

ICT Delivery Systems' Research Trends in Malaysian Higher Education Institutions: A Content Analysis

Irfan N. Umar, Nur H. Kamal, Nurullizam Jamiat, Mona Masood

Abstract — Not to be left behind in terms of ICT, Malaysian higher education institutions (HEI) have taken the necessary actions to provide their communities with the appropriate ICT environment. Although the use of ICT is no longer an issue, there is a need to study the trends of ICT delivery systems in the country's HEIs. A content analysis was carried out on 100 articles published in four Malaysian instructional technology convention proceedings, specifically from the year 2005 to 2008. Based on the analysis, the trends of ICT delivery systems have been identified. These trends were clustered into three main categories: (i) *computer-based delivery* (focusing on using CD-ROM and stand-alone platform), (ii) *web-based delivery* (emphasizing web 1.0 technology) which brought the learning and teaching practices into the World Wide Web, and (iii) *technology enhanced learning* which focuses on the combination of Web 2.0 technology and other modern electronic devices using the latest technology. The features and details of each delivery system will be discussed. It is hoped that this paper will offer a guideline on the planning, implementation, and evaluation of such delivery system for any institutions of higher learning.

Index Terms — Computer-based delivery, Content analysis, ICT delivery system, Technology-enhanced-learning delivery, Web-based delivery

1 INTRODUCTION

Delivery system is a way on how message can be transferred from one party to the other. The era of delivering the message by using electronic devices started in 1920 [1] when the first radio was invented. Back then, it was fascinating when the information could be delivered to a huge number of audiences synchronously. Then in 1929, television was invented that enables information to be delivered in audio visual form. However, it should be highlighted that the existing of new media complement the old one but never countervail them [2]. The first computer was invented during World War One for military used, but later on was commercialized from the really big machines to a portable form that we used today. In early 1990s, the World Wide Web and Internet was officially launched which marks the marriage of the computerized information with the

Internet. The web has played the most important role in the century as it is one of the most rapid and vital ways in sharing and delivering the information to the entire world. In addition, it also has become one of the powerful delivery systems that support teaching and learning processes for all levels of education.

The purpose of this study is to investigate the current trends of ICT delivery system in higher education institutions in Malaysia. A content analysis of four Malaysian Educational Technology Convention (METC) proceedings which present research findings on ICT applications in Malaysian education system, will be conducted. This annual convention is the sole platform for educational technologists from various sectors including primary and secondary schools, higher education institutions and training centers to discuss and share their practices and research findings, and as such, most of the ICT research findings, initiatives, and practices in higher education institutions are reported here.

In this study, four latest METC proceedings will be selected, namely, the 2005 and 2006 National METC proceedings as well as the 2007 and 2008 International METC proceedings. The types of delivery system or media format as documented in each article will be identified and categorized.

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2 LITERATURE REVIEW

Instructional technology (or educational technology) is defined as “the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning” [6:1]. This definition of instructional technology was endorsed by the American Association of Educational Communication and Technology (AECT) and has been accepted and used globally, including in Malaysia. There are five domains of instructional technology: design, development, utilization, management, and evaluation. *Design* is the process of specifying conditions for learning, and this includes determining the needs and characteristics for learning. The *development* domain involves translating the design specifications into physical form, and in this domain, technology is its main focus. There are four types of technology as far as instructional development is concerned: print technology, audio-visual technology, computer based technology, and integrated technology. The *utilization* domain involves the use of processes (methods and instructional models), resources (media and hardware), and environment for learning. The *management* domain involves controlling instructional technology through planning, organizing, coordinating and supervising, while the *evaluation* domain is the process of determining the adequacy and effectiveness of instruction and learning.

In terms of history, the movement of ICT in education started in late 1970s [2] when the programming, drill and practices were introduced to the students in order to develop their logic and math skills. Then, the computer based training (CBT) has emerged from the cognizant that the combination of text, animations, sound and visual in CD-ROM form. This combination is believed to enhance students' learning process as suggested by dual coding theorists (Clark & Paivio, 1991, as cited in [3]). The main postulate of dual coding theory is that learning is enhanced when the information is processed in both the visual and verbal channels. Next, in the early 1990's, the Internet has emerged. The first generation of the Internet is Web 1.0 technology that allows people to access and reach the information from anywhere and at anytime just by the clicking of a button. With huge amount of information accessible from anywhere, this technology serves as a huge digital library of information.

Then, in late 1990's until early 2000, e-learning which is more commonly related to the higher level of educational institutions and corporate training [4], has been introduced to the society. E-learning that uses Internet technology as its platform, allows learning to transcend time and space. Then, in late 2000, social software and free open content emerge, and this allows the blooming of Web 2.0 technology. This movement adopted a new culture of sharing and providing free-of-charge contribution and distribution of contents over the Internet [5] through the use of web blogs, video blogs, wiki and social networking. The social networking sites such as Facebook, MySpace, Tagged, Friendster etc., have attracted a great number of users and members within just few years of their launching. In education, these applications facilitate a new way of collaborative work among the users which ultimately enhance the teaching and learning process.

In Malaysia, the field of instructional technology is showing a steady progress, due to the rapid advancement of technology as well as the demand of technology application in education and training sectors. In 1972, the Ministry of Education has established its own Educational Technology Division to look into matters pertaining to instructional technology, especially at the school levels. In terms of ICT, the Ministry of Education has formulated three policies: (a) ICT for all students, that is, ICT as an enabler in reducing the digital divide between schools, (b) as teaching and learning tools in education, either taught as an independent subject or integrated into others, and (c) ICT to enhance efficiency, effectiveness, and productivity of management in education [7].

Meanwhile, the aim of ICT application in Malaysia higher education is to improve in several areas, and this has been clearly indicated in the 2001-2010 Malaysian Education Development Plan [8]:

“.... aims to improve post-graduate programmes, produce students of excellence and quality, further develop students character, encourage research and development (R&D) of international standards, inculcate a culture of quality in higher education, and promote lifelong learning” [8:8].

In addition, the Malaysian Educational Technology Association (META) which was established in 1988, is the only platform that brings together educational technologists from

the schools, teacher training institutions, polytechnics and institutions of higher learning in Malaysia. This association is under the patronage of the Educational Technology Division of the Ministry of Education. Since its inception, META has successfully organized its annual educational technology convention. In 2007, this annual national convention was upgraded to International Malaysian Educational Technology Convention. During the convention, conference proceedings that document the selected articles, was published and distributed to the participants.

There are three main terms used for this study. The first one is computer-based training or CBT, which focusing on the usage of stand-alone computer system and the courseware in delivering the message. Web-based teaching, or web-based training WBT, is basically an approach that is using the Internet connection or World Wide Web in delivering the message. This web generation is also sometimes called as Web 1.0 technology. The third one is technology enhanced learning/training or TEL which is generally focusing on the usage of latest technology in delivering the message in teaching and learning conditions. It is a combination of Web 2.0 technology - that promotes interactivity and collaboration- and the use of mobile technology, such as Bluetooth application, iPod, etc. In other words, TEL is a combination of web 2.0 and other electronic devices besides the computer [9]. TEL as the third delivery system allows more interaction, collaboration, and cooperation among the learners and instructors, which in the end will help the learners to construct meaningful learning. This is inline with social constructivism theory – to ensure meaningful learning, students should construct their own learning and experience, collaborate with others to solve a given problem, and that the problem given needs to be of relevance to them.

3 RESEARCH METHODOLOGY

In this study, a content analysis on four educational technology conventions proceedings was conducted. This methodology is used because it enables researchers to sift through large volumes of data with relative ease in a systematic fashion (Gao, 1996, as cited in [10]). According to Carney [11], content analysis forces the researcher in developing fixed questions while analyzing the writings to produce countable results. The aim in using content analysis for

this paper was to discover and describe the focus in the ICT delivery system used in Malaysian higher education institutions. The four METC proceedings (2005-2008) were chosen because they document most of the initiatives, practices and research findings pertaining to ICT in Malaysian educational institutions. From a total number of 553 articles documented in these four proceedings, only 100 articles involving Malaysian higher educational institutions were selected for this study. The rationales of choosing the last four years of these proceedings are: (a) the changes in ICT applications and practices in such institutions are obvious for the last four years, and (ii) more articles on the applications and research in ICT have been reported in these last four convention proceedings.

There are several steps taken in identifying and sorting the conference proceedings articles. First, all 553 articles appeared in the four proceedings were analyzed and sorted into the clusters based on 18 concepts used. The clusters of concepts are: (1) instructional or educational technology, (2) other fields or disciplines, (3) instructional process variables, (4) instructional process elements, (5) teaching/learning perspective, (6) instructional method, (7) delivery system/media format, (8) instructional development, (9) production variables, (10) learner outcomes, (11) learner variables, (12) learning environment, (13) evaluation, (14) performance technology and performance support system, (15) organizational change, (16) the profession, (17) culture, and (18) teacher variable [12]. Another cluster was added to identify the level of institution (higher institution, school system, training sector, etc) addressed by each article. Then the selection was narrowed down, focusing only on articles that related to delivery system in Malaysian higher institutions. After that, each of the selected articles was sorted into three main categories: computer based training delivery (CBT), web based training delivery (WBT) or technology enhanced learning delivery (TEL) by looking at **cluster 7** (delivery system / media format) as suggested by Masood [12].

4 FINDINGS

Based on the content analysis, there are 553 articles documented in the four METC proceedings (year 2005-2008). Then, further analysis was carried out to identify the level of institution addressed in each article, and there are exactly 100 articles involving higher

education institutions. Next, based on Masood's [12] cluster of concepts, the delivery system/media format (Cluster 7) reported in each of the 100 articles was identified and categorized either as computer based teaching or learning (CBT), web-based teaching/learning (WBT), or technology-enhanced teaching/learning (TEL). From the analysis, it was found that 30 articles are focusing on CBT, 29 articles on WBT, and 41 articles on TEL delivery. The categorization of the 2005-2008 METC proceedings based on the delivery format is shown in Table 1 (Appendix A).

Based on Table 1, the trends of research in ICT delivery system in Malaysia higher education institutions have been detected. There are 19 articles that deal with higher education institutions reported in the METC 2005 proceedings. Based on the content analysis of the 2005 proceedings, there are nine articles (47.4%) pertaining to CBT, five articles on WBT (26.3%), and also five articles on TEL (26.3%). In 2006, the number of articles pertaining to the use of ICT in higher education has increased to 44 (as compared to only 19 articles in 2005). Out of the 44 articles, there are 10 articles on CBT (23.3%), 14 articles on WBT (32.6%), and 20 articles on TEL (46.5%). As expected, due to technology advancement, the percentage of CBT related articles has decreased from 47.4% in 2005 to 23.3% in 2006, whereas the percentage of WBT related articles has increased from 26.3% to 32.6%. Similar trend can be seen in TEL in which the percentage has increased from 26.3% to 46.5%.

A total of 25 articles related to ICT delivery in Malaysian higher educational institutions was reported and documented in the 2007 proceedings. Compared to 2006, there was a decline in the number of articles in 2007. Due to the upgrading of METC to international convention in 2007, a number of articles written by international participants was received and published, and this has resulted in a reduction in the number of articles by Malaysian presenters. As a result, the number of local articles concerning higher educational institutions is less than that of 2006. Interestingly, in 2007, the number of articles concerning CBT is about equal to that of WBT and TEL. Based on the analysis of the 2007 proceedings, it was found that there are nine articles on CBT (36%) and eight articles (32%) for both the WBT and TEL. In 2008, the research trends in ICT delivery format in Malaysian higher educational institutions are

reflecting the latest focus of technology. In specific, there are 12 articles reported, with eight articles (66.6%) focusing on TEL delivery format, and only two articles (16.7%) on both the WBT and CBT delivery system. The shift from the stand-alone ICT delivery format in CBT to a more interactive, collaborative web 2.0 environment in TEL is a clear evident on such changes in practices in the country's education systems.

From the perspective of each delivery format, the percentage of articles concerning TEL format has increased from 2005 to 2008. In 2005, it contributed to 26.3% of the whole articles, whereas in 2006, it contributed to 46.5%. In 2007, only 32% of the articles are TEL based, while in 2008, the percentage has increased to 66.6%.

For the WBT delivery format, there is an increase from 2005 to 2006, with each year contributed to 26.3% and 32.6% of the total articles documented in the proceedings. However, the percentage is slightly reduced with only 32% in 2007. A huge reduction in the number of WBT related articles is seen in 2008 when only 16.7% of such articles are reported in the 2008 proceedings.

A similar trend of reduction can be seen for the CBT delivery format. For instance, in 2005, 47.4% of the articles are CBT-based, while 23.3% are reported in 2006. However, there is an increase in 2007, in which 36% of the articles are CBT-based. The percentage, nevertheless, is reduced in 2008 when only 16.7% of the articles documented are CBT-related.

These analyses indicate a clear trend of ICT research in Malaysian higher education. There is a shift from computer-based instruction, CBT to web technology, WBT and finally to technology-enhanced learning (TEL) delivery format. In specific, there is an increase in the use of technology enhanced learning such as web 2.0 and other electronic devices from 2005 to 2008. On the other hand, there is a decrease in the number of CBT-related articles, indicating the reduction in research pertaining to CBT technology. A similar finding can also be seen for research on WBT delivery system – there is a decline in such research, especially from 2007 to 2008. Therefore it can be concluded that the research trends have shifted from CBT-based towards TEL-based. This is, again, resembles the advancement of technology, whereby Internet and web 2.0 technology is becoming

more important platform for teaching and learning.

The authors have also analyzed the 100 articles that deal with higher education institutions according to the cluster of concepts emerged within each article. In 2005 (19 articles), *learning outcome* (cluster 10) is the most frequent concept occurs in those articles, in that it appears in seven articles (36.8%). This was followed by the *instructional/educational technology* concept (cluster 1) and *learning environment* (cluster 12), with six appearances (31.6%) each. In 2006 (43 articles), *learning environment* (cluster 12) has emerged as the most frequent cluster, with 17 (39.5%) appearance. It was followed by the *learning outcome* concept (cluster 10) with 12 appearances (27.9%) and *learner variables* (cluster 11) with 11 appearances (25.6%). As for the year 2007 (25 articles), *learning outcome* (cluster 10) once again holds the most frequent concept appears in the articles, with 14 occurrence (56%). It was followed by the *learning environment* concept (cluster 12) with 11 appearances (44%). However in year 2008 (12 articles), the *learning outcome* and *learning environment* concepts (cluster 10 and cluster 12) both shared the most frequent concept with eight appearances (66.7%) each. Based on this analysis, it can be concluded that *learning outcomes* and *learning environment* are the two most frequent concepts that have appeared in the 100 articles.

5 CONCLUSION

The ICT research trends in Malaysian higher education institutions could be traced by conducting a content analysis of the national conference proceedings. Based on the content analysis of the last four years proceedings, there are 100 articles focusing on ICT research in higher institutions. It is obvious that the ICT research trend has shifted from stand-alone computer based learning delivery format to the use of web technology. Then, the focus has shifted towards a more interactive technology-enhanced learning format that involves web 2.0. The elements of collaboration and interactivity using several web applications such as discussion forum, wiki, blog, etc., have emerged in this environment. It is hoped that this analysis will provide a guideline for academicians, researchers and practitioners in the application of ICT in higher educational institutions.

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APPENDIX A

Table 1: Categorization of the 2005-2008 Malaysian Educational Technology Convention Proceedings based on the three main clusters.

Article Overall	Cluster	META 2008 Title	CBT	WBT	TEL
1	7,10,12	Unleashing the potentials of desktop virtual reality as an educational tool: A Look into the design and development process of VISTREET.		✓	
2	3,7,12	The use of shared representation interfaces as collaboration mediated tools in a pair programming environment.	✓		
3	7,10,12	Reka bentuk pembelajaran koperatif menerusi web bagi meningkatkan kemahiran komunikasi bertulis dan kerjasama berkumpulan.			✓
4	7,8,10,12	A tutorial on creating multimedia content for mobile learning.			✓
5	3,6,7,11,13	One-to-One computing using the class mate personal computer (CMPC).	✓		
6	7,10,11	Piawaian kompetensi IGT untuk Pendidik – Sorotan literatur.			✓
7	7,10,11	Pencarian maklumat menggunakan laman web berasaskan teknologi mobil untuk pelajar diploma seni bina di Politeknik Port Dickson.			✓
8	3,6,7,10,12	Kesan sistem pembelajaran berasaskan projek (Pjbl) secara atas talian (E-Solms) terhadap motivasi, kesediaan pembelajaran secara sendiri (Sdl-Readiness) dan locus kawalan pelajar.		✓	
9	5,6,7,10,11	An investigation of effects of modern communication technologies (synchronous and asynchronous) on quality of communication feedback in the online learning environment.			✓
10	3,7,8,9,12	Pembangunan dan penilaian kursus NPQH secara atas talian menggunakan CMS terbuka moodle: E-HEADSHIP reka bentuk dan pembangunan.			✓
11	3,6,7,12	Kolaborasi dalam pembelajaran berasaskan masalah (PBM) dan penggunaan wiki.			✓
12	3,6,7,10,12	Feedback and reflection through the e-Learning platform: A window into students' acquisition of soft-skills.			✓
12			2	2	8
		META 2007 Title	CBT	WBT	TEL
13	1,5,7	Attitude towards information and communication technology on learning Bahasa Melayu among foreign students.		✓	
14	3,7,10,11,12	Relationship between students' perception of the instructors' role and their interaction in asynchronous online discussion.			✓
15	7,10,13,14	Assessment using e-learning platform in UTHM.			✓
16	7,14	Online web-based industrial internship system.			✓
17	1,7,10,12	Keberkesanan penggunaan perbincangan atas talian dalam portal My Guru 2 terhadap pembelajaran di UPSI.			✓
18	7,10	Exploring Universiti Teknologi Petronas students' attitudes towards learning application of integration using courseware.	✓		
19	3,5,6,7	Simulasi menerusi web: Persepsi pelajar terhadap pembelajaran WWWS.		✓	
20	7,12	Agent technology teaching and learning of computer network course.	✓		
21	7,8,10,11	Designing technology based learning experience for educational managers.			✓
22	7,13,14	Summative evaluation for the usability of intelligent tutoring system (SPATH).		✓	
23	3,7,10	Tutoring using a mastery learning calculus computer courseware: Is it effective?	✓		
24	3,7,12	Lost in benchmarking or learning using open source tools?			✓
25	7,12	Web portal for electrical engineering as a platform for resource sharing.		✓	✓
26	3,7,9	Guidance system supporting design phase.	✓		
27	6,7,10,12	Social network analysis of virtual students teams' interactions in asynchronous discussion form.	✓	✓	
28	3,7,10,12	Utilizing w-portfolio for performance improvement puposes among student teachers.			✓
29	6,7,10,12,13	Pembangunan dan penilaian pembelajaran menerusi web bagi sub topik "Membina Laman Web" berasaskan pendekatan kolaboratif.			✓
30	6,7,10,13,17	Pembangunan perisian pembelajaran berasaskan web menggunakan kaedah simulasi bagi sub topik teknologi rangkaian tanpa untuk rangkaian kawasan setempat.		✓	
31	3,6,7,10,12	Reflective learning through weblogging.	✓		
32	3,7,10,13	Users' current views about applied e-learning courseware usability: A case study at Universiti Sains Malaysia.	✓		
33	3,7,8,9	Juztick: Kamus multimedia interaktif berasaskan web.		✓	
34	1,7	Inovasi teknik pengajaran dan pembelajaran Al-Quran dalam bilik kuliah.	✓		
35	7,10,11,12,15	Faktor-faktor yang mempengaruhi penggunaan e-pembelajaran di kalangan pelajar tahun akhir fakulti pendidikan, Universiti Teknologi Malaysia.		✓	

Table 1: (cont')

Table 1: (cont')

36	7.10	Effects of two modes of pedagogical agent on learning among students of Arabic at center for languages.	√		
37	1,7,12	Tinjauan terhadap tingkah laku maklumat dalam kalangan pelajar sarjana pendidikan Universiti Teknologi Malaysia, Skudai.		√	
25			9	8	8
		META 2006 Title	CBT	WBT	TEL
38	1,8,7,10,14	Learning "Goal Programming" using multimedia: Design factors and students' preferences.	√		
39	7,12,15,18	Faktor-faktor yang mempengaruhi penggunaan e-learning di kalangan pelajar.			√
40	6,7,10,11	Exploring the use of technology in Mandarin learning in UITM Terengganu: A comparison between two computer based learning tools.	√	√	
41	4,7,12	The challenges faced in KUIIM (Islamic University Collage of Malaysia) towards e-learning.			√
42	6,7	Segment by segment animation (SSA): One way to facilitate students' conceptual change of dynamic science concepts.	√		
43	3,7,8,12	Penilaian penggunaan sistem pengurusan pembelajaran berasaskan web.			√
44	6,7,12	Pedagogy of engagement integrating technology (POEIT) in Smartedu@UM.			√
45	6,7,10,12	Computation, exploration and visualization online with Webmathematica®.			√
46	7,12,15	Persepsi pesyarah politeknik terhadap m-learning: Satu kajian kes.			√
47	7,11	Development of a multimedia courseware for visualization on teaching and learning: Area and volume.		√	
48	5,7,11,12	Active learning through technology among undergraduate's students at Universiti Teknologi Malaysia.			√
49	1,7,10,11	Instructional technology and online recruitment: An empirical study on senior students in Malaysian universities.		√	
50	6,7,11,12	A study on the impact interaction of lecturers, students and peers using CD-interactive algebra courseware and collaborative learning - in a polytechnic Malaysia.	√		
51	3,7,10	Penilaian perisian kursus tutorial bagi kursus matematik kalkulus.	√		
52					
53	3,5,7,10	Keberkesanan sistem pembelajaran laman web berasaskan taksonomi Simpson bagi kemahiran mendirisiap ukur Teodolit (Sweb-tech).		√	
54	3,5,6,7,12	Learningcare sebagai sistem pengurusan pembelajaran: Amalan dan tahap kepuasan pelajar kursus teknologi pendidikan Universiti Utara Malaysia.			√
55	7,12	A proposal of the implementation of Bluetooth in online examinations in universities.			√
56	1,3,7,8,12	Pendekatan pembelajaran misteri dalam pembangunan sesebuah perisian kursus e-pembelajaran animasi.		√	
57	3,7	Tahap kepuasan pelajar terhadap penggunaan sistem e-pembelajaran berasaskan sumber terbuka di Universiti Teknologi Malaysia.			√
58	7,10	Effectiveness of on-line system for the conduct on an engineering final year project.			√
59	7,14	Analysis: First step in designing technology supported learning environment to enhance generic skills of student teachers.		√	
60	6,7	Pengaplikasian pembelajaran kolaboratif dalam sistem pembelajaran e-pembelajaran bagi mata pelajaran Bahasa Gubahan (SPM 2322) di Fakulti Pendidikan, Universiti Teknologi Malaysia.			√
61	3,7,11,12	Teknologi instruktif dalam penyebaran pengetahuan teknologi remote sensing dalam sistem pendidikan jarak jauh.			√
62	7,13	A perspective evaluation of ESL web sites in KUIIM.			√
63	3,7,12	Pengalaman dengan pelaksanaan program sarjana dalam talian.		√	
64	7,9,10,12	On-line skill based assessment of network technology course using simulation techniques.		√	
65	4,7	Remote laboratory implementation model: A comparative study.			√
66	7,12,14	Online radio station for education institutions: A practical approach for existing network architecture.			√
67	7,15,18	Designing the template of e-learning for multimedia course.	√		
68	7,8	Pembangunan aplikasi multimedia untuk pengajaran dan pembelajaran dalam bidang kejuruteraan awam.	√		
69	7	Emerging technology for education: Adopting web 2.0 for educational purpose.			√
70	3,7,11,12	Academic support system (Assist): Virtual teaching aids.			√
71	7,14,18	Web/PSS - Sistem pengurusan disiplin pelajar berdasarkan pembelajaran dewasa.		√	
72	1,7,11,13	Membangun dan menguji koswer animasi berdasarkan prinsip animasi Weir & Heaps.	√		
73	7,10,11	Kestabilan rangkaian komputer dalam proses pembelajaran e-learning: Kajian kes.		√	
74	7,10,11,12	IIR digital filter design package using MATLAB.	√		
75	1,7	Are we "lost"? Learning using open-source tools: A case study in Universiti Malaya.			√

76	7,10,13	Ways of developing students' vocabulary using the internet: A case study of the department of Arabic language & literature, International Islamic University Malaysia (IIUM).		√	
77	1,7,13	Pembelajaran berasaskan kecerdasan pelbagai (PBKP) melalui web: Analisis persepsi pelajar.		√	
78	1,7,10	Pembelajaran berasaskan inkuiri (Pbi) melalui web: Mengkaji persepsi pelajar terhadap pendekatan Pbi.		√	
79	2,7,8	Analisis persepsi pelajar terhadap aktiviti pembelajaran dalam pengendalian kursus tmk 200 – Sifat-sifat fizikal makanan melalui sistem pengurusan pembelajaran (Spp).			√
80	7,14,18	Pembangunan cerita multimedia "Streaming Video" untuk murid-murid bermasalah pendengaran... lebih mudah, cepat dan canggih!	√		
81	7,9,11,12,13	The needs and wants of adult learners in e-learning design.			√
43			10	14	20
		META 2005 Title	CBT	WBT	TEL
82	1,7	Constructivist animation for conceptual change: An effective instructional strategy in understanding complex, abstract and dynamic science concepts.	√		
83	7,10,11	Sistem sokongan keputusan pengukuran prestasi pensyarah berasaskan metrik.	√		
84	6,7,9,10	Online newspaper: An alternative approach of knowledge acquisition.		√	
85	4,7,10,11,17	The influence of demographic factors on business simulation effectiveness.	√		
86	6,7,10,11	Students' value and business simulation performance.	√		
87	1,7,12,17	Sumber terbuka dan e-pembelajaran: Pengalaman Fakulti Teknologi Maklumat dan Komunikasi, Universiti Pendidikan Sultan Idris.			√
88	7,12,17	Kesediaan media pengajaran kepada penggunaannya dan nilai pembelajaran pelajar.	√		
89	9,7,10	A study on multiple contexts in a context-aware application to support ubiquitous learning environment.			√
90	1,5,12	Reka bentuk laman web berasaskan taksonomi Simpson bagi tajuk kemahiran mendirisiap alat ukur teodolit untuk mata pelajaran teknikal.		√	
91	6,7,9,10,11	Enhancement of understanding in mathematics using CD interactive-collaborative model.	√		
92	7,8	Gaya pembelajaran visual pelajar teknikal menenusi pembangunan koswar berorientasikan grafik dan animasi.	√		
93	7,8,12	Aplikasi e-pembelajaran pengajaran dan pembelajaran di Universiti Kebangsaan Malaysia, Malaysia.	√		
94	1,3,4,7,12	Development of an adaptive hypermedia learning system.		√	
95	1,3,7,14	ICT infrastrucur development for multimedia conferencing in distance education.			√
96	1,7,8	Designing of a web-based smart editor for the learning of computer programming.			√
97	7,10,12	Pembelajaran berbantu komputer: Aras penguasaan kemahiran pelajar dalam penyelesaian masalah.	√		
98	7,9,14	Persekitaran pembangunan bersepadu pintar (SmartIDE) bagi bahasa pengaturcaraan C tahap permulaan berasaskan web.		√	
99	3,7,16	The use of e-group as support tool during practicum: A case study of PKPG teachers.			√
100	4,6,7,13,14	Perkongsian maklumat atas talian melalui portal e-komuniti kumpulan kecenderungan kepintaran buatan (KKKB).	√	√	
19			9	5	5

1. For METC 2005 articles, see [13]
2. For METC 2006 articles, see [14]
3. For METC 2007 articles, see [15]
4. For METC 2008 articles, see [16]



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