Allyn and Bacon Inc.

Ingvarson, L., & Rowe, K. (2008). Conceptualising and evaluating teacher quality: substantive and methodological issues *Australian Journal of Education, 52*(1), 5.

Jabot, M. E. (2002). Teacher Pedagogical Content Knowledge As A Predictor Of Student Learning Gains In Direct Current Circuits. Tesis Ed.D. Syracuse University.

Jackson, B. C. (2013). Teacher's preparation needs for intergrating technology in the classroom. EdD Thesis. Missouri Baptist University.

Jacob, B. A., & Lefgren, L. (2008). Can principals identify effective teachers? Evidence on subjective performance evaluation in education. *Journal of Labor Economics, 26*(1), 101-136.

Jacobo, A. L. (2012). Measuring Teacher Effectiveness. Tesis Ed.D. California State University.

Jamieson-Proctor, R., Finger, G., Albion, P., Cavanagh, R., Fitzgerald, R., Bond, T.,& Grimbeek, P., (2012). *Teaching Teachers For The Future (TTF) project: Development of The TTF TPACK survey instrument.* Paper presented at ACE2012: Its Time Conference, Perth, Australia. http://bit.ly/ACE2012_proceedings.

Jang, S., & Chen, K. (2010). From PCK to TPACK: Developing a transformative model for pre-service science teachers.*Journal of Science Education and Technology, 19*(6), 553-564. Retrieved from http://search.proquest.com/docview/822507381?accountid=48462

Jones, A., & Moreland, J. (2005). The Importance of Pedagogical Content Knowledge in Assessment for Learning Practices: A Case Study of a Whole-School Approach. *The Curriculum Journal, 16*(2), 193-206.

Joyce Hwee, L. K., Chai, C. S., & Ching-Chung, T. (2014). Demographic factors, TPACK constructs, and teachers' perceptions of constructivist-oriented TPACK. *Journal of Educational Technology & Society, 17*(1), 185-196. Retrieved from http://search.proquest.com/docview/1502989170? accountid=48462

Kamisah Osman, Lilia Halim, & Subahan Mohd Merah. (2006). Pembinaan Instrumen Untuk Mengenal Pasti Tanggapan Keperluan Semasa Guru-Guru Sains Di Malaysia. *Malaysian Journal of Educators and Education, 21,* 101-103.

Kane, T. J., Wooten, A. L., Taylor, E. S., & Tyler, J. H. (2011). Evaluating teacher effectiveness. *Education Next, 11*(3) Retrieved from http://search.proquest.com/docview/1237831464?accountid=48462

Kaya, S., & Dag, F. (2013). Turkish adaptation of technological pedagogical content knowledge survey for elementary teachers. *Kuram Ve Uygulamada Egitim Bilimleri, 13*(1), 302-306. Retrieved from http://search.proquest.com/docview/1324995198?accountid=48462

Keating, T., & Evans, E. (2001). *Three Computers in the back of the classroom: Pre-service*

Kersting, N., B. (2005). Assessing teachers knowledge of teaching mathematics: Instrument development and validation. Doctoral thesis. University of California, Los Angeles.

Kit-Ling Lau, & Chan, D. W. (2001). Identification of underachievers in hong kong: Do different methods select different underachievers? *Educational Studies, 27*(2), 187-200. Retrieved from http://search.proquest.com/ docview/209730193? accountid =48462

Klassen, R. M., Tze, V. M. C., Betts, S. M., & Gordon, K. A. (2011). Teacher Efficacy Research 1998-2009: Signs of Progress or Unfulfilled Promese? *Educational Psychology Review. 23,* 21-43.

Koehler, M. J., & Mishra, P. (2005). Teachers Learning Technology by Design. *Journal Of Computing In Teacher Education*, *21*(3), 94-102.

Koehler, M. J., Mishra, P., & Zhao, Y. (2007). *Faculty development by design [electronic resource] : integrating technology in higher education / edited by Punya Mishra, Matthew J. Koehler, Yong Zhao*. Charlotte, N.C. : IAP-Information Age Pub., c2007 (Norwood, Mass. : Books24x7.com [generator]).

Koehler, M. J., Mishra, P., Hershey, K., & Peruski, L. (2004). With a little help from your students: A new model for faculty development and online course design. *Journal of Technology and Teacher Education, 12*(1), 25-55. Retrieved from http://search.proquest.com/docview/200088815? accountid=48462

Koehler, M., Mishra, P., & Yahya, K. (2007). Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy and technology. *Computers and Education. 49*(3), 740-762.

Koehler, N. A., Thompson, A. D., & Phye, G. D. (2011). A design study of a multimedia instructional grammar program with embedded tracking. *Instructional Science, 39*(6), 939-974. doi:http://dx.doi.org/10.1007/ s11251-010-9161-2

Koh, J. H. L., Chai, C. S. & Tsai, C. C., (2012). Examining Practicing Teachers' Perceptions of Technological Pedagogical Content Knowledge (TPACK) Pathways: A Structural Equation Modeling Approach. *Springer Science + Bussiness Media B.V.2012*

Koh, J. H. L., Chai, C. S., & Tsai, C. C. (2010). Examining the technological pedagogical content knowledge of pre service teachers with a large scale survey. *Journal of Computer Assisted Learning,* 26, 563-573.

Kramer, B. S., Walker, A. E., & Brill, J. M. (2007). The underutilization of information and communication technology-assisted collaborative project-based learning among international educators: A Delphi study. *Educational Technology Research and Development*, *55*(5), 527–543.

Krejcie, R.V., & Morgan, D.W. (1970). Determining sample size for research activiyies. *Educational And Psychological Measurement, 30,* 607-610.

Kutame, M. M. (2007). *Understanding self-neglect from the older person's perspective.* (Order No. 3275209, The Ohio State University). *ProQuest Dissertations and Theses, ,* 224. Retrieved from http://search.proquest.com/ docview/304833429? accountid=48462. (304833429).

Lambert, J. L. (2004). *Technology integration expertise in middle school social studies teachers: A study of multiplicity in thinking and practice.* (Order No. 3120238, North Carolina State University). *ProQuest Dissertations and Theses, ,* 329-329 p. Retrieved from http://search.proquest.com/ docview/305166041?accountid= 48462. (305166041).

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research, 77*(4), 575-614.

Learning science and technology; new learning science and technology study results reported from national taiwan university of science and technology exploring the profiles and interplays of pre-service and in-service teachers' technological pedagogical content knowledge ...]. (2015). *Education Letter, ,* 530. Retrieved from http://search.proquest.com/docview/ 1673174911?accountid=48462

Learning science and technology; researchers from nanyang technological university report recent findings in learning science and technology. (2014). *Education Letter, ,* 141. Retrieved from http://search.proquest.com/docview/ 1475185897?accountid=48462

Lederman, N. G. (2001). A partial list of the empirical theoretical literature on subject-specific pedagogy. *School Science and Mathematics, 101*(2), 61-80. Retrieved from http://search.proquest.com/docview/195201021? accountid= 48462

Lee, E. (2005). Conceptualizing Pedagogical Content Knowledge From The Perpective of Experienced Secondary Science Teachers. Tesis Ed.D. University of Texas.

Lee, M. H., dan Tsai, C. C. (2010). Exploring Teachers' Perceived Self Efficacy And Technological Pedagogical Content Knowledge With Respect to Educational Use of The World Wide Web. *Instr Sci, 38,* 1-21.doi:10.1007/s-008-9075-4.

Leigh, A. (2006). *Estimating teacher effectiveness from two-year changes in students' test scores.* Retrieved July 17, 2007, from Australian National University, Research School of Social Sciences.

Lembaga Peperiksaan Malaysia (2014). *Kupasa mutu jawapan Sains UPSR 2014.* Kuala Lumpur: Kementerian Pendidikan Malaysia.

Lemke, C. (2005). Measuring progress with technology in schools. *T.H.E.Journal, 32*(9), 16-16,18,20. Retrieved from http://search.proquest.com/docview/ 214829723?accountid=48462

Lester, D. (2010). Developing an Effective Instrument For Assessing The Performance of Public University President. Tesis Ed.D. University of New Mexico.

Levin, D. M., Grant, T., & Hammer, D. (2012). Attending and responding to student thinking in science. *The American Biology Teacher, 74*(3), 158-162. Retrieved from http://search.proquest.com/docview/947862150? accountid=48462

Libarkin, J. C., & Anderson, S. W. (2005). Assessment of learning in entry-level geoscience courses: Results from the geoscience concept inventory. *Journal of Geoscience Education, 53*(4), 394-401. Retrieved from http://search. proquest.com/docview/202779979?accountid=48462

Lilia Halim & Subahan Mohd Merah. (2002). Science Trainee Teachers' Pedagogical Content Knowledge and its Influence on Physics Teaching. *Research in Science & Technological Education, 20*(2), 215-225.

Lilia Halim, Abd Razak Habib, Abd Rashid Johar, & Subahan Mohd Merah. (2001). Tahap Pengetahuan Pedagogi Kandungan Guru Pelatih Fizik Melalui Pengajaran Eksplisit dan Implisit. *Journal Pendidikan (UKM), 26,* 65-80 .

Linstone, H. A. & Turroff, M. (eds) 1975. *The Delphi Method: Techniques and aplication.* Reading, MA: Addison-Wesley Publishing

Liston, D., Borko, H. & Whitcomb, J. (2008). The teacher educator's role in enhancing teacher quality. *Journal of Teacher Education*, *59*(2), 111-116.

Lu, L. (2014). Cultivating reflective practitioners in technology preparation: Constructing TPACK through reflection. *Education Sciences, 4*(1), 13-35. doi:http://dx.doi.org/10.3390/educsci4010013

Lux, N. J. (2010). Assessing Technological Pedagogical Content Knowledge. Tesis Ed.D. Boston University School Of Education.

Lyublinskaya, I., & Tournaki, N. (2012). The effects of teacher content authoring on TPACK and on student achievement in algebra: Research on instruction with the TI-Nspire handheld. In R. N. Ronau, C. R. Rakes & M. L. Niess (Eds.), *Educational technology, teacher knowledge, and classroom impact: a research handbook on frameworks and approaches,* 295-322.

Mackenzie, S.B., Podsakoff, P.M., & Podsakoff, N.P. (2011). Construct measurement and validation procedures in MIS and behavioral rwsearch: integrating new existing techniques. *Mis Quarterly, 35(2)* 293-334.

Madeira, M. C. (2010). *The development of pedagogical content knowledge in science teachers: New opportunities through technology-mediated reflection and peer-exchange* (Order No. NR72213). Available from ProQuest Education Journals. (870036341). Retrieved from http://search.proquest. com/docview/870036341?accountid=48462

Mahmud, Yahya (2012) *Persepsi guru pelajar di Sekolah-sekolah Menengah daerah Pontian terhadap pemansuhan pengajaran dan pembelajaran Sains dan Matematik dalam Bahasa Inggeris (PPSMI).* Masters thesis, Universiti Teknologi Malaysia, Faculty of Education. Item not available online.

Manizade, A.G, & Mason, M. M. (2011). Using Delphi methodology to design assessments of teachers' pedagogical content knowledge. *Educational Studies In Mathematics*, *76*(2), 183-207. doi:10.1007/s10649-010-9276-z

Marks, R. (1990). Pedagogical content knowledge : From a mathematical case to a modified conception. *Journal of teacher education*, *41*(3), 3-11.

McCaughtry, N. (2005). Elaborating Pedagogical Content Knowledge: What It Means To Know Students And Think About Teaching. *Teachers and Teaching: Theory and Practice, 11*(4), 379-395.

McCormick, B. & Thomann, W. (2007). Integration of Pedagogy, technology, and content in an undergraduate research course dalam *Proceedings of society for information Technology and Teacher Education International Conference 2007*. Chesapeake, VA: AACE

McCrory, M. R. (2010). *An exploration of initial certification candidates' TPACK and mathematics-based applications using touch device technology.* (Order No. 3447134, The University of Mississippi). *ProQuest Dissertations and Theses, ,* 142. Retrieved from http://search. proquest.com/docview/864662100? accountid=48462. (864662100).

McCrory, R. (2008). Science, technology and teaching: The topic-specific challenges of TPCK in science. In AACTE Committee on Innovation and Technology (Ed). *Handbook of Technological Pedagogical Content knowledge (TPCK) for Educators.* (pp. 193-206). New York: Published by Routledge for the American Assosiation of Colleges for Teacher Education.

Mei, L. (2001). *HOW TO IMPROVE CE STUDENTS' ORAL SKILLS.* (Order No. H005979, Shanghai Jiaotong University (People's Republic of China)). *PQDT - Asia,* Retrieved from http://search.proquest.com/docview/ 1027138758?accountid =48462. (1027138758).

Meighan, R. (1995). Home-based education effectiveness research and some of its implications. *Educational Review*, *47*(3), 275.

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist,* 50, 741-749.

Miktuk, D. (2012). Impact of professional development on level of technology integration in the elementary classroom. Doctoral thesis. Capella University.

Mims-Word, M. (2012). The importance of technology usage in the classroom, does gender gaps exist. *Contemporary Issues in Education Research (Online), 5*(4), 271. Retrieved from http://search.proquest.com/docview/ 1418450487? accountid= 48462

Mishne, J. (2012). An Investigation of The Relationships Between Technology Use And Teachers' Self-Efficacy, Knowledge and Experience. Tesis Ed.D. Pepperdine University.

Mishra, P. & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record,* 108, 1017-1054.

Mishra, P. (1998). Flexible learning in the periodic system with multiple representations: The design of a hypertext for learning complex concepts in chemistry (Doctoral dissertation, University of Illinois).

Mishra, P., & Girod, M. (2006). Designing learning through learning to design. *High School Journal*, *90*(1), 44-51.

Mishra, P., & Koehler, M. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of educational Computing Research, 32*(2), 131-152.

Mishra, P., Koehler, M. J., & Kereluik, K. (2009). The Song Remains the Same: Looking Back to the Future of Educational Technology. *Techtrends: Linking Research & Practice To Improve Learning*, *53*(5), 48-53. doi:10.1007/s11528-009-0325-3

Moersch, C. (2010). LoTi Turns Up the Heat!. *Learning & Leading With Technology*, *37*(5), 20-23.

Mouza, C. (2011). Promoting urban teachers' understanding of technology, content, and pedagogy in the context of case development. *Journal of Research on Technology in Education, 44*(1), 1-29. Retrieved from http://search.proquest.com /docview/888563410?accountid=48462

Mulholland, J., & Wallace, J. (2008). Computer, craft, complexity, change: Explorations into science teacher knowledge. *Studies in Science Education, 44*(1), 41-62. Retrieved from http://search.proquest.com/docview/ 222858469?accountid=48462

Muller, D. A., & Sharma, M. D, (2008). Tackling Misconceptions in Introductory Physics Using Mutimedia Presentations. *UniServe Science Teaching and Learning Research Proreadings (Symposium presentation),*59-63.

Nathan, E. J. (2009). An Examination of The Relationship Between Preservice Teachers' Level of Technology Integration Self-Efficacy (TISE) and Level of Technological Pedgogical Content Knowledge (TPACK). Tesis Ed.D. University of Houston.

Niess, M., & Gillow-Wiles, H. (2013). Advancing K-8 teachers' STEM education for teaching interdisciplinary science and mathematics with technologies. *The Journal of Computers in Mathematics and Science Teaching, 32*(2), 219. Retrieved from http://search.proquest.com/docview/1287173280? accountid= 48462

Noraziah Kassim@Aziz (2009). *Penggunaan ICT dalam P & P Matematik di kalangan guru-guru pelatih UTM.* Universiti Teknologi Malaysia, Skudai.

NorHisham Abu Samah, Mazenah Youp dan Rose Alinda Alias (1996). *Pengajaran Bantuan Komputer .* UTM.

Norsiah binti Abdul Hamid. 2011. Development and validation of a knowledge society model and indicators in the Malaysia context. Doctoral thesis. Universiti Kebangsaan Malysia Bangi.

Osborne, J., Simon, S., & Collins, C. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education, 25*(9), 1049-1079.

Othman Mohamad. (2000). *Prinsip psikoterapi dan pengurusan dalam kaunseling. S*erdang: Penerbit UPM.

Ovando, M. N. (2005). Building instructional leaders' capacity to deliver constructive feedback to teachers. *Journal of Personnel Evaluation in Education, 18*(3), 171-183.

Ozden, M. (2008). The Effect of Content Knowledge on Pedagogical Content Knowledge: The Case of Teaching Phases of matters. *Educational Sciences: Theory & Practice, 8*(2), 633-645.

Ozgun-Koca, S., Meagher, M., Edward, M. T. (2011). A teachers journey with new generation handheld: Decisions, struggles & accomplishment. *School Science & Mathematics.* 111(5), p 209-224.

Papanastasiou, E. C., & Angeli, C. (2008). Evaluating the use of ICT in education: Psycometric properties of the survey of factors affecting teachers teaching with technology(SFA-T). *Educational Technology & Society*. 11(1), 69-80.

Pardhan, H. (2002). Collaborative Action Research for Science Teachers' Pedagogical Content Knowledge Enhancement. Tesis Ed.D. University of Alberta.

Payne, D. A., & McMorris, R. F. (1967). *Educational and Psychological Measurement: Contributions to theory and practice.* Waltham: Mass Blaisdell Pub.Co.

Penick, J. E., Yager, R. E. & Bonnstetter, R. (1986). Teachers make exemplary programs.E*ducational Leadership, 44*(2), 14-20.

Penso, S. (2002). Pedagogical content knowledge: How do student teachers identify and describe the causes of their pupils' learning difficulties? *Asia - Pacific Journal of Teacher Education, 30*(1), 25-37. Retrieved from http://search.proquest.com /docview/203328849?accountid=48462

Perkmen, S. (2008). *Factors that influence pre-service teachers' technology integration performance.* (Order No. 3310804, Iowa State University). *ProQuest Dissertations and Theses,* , 109-n/a. Retrieved from http://search.proquest.com/docview/304612130?accountid=48462. (304612130).

Petras, Y., Jamil, H., & Mohamed, A. R. (2012). How do teachers learn? A study on the policy and practice of teacher professional development in malaysia. *KEDI Journal of Educational Policy, 9*(1) Retrieved from http://search.proquest.com /docview/1023360656?accountid=48462

Pierson, J. L. (2008). *The relationship between patterns of classroom discourse and mathematics learning.* (Order No. 3324548, The University of Texas at Austin). *ProQuest Dissertations and Theses,* , 176-n/a. Retrieved from http://search.proquest.com/docview/304482383?accountid=48462. (304482383).

Pierson, M. E. (1999). Technology Integration practice as a function of pedagogical expertise. Thesis Phd. Arizona State University.

Pierson, M. E. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Computing in Education,* 33(4), 413-429.

Pijls, M., Dekker, R., & Van Hout-Wolters, B. (2007). Teacher help for conceptual level raising in mathematics. *Learning Environments Research, 10*(3), 223-240. doi:http://dx.doi.org/10.1007/s10984-007-9032-1

policies for effective classroom practice. *Contemporary Issues in Technology & Teacher Education*, *7*(3), 129-139.

Polly, D., & Brantley-Dias, L. (2009). TPACK: Where do we go now? *TechTrends, 53*(5), 46-47. Retrieved from http://search.proquest.com/docview/ 223118483?accountid =48462

Price, J.L. & Mueller, C.W. (1986). *Handbook of organizational measurement.* Marshfield, MA: Pitman Publishing.

Rainie, L., & Wellman, B. (2012). The individual in a networked world: Two scenarios. *The Futurist, 46*(4), 24-27. Retrieved from http://search.proquest.com/ docview/1024141356?accountid=48462

Raman, A., & Mohamed, A. H. (2013). Issues of ICT usage among malaysian secondary school english teachers. *English Language Teaching, 6*(9), 74-82. Retrieved from http://search.proquest.com/docview/1459136310? accountid=48462

Raman., A. (2014). TPACK Confidence of Pre-service Teachers in Universiti Utara Malaysia. Mediterranean. *Journal of Social Sciences.* Vol.5 No.22. DOI:10.5901/mjss.2014.v5n22p167.

Renner, J., Abraham, M. R., & Birmie, H. H. (1988). The necesity of each phase of the learning cycle in teaching high school physics. *Journal of Research in Science Teaching, 25*(1), 39-58.

Richardson, I. (2010). *Exploring elementary teachers' implementation of formative assessment practices for reading.* (Order No. 3409838, University of Massachusetts Amherst). *ProQuest Dissertations and Theses,* , 200. Retrieved from http://search.proquest.com/docview/ 733021744?accountid=48462. (733021744).

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

Robiah Sidin, (2003). Pembudayaan Sains dan Teknologi: Satu Cadangan Piawai (Socialization of science and Technology: a standard proposal).*Jurnal Pendidikan (UKM)*, *28*, 47-63.

Roch, S., McNall, L., & Caputo, P. (2011). Self-Judgments of accuracy as indicators of performance evaluation quality: Should we believe them? *Journal of Business Psychology, 26,* 41-55.

Roehrig, A. D., Turner, J. E., Grove, C. M., Schneider, N., & Liu, Z. (2009). Degree of alignment between beginning teachers' practices and beliefs about effective classroom practices. *The Teacher Educator, 44*(3), 164-187. Retrieved from http://search.proquest.com/ docview/220632795?accountid=48462

Rohaida Mohd Saat, dan Kamariah Abu Bakar. (2005). Technology-Based Science Classroom: What Factors Facilitatte Learning. *Malaysian Journal of Educators and Education, 20*, 1-19.

Rosseau, G., & Rogers, W. (1998). Computer usage patterns of university faculty mambers across the lifespan. *Computers In Human Behavior, 14,* 103-428.

Rosson-Niess, S. (2012). *An investigation of intergenerational conflict within teacher work groups.* (Order No. 3535793, University of La Verne). *ProQuest Dissertations and Theses,* , 157. Retrieved from http://search.proquest.com/ docview/1286745345?accountid=48462. (1286745345).

SAHIN, I. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *TOJET : The Turkish Online Journal of Educational Technology, 10*(1) Retrieved from http://search.proquest.com/ docview/ 1288352054?accountid=48462

Sahin, L., Akturk, A, & Schmidt, D. (2009) Relationship of preservice teachers' technological pedagogical content knowledge with their vocational self-efficacy beliefs, dalam *Proceedings of society for information Technology and Teacher Education International Conference 2009* Chesapeake, VA: AACE.

Sancar-Tokmak, H., Surmeli, H., & Ozgelen, S. (2014). Preservice science teachers' perceptions of their TPACK development after creating digital stories. *International Journal of Environmental and Science Education, 9*(3), 247-264. Retrieved from http://search.proquest.com/docview/1651855609? accountid=48462

Sanders, W. L. (2006). *Comparisons among various educational assessment valueadded models.* Paper presented at the The Power of Two-National Value-Added Conference, Cary, NC.

Sandholtz, J. H. (2011). Preservice teachers' conceptions of effective and ineffective teaching practices. *Teacher Education Quarterly, 38*(3), 27-47. Retrieved from http://search.proquest.com/docview/892988569? accountid=48462

Sarimah bt Abd Razak (2005). Motivasi, gaya pembelajaran dan kebolehan kognitif pelajar sekolah menengah teknik. Thesis PhD Universiti Pertanian Malaysia.

Scarlett, T. (2008). An Exploratory Study Of The Impact Of Two Version Of Inquiry –Based Science Program Professional Development on Teachers' Perseptions Of Their Pedagogical Content Knowledge. Tesis Ed.D. University of Hawaii.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2010). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education, 42*(2), 123-149. Retrieved from http://search.proquest.com/docview/274696152? accountid=48462

Schmidt, M., & Vandewater, E. A. (2008). Media and Attention, Cognition, and School Achievement. *Future Of Children*, *18*(1), 63-85.

Schuster, D., Cobern, W. W., Applegate, B., Schwartz, R., Vellom, P., & Undrelu, A. (2007). Assessing Pedagogical Content Knowledge of Inquiry Science Teaching. *National STEM Assessment Conference on assessment of Student Achievement by The National Science Foundation and Drury University.*

Schriesheim, C.A., Powers, K.J., Scandura, T.A., Gardiner, C.C., & lankau, M.J. (1993). Improving construct measurement in management research: Comments and a quantiative approach for assessing the theoritical adequacy of paper-and-pencil survey-type instruments. *Journal of management, 19,* 385417.

Schwab, D.P. (1980). Contruct validity in organisation bahavior. In B.M. Staw & L.L. Cummings (eds.) *Research in organizational behavior (Vol. 2, 3-43).*Greenwich, CT: JAI Press.

Science and technology education; report summarizes science and technology education study findings from national taiwan normal university (science teachers' proficiency levels and patterns of TPACK in a practical context). (2015). *Education Letter,* , 80. Retrieved from http://search.proquest.com/docview /1656148355?accountid=48462

Scott-Little, C., Brown, E. G., Hooks, L. M., & Marshall, B. J. (2008). CLASSROOM QUALITY RATING SYSTEMS: How do teachers prepare and what do they think

about the process? *YC Young Children, 63*(6), 40-45. Retrieved from http://search.proquest.com/docview/197595224? accountid=48462

Settlage, J. (2013). On acknowledging PCK's shortcomings. *Journal of Science Teacher Education, 24*(1), 1-12. doi:http://dx.doi.org/10.1007/ s10972-012-9332-x

Shin, T., Koehler, M., Mishra, P., Schmidt, D., Baran, E., & Thompson, A. (2009). Changing technological pedagogical content knowledge (TPACK) in PreK-6 teachers dalam *Proceedings of society for information Technology and Teacher Education International Conference 2009* Chesapeake, VA: AACE.

Shinas, V.H., Ozden, S.Y., Mouza, C., Klein, R.K. and Glutting, J.J. (2013). Examining Domains Of Technological Pedagogical Content Knowledge Using Factor Analysis. *Journal of research on technology in education;* Summer 2013; 45, 4; Proquest Education Journals pg. 339.

Shulman, L. S. (1986a). Paradigms and research programs in the study of teaching: A contemporary perspective. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3-36). New York: Macmillan.

Shulman, L. S. (1986b). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Shulman, L. S. (1987). Knowledge and teaching. Foundation of the new reform. *Havard Educational Review, 57*, 1-22.

Sidek Mohd Noah. (1998). *Penilaian dalam kaunseling.* Serdang: IDEAL-UPM.

Siti Mardziah binti Aziz (2013). Kesediaan Guru Sekolah Menengah Agama Terhadap PenggunaanTeknologi Maklumat Dan Komunikasi (ICT) Dalam Pengajaran Dan Pembelajaran. Tesis Masters Universiti Tun Hussein Onn Malaysia.

Slykhuis, D., & Park, J. (2006). Correlates of achievement with online and classroom-based MBL physics activities. *The Journal of Computers in Mathematics and Science Teaching, 25*(2), 147-163. Retrieved from http://search.proquest.com/docview/220640793?accountid=48462

Sook-Jeong, L. (2007). The relations between the student-teacher trust relationship and school success in the case of Korean middle schools. *Educational Studies, 33*(2), 209-216. Retrieved from http://web.ebscohost.com.

Southerland, S. A., Sowell, S., & Enderle, P. (2011). Science teachers' pedagogical discontentment: Its sources and potential for change. *Journal of Science Teacher Education, 22*(5), 437-457. doi:http://dx.doi.org/10.1007/ s10972-011-9242-3

Spazak, L. (2013). *Secondary preservice teachers' perception of preparedness to integrate technology* (Order No. 3558231). Available from ProQuest Dissertations & Theses Global. (1348684152). Retrieved from http://search.proquest.com /docview/1348684152?accountid=48462

Strong, M. (2011). *The highly qualified teacher : What is teacher quality and how do we measure it?* New York: Teachers College Press.

Stronge, J. H. (2007). *Qualities of effective teachers.* Alexandria, VA: Association for Supervision and Curriculum Development.

Stronge, J. H., Ward, T. J., Tucker, P. D., & Hindman, J. L. (2007). What is the relationship between teacher quality and student achievement? an exploratory study. *Journal of Personnel Evaluation in Education, 20*(3-4), 165-184. doi:http://dx.doi.org/10.1007/s11092-008-9053-z

Sun, J. (2005). Assessing Goodness of Fit in Confirmatory Factor Analysis. *Measurement and Evaluation in Counselling and Development, 37*(4), 240-256.

Sweetman, S. B. (2013). *Teachers developing exemplary inquiry practices: Three longitudinal case studies.* (Order No. 3556769, University of Rhode Island). *ProQuest Dissertations and Theses,* , 198. Retrieved from http://search.proquest.com/docview/1328402262?accountid=48462. (1328402262).

Swenson, J., Young, C. A., McGrail, E., Rozema, R., & Whitin, P. (2006). Extending the conversation: New technologies, new literacies, and english education. *English Education, 38*(4), 351-369. Retrieved from http://search.proquest.com/ docview/214372432?accountid=48462

Tan Sri Muhyidin bin Mohd Yassin (2015). Laporan Awal Pelan Pembangunan Pendidikan 2013-2015. http//www.moe.gov.my.

Tan, H. M. (2009). *Changing the language of instruction for mathematics and science in malaysia: The PPSMI policy and the washback effect of bilingual high-stakes secondary school exit exams* (Order No. NR66540). Available from

ProQuest Education Journals. (808407479). Retrieved from http://search.proquest. com/docview/808407479?accountid=48462

Tan, M. (2011). Mathematics and science teachers' beliefs and practices regarding the teaching of language in content learning. *Language Teaching Research, 15*(3), 325-342. doi:http://dx.doi.org/10.1177/1362168811401153

Tengku Faekah Temgku Ariffin, (2005) *Gender Differences in Computer Attitudes and Skills.* Jurnal Pendidikan (UKM), 30 . pp. 75-91. ISSN 01266020

Tengku Zawawi Tengku Zainal, Ramlee Mustafa, & Abdu Razak Habib. (2009). Pengetahuan Pedagogi Isi Kandungan Guru Matematik bagi Tajuk Pecahan: kajian Kes di Sekolah Rendah. *Journal Pendidikan (UKM)*, *34*(1),131-153.

Teo, T. (2008). Preservice Teachers' attitudes towards computer use: A Singapore survey, Australian Journal of Educational Technology, 24(4), 413-424.

Teo, T. (2010). Using Structural Equation Modeling (SEM) In Educational Research: Practices and Issues. *IJAES. 10*(1), 50-65.

Teo, T., & Koh, J. H. L. (2010). Assessing the dimensionality of computer self-efficacy among pre-service teachers in singapore: A structural equation modeling approach. *International Journal of Education and Development using Information and Communication Technology, 6*(3), 7-18. Retrieved from http://search.proquest. com/ docview/ 817561996?accountid=48462

Terrell, S. (2011). Mixed-methods research methodologies. *The qualitative Report, 17(1), 254-280.* Retrieved from http://www.nova.edu/ssss/QR/QR17-1/terrell.pdf

Timur, B., & Tasar, M. F. (2011). In-service science teachers' technological pedagogical content knowledge confidences and views about technology-rich environments. *CEPS Journal : Center for Educational Policy Studies Journal, 1*(4), 11-25. Retrieved from http://search.proquest.com/docview/ 1095116295?accountid=48462

Tokmak, H. S., Incikabi, L., & Ozgelen, S. (2013). An investigation of change in mathematics, science, and literacy education pre-service teachers' TPACK. *The Asia - Pacific Education Researcher, 22*(4), 407-415. doi:http://dx.doi.org/ 10.1007/s40299-012-0040-2

Treagust, D. F., & Duit, R. (2008). Conceptual change: A discussion of theoretical, methodological and practical challenges for science education. *Cultural Studies of Science Education, 3*(2), 297-328. doi:http://dx.doi.org/10.1007/ s11422-008-9090-4

Tuckman, B. W. (1978). *Conducting educational research.*New York: Harcout Brace Javanovich, Inc.

Ueckert, C. W., & Gess-Newsome, J. (2008). Active learning strategies. *The Science Teacher, 75*(9), 47-52. Retrieved from http://search.proquest.com/docview/ 214624210?accountid=48462

Van Meeteren, B. D., & Escalada, L. T. (2010). Science and literacy centers. *Science and Children, 47*(7), 74-78. Retrieved from http://search.proquest.com/docview /236949187?accountid=48462

Varrella, G. F. (2000). Science teachers at the top of their game: what is teacher expertise? *Clearing House. 74*(1), 43-45.

Vygotsky, L. S. (2011). The dynamics of the schoolchild's mental development in relation to teaching and learning. *Journal of Cognitive Education and Psychology, 10*(2), 198-211. Retrieved from http://search.proquest.com/docview/892609636? accountid=48462

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing Preservice Teachers' Self-Efficacy Beliefs for Technology Integration. *Journal Of Research On Technology In Education*, *36*(3), 231-250.

Wayne, A., & Youngs, P. (2003). Teacher characteristics and student achievement gains: A review. *Review of Educational Research, 73*(1), 89-122.

Weiss, I. R., Pasley, J. D., Smith, P. S., Banilower, E. R., & Heck, D. J. (2003). *Highlights Report - Looking Inside the Classroom: A Study of K-12 Mathematics and Science Education in the United States*.

Wiersma, W., & Jurs, S. G. (2009). *Research Methods In Education: An Introduction*. 9th edition. Allyn & Bacon Inc.

Williams, P. L., & Webb, C. (1994). The Delphi technique: A methodological discussion. *Journal of Advanced Nursing, 19*(1), 180-186. doi: 10.1111/j.1365-2648. 1994.tb01066.x.

Wilson, M. (2011). *Teachers' professional growth: The blending of technology, pedagogy and content* (Order No. 3444791). Available from ProQuest Education Journals. (859003772). Retrieved from http://search.proquest.com/docview/ 859003772?accountid=48462

Wilson, T. D., & Gilbert, D. T. (2008). Explaining Away: A Model of Affective Adaptation. *Perspectives On Psychological Science (Wiley-Blackwell)*, *3*(5), 370-386. doi:10.1111/j.1745-6924.2008.00085.x

Wischow, E. D. (2010). *Interactions between teachers' existing pedagogical content knowledge and novel subject matter knowledge* (Order No. 3444880). Available from ProQuest Education Journals. (859253996). Retrieved from http://search.proquest.com/docview/859253996? accountid=48462

Wong Su Luan. (2002). Development And Validation of an Information Technology (IT) Based Instrument to Measure Teachers' IT Preparedness. Tesis Phd. Universiti Putra Malaysia

Wong, S. L., & Hanafi, A. (2007). Gender differences in attitudes towards information technology among malaysian student teachers: A case study at universiti putra malaysia. *Journal of Educational Technology & Society, 10*(2) Retrieved from http://search.proquest.com/docview/ 1287039857?accountid=48462

Woo, J., Lew, H., Park, K., Seo, D., & International Group for the Psychology of Mathematics, E. n. (2007). *Proceedings of the Conference of the International Group for the Psychology of Mathematics Education (31st, Seoul, Korea, July 8-13, 2007). Volume 1*. International Group for the Psychology of Mathematics Education.

Vekiri, L., & Chronaki, A. (2008). Gender issues in technology use: Perceived social support, computer self-efficacy and value beliefs, and computer use beyond school. *Computers & Education, 51(*3), 1392-1404. Doi: 10.1016/j.compedu, 2008.01.003

Yeo, S., & Zadnik, M. (2000). Newton, we have a problem.. *Australian Science Teachers Journal, 46*(1), 9-18. Retrieved from http://search.proquest.com/docview/ 194522432?accountid=48462

Young, J. R., Young, J. L., & Shaker, Z. (2012). Technological pedagogical content knowledge (TPACK) literature using confidence intervals. *TechTrends, 56*(5), 25-33. doi:http://dx.doi.org/10.1007/ s11528-012-0600-6

Yousuf, M. I. (2007). Using Experts Opinions through Delphi Technique. *Practical Assessment, Research & Evaluation* 12 (4).

Yuruk, N. (2005). An Analysis of The Nature of Students' Metaconceptual Processes and The Effectiveness of Metaconceptual Teaching Practices on Students' Conceptual Understanding of Force and Motion. Tesis Ed.D. The Ohio State University.

Yusof Petras, Hazri Jamil, & Abdul Rashid Mohamed. (2012). How do teachers learn? A study on the policy and practice of teacher professional development in malaysia. *KEDI Journal of Education Policy.* ISSN 1739-4341. 51-57.

Zelkowski, J., Gleason, J., Cox, D. C., & Bismarck, S. (2014). Developing and validating a reliable TPACK instrument for secondary mathematics preservice teachers. *Journal of Research on Technology in Education, 46*(2), 173-206. Retrieved from http://search.proquest.com/docview/ 1492735123?accountid=48462

Zhao, Y. (2003). *What teachers should know about technology: Perspectives and practices.* Greenwich, CT: Information Age Publishing.

Zipfinger, S. 2007. *Computer-aided Delphi: An experimental study of comparing round-based with real-time implementation of the method.* Linz, Austria: Johannes-Kepler University Linz.