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Effective E-Learning Multimedia Material in Distance Education: The Students/Learners Perception

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Abstract

This article discusses the development towards an effective and desirable e-learning multimedia material in distance education from the learners' perspectives. The advance of technologies and associated methodologies in teaching and learning using network and/or multimedia technologies are dynamic and generate challenges for achieving the most effective and desirable e-learning material. Furthermore, the introduction of information and learning technologies (ILTs) into the learning process and the shift in approach in learning from a traditional approach such as Gagnes' instructivist to Kellers' constructivist approach makes the dispute even greater especially when applied to distance learning or online learning environment. The analysis for this study was based upon quantitative data from questionnaires modified from Keller's ARCS (Attention, Relevance, Confidence, Satisfaction) Model of Motivation study. Data was collected from a survey among distance education students during 2008/2009 Academic Session who enrolled in courses provided with additional multimedia material to complement existing course materials. Based on the data analysis, several factors related to the construction, strategies and content design elements were recommended to develop as effective e-learning multimedia material. These factors include accommodating materials that are relevant to students' experience and knowledge, control attention, confidence and satisfaction.

Keywords: Perception, learner, multimedia material, e-learning effective

Abstrak

Artikel ini membincangkan pembangunan bahan multimedia e-pembelajaran yang efektif dan beraspirasi untuk pendidikan jarak jauh berdasarkan perspektif pelajar. Kemajuan teknologi dan metodologi berkaitan pengajaran dan pembelajaran yang menggunakan jaringan dan teknologi multimedia sangat dinamik lantas mencabar pembentukan bahan e-pembelajaran yang lebih efektif. Hal ini didorong lagi dengan pengenalan terhadap teknologi maklumat dan pembelajaran dalam proses pembelajaran serta perubahan pendekatan pembelajaran daripada pendekatan tradisional seperti pendekatan Instruktif Gagne kepada pendekatan Konstruktif Keller yang menyebabkan tuntutan ini semakin hebat terutama apabila diaplikasikan pada pendidikan secara jarak jauh atau persekitaran pembelajaran atas talian. Analisa kajian ini berasaskan data kuantitatif yang mengguna pakai soal selidik yang diubahsuai dari Model Motivasi Keller. Data kajian telah dikumpul daripada pelajar pendidikan jarak jauh sidang akademik 2008/2009 yang mendaftar dalam kursus-kursus yang menyediakan bahan tambahan multimedia sebagai pelengkap bahan kursus sedia ada. Berasaskan dapatan kajian, beberapa faktor berkaitan elemen pembinaan, strategi dan rekabentuk kandungan disyorkan dalam membangunkan bahan multimedia e-pembelajaran yang efektif untuk pendidikan secara jarak jauh. Faktor-faktor ini merangkumi penyediaan bahan yang bersesuaian dengan pengalaman dan pengetahuan pelajar, dapat mengawal perhatian, menambah keyakinan dan mendatangkan kepuasan kepada pelajar.

Kata kunci: Persepsi, pelajar, bahan multimedia, e-pembelajaran, berkesan

Introduction

Distance education is becoming an essential and even preferred method of instructional delivery for many educational institutions world wide today. The use of e-learning is increasingly accepted due to the system's advantages such as time and cost saving. It also has the ability to handle variety student needs and applicable to different student's approach, capability and capacity in learning process. Teaching and learning via distance education are far more challenging than traditional face to face method. Both online learning and e-learning are components of distance education, where students and faculty may be at a different location, and at

a different time phase. However, technology advances especially with the introduction of information and learning technologies (ILTs), have empowered individuals and facilitate a more active role in the educational process. It enables a person to have access to never-ending quantities of information and knowledge. E-learning has the power to transform the way we learn, and to bring high quality accessible learning to everyone—so that every learner can achieve his or her full potential.

There are three key sectors of the e-learning industry, identified as the developments of content, technologies and services (Nagy, 2005). Among these sectors, Noorhuzaimi@Karimah et al. (2006) and Selim (2005) have found that technologies such as computer network concentration and stability, and related technology which covered broadband, hardware credibility, network security and facility accessibility are among the important factors in e-learning to be implemented successfully. On the other hand, Rosenberg (2000), Baharuddin, Rio and Manimegalai (2002), Mohamed Ally (2004), Yusup and Razmah (2005) and Reginamary et al. (2005), have all agreed that development of the material, especially the elements and content design play the most important role in order for e-learning to achieve its objective. It is because, even though a nicer material presented or sophisticated material technology was utilized and produced, if the material was not based on pedagogy and suitable instructional design principle, then the e-learning multimedia material will not have a high value, furthermore would not achieve appropriate quality and therefore could not increase learning. As a result it will be an ineffective course material for e-learning students. The insufficiency in constructive, instructive and comprehensive design material element in learning and teaching process are very perceptible in recent and available e-learning material. It is because technology and sophistication innovation caused many material developers to only load an interactive and multimedia element without taking into account that no skill and knowledge have been acquired by the learners (Yusup and Razmah, 2005). Consequently, Dabbagh (2005) conclude that, the three key components working collectively to foster meaningful learning and interaction are pedagogical models or constructs, instructional and learning strategies, and pedagogical tools or online learning technologies such as Internet and Web-based technologies.

In view of these issues, this article discusses the development towards an effective and desirable e-learning multimedia material in distance education from learners' perspectives. This study attempts to identify some of the important elements to be incorporated while developing learning and teaching materials in e-learning. Focus will be on the element and content design that require systematic and integrated change to accommodate recent development and existing situation.

Traditional Approaches in Developing E-Learning Materials

Teaching and learning via distance education (DE) is far more challenging than traditional face to face method due to the nature of the DE system that separated students and teacher physically. The success of the applications of e-learning depends on many factors whereby information and communication technology (ICT) has been of great help in enhancing the development of e-learning. Among other factors is the quality of instruction that is given through distance learning programs. According to Valentine (2002), much of the quality of instruction depends on the attitude of the instructor when using ICT in the design and delivery of courses. Too often instructors do not design their lessons to take advantage of the technology presented. On the other hand, Rosenberg (2000), Baharuddin, Rio and Manimegalai (2002), Mohamed Ally (2004), Yusuf and Razmah (2005) and Reginamary et al. (2005) stated that advancement in technology does not necessarily lead to effective distance education. What matters is a comprehensive pedagogical and instructional design in preparing the course materials and delivery that play a crucial role. Due to advancement in ICT, the delivery of content is viable via all electronic media, including the Internet, satellite broadcast, audio/video tape, interactive TV, and CD-ROM. It is broader than the term online learning which generally refers to purely web-based learning. An online learning program, being a subset of e-learning, includes the text and graphics of the course, exercises, animations, simulations, audio and video sequences, peer and expert discussion groups, online mentoring and links to material on the Web (Backroad Connections, 2003). The development of e-learning multimedia material suitable for delivery via any media must comprehend certain standards and guidelines. An ideal multimedia production team should consist of instructional designers, graphic designers and programmers whom are well versed in programming languages (Davis,

2005). In addition, softwares such as Adobe Photoshop, Picture Publisher, CorelDraw, Macromedia Extreme 3D, Autodesk 3D Studio Max and Adobe Premiere are required in the production of multimedia coursewares (Rozinah, 2003).

Despite problems with hardware and software in developing the e-learning multimedia material, the approaches to teaching and learning in DE should also integrate instructional strategies that focus on learner-centred base instead of the teacher-centred base. The nature of DE physical systems, which separates the students from the lecturer and other students, will lead learners to be self-directed. It also allows learners to learn at a time, place and pace that is suitable and appropriate to them. Thus, approaches integrated in DE and e-learning material shall move accordingly, for example, from an instructivist approach to a constructivist approach.

According to Reeves and Reeves (1997), the traditional approach to designing and delivering instruction, sometimes referred as the objectivist approach or the instructivist approach views learners as passive recipients of instruction. They are treated as empty vessels to be filled with learning. Therefore, this approach emphasises the importance of objectives that exist, apart from learners. It provides objectives that are sequenced into teaching and learning hierarchies which start from the lower to the higher order of learning. It's direct instructions are designed to address each of the objectives in sequence.

Constructivist Approaches in Developing E-Learning Materials

A constructivist approach stresses on the superiority of the learner's strategies. As stated by Keller (2004), constructivism is context dependent rather than content dependent and focuses not on the content or its objectives, but on the diverseness and richness of the learning environment. Thus, in this approach the learners construct different cognitive structures based upon their previous knowledge and experiences. As a result, the learning environment is diverse, affluent and feasible. This approach shows that direct instructions should be replaced, and the task and solving of problems can be accomplished with personal relevance. On the other hand, knowing the e-learning students' wants and needs, competencies, personal characteristics, reasons for participating in

learning and barriers they face, are the important keys in order to engage students effectively in online learning (Abu Daud, Daing Zaidah and Bahaman, 2001). According to Brandon (2004), constructivism is about how individuals create meaning and knowledge, by extending and modifying current personal knowledge and skills. Active learning, cooperative learning and collaborative learning are some of the different learning techniques engaged by constructivist approaches to ensure student's participation in the learning process. Examples of instructional strategies that embody the characteristics of pedagogical models grounded in the situated cognition and constructivist views suggested by Dabbagh (2005) include:

1. Promoting or supporting authentic learning activities.
2. Facilitating problem-solving, exploration, and hypothesis generation.
3. Promoting collaboration and social negotiation.
4. Supporting or facilitating role-playing activities.
5. Promoting articulation and reflection.
6. Supporting multiple perspectives.
7. Supporting modeling and explaining.
8. Providing scaffolding.

According to Brandon (2004), Constructivist Learning Environments (CLE) is a framework that provides a supportive, safe, motivating environment in which learners can solve problems, interact with others, and assess their learning. Within a CLE, a designer can provide any resources the learners may need, from problem-based or case-based experiences to micro worlds and virtual realities. Table 1, summarizes the five interdependent attributes which will lead to an effective, desirable and meaningful learning material with the use of recent and advance technology (Brandon, 2004).

Table 1 Attributes in effective learning

Attributes	Elements	Technology
Active and manipulative	Learners are engaged in mindful processing of information, interactions and explorations with learning materials and provide opportunities for them to observe the results of their manipulations. They are responsible for the result when they manipulate objects and parameters of the environment they are working in.	Web Quests, Office-type applications
Constructive and reflective	Learners integrate new ideas with prior knowledge in order to make sense or meaning. It enables learning through reflection. Learners articulate what they have accomplished and reflect on their activity and observations; they construct increasingly complex mental models.	Web logs, mind maps, concepts maps
Intentional	It provides opportunities for students to articulate their learning goals and monitor their progress in achieving them. When learners are actively and wilfully trying to achieve a cognitive goal, they think and learn more because they are fulfilling an intention. Technology should help learners articulate their learning goals, and then support them.	Web logs, WebQuests, concepts maps, mind maps
Authentic, challenging and real-world (or simulated)	Learning tasks that are situated in meaningful real-world tasks or simulated in a case-based or problem based learning environment are better understood and more consistently transferred to new situations. It facilitates better understanding and transfer of learning to new situations. Technology should support learners in solving complex and ill-structured problems as well as simple and well-structured problems.	Office-type applications, hypermedia

Continued on next page

Table 1 (*continued*)

Attributes	Elements	Technology
Cooperative, collaborative and conversational	Collaboration requires conservation, and technology can support this at any scale. Cooperation and collaboration are the most difficult attributes to support, especially if learning is evaluated on an individual basis. Providing students with opportunities to interact with each other to clarify and share idea, to seek assistance, to negotiate problems and discuss solutions.	Wikis, community systems, hypermedia, content maps, course maps.

Source: Brandon, 2004.

Objective of the Study

The main objective of the study is to describe students' perceptions, in developing the effective and desirable elements, and content design in e-learning multimedia materials.

The specific objectives are:

1. To analyze students' perception towards e-learning multimedia materials that control and attract their attention while learning.
2. To determine students' perception towards e-learning multimedia materials relevance to experience and knowledge.
3. To determine students' perception towards e-learning multimedia materials that develop confidence in their learning.
4. To determine students' satisfaction towards e-learning multimedia materials developed to supplement their learning materials.

Methodology

Universiti Sains Malaysia (USM) being the pioneer institution in distance education in Malaysia has gone through tremendous evolution. It began in 1971 as an off-campus program, offering Arts and Social Sciences programs, followed by Sciences program in 1973. Information and communication technology (ICT) has been of great help in enhancing the development of e-learning materials for the students of the School of

Distance Education (SDE), USM. It has been very encouraging when SDE puts into practice the Learning Management System (LMS) in accommodating its blended learning system in teaching and learning process. In addition to guided self-study modules which is a major course material, additional materials especially in the forms of multimedia are always welcomed in keeping the distance learners engaged in e-learning. Thus, many lecturers in SDE from various disciplines were and are active in developing e-learning multimedia materials for their students.

In this study we employed a quantitative data analysis. A questionnaire, using five Likerts Scale measurements was constructed based on the constructivist approach and modified from Keller's ARCS Model of Motivation study. Majority of the items questioned relate to developing effective learning such as attracting and controlling students' attention, application to students' experience and knowledge, developing confidence and providing satisfaction. The questionnaires were distributed to students who attended Basic Mathematics (JIM 105) and Business Research Methods (JTP 201) which have additional e-learning multimedia materials provided by their lecturers (see Figures 1 and 2). A total of 110 questionnaires were completed and returned to the researchers during the intensive programme in the 2008/2009 Academic Session. Each of the multimedia material was developed using Articulate Program identified as the easiest, fastest and cheapest way in developing e-learning multimedia materials (Hasmawati et al., 2008). The materials were provided in their e-portal for access prior to the opening of the Academic Session. Therefore, the students will have seen and gone through the materials ahead of time. Reliability test statistics showed that the Cronbach's Alpha value for the 21 items in the questionnaire is 0.940.

Figure 1 Material for JTP 201

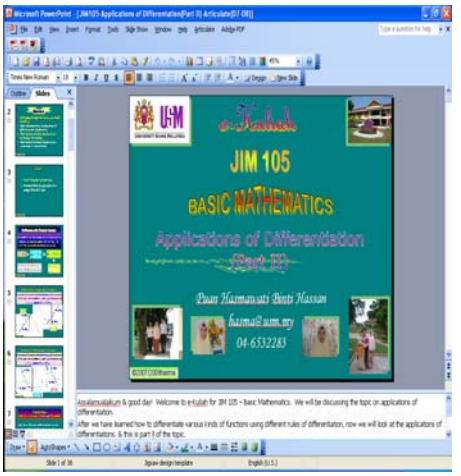

Figure 2 Material for JIM 105

Results and Discussion

Based on the 110 questionnaires received, 74 attended the Business Research Methods (JTP 201) course while 36 students were from the Basic Mathematics (JIM 105) course.

Table 2 shows the results of the reliability of the items in the questionnaires constructed whereby the Alpha values for reliability was more than 0.7 for all dimensions. The overall Alpha value was more than 0.8 and it is clear that the items in the questionnaire has internal consistency and is reliable. However, the reliability statistics only accepted 106 cases and excluded 4 cases which were deleted based on all variables in the procedure such as a missing value.

Table 2 Reliability of questionnaire

Dimensions	N	No. of items	Alpha
Attention	110	5	0.832
Relevance	107	7	0.867
Confidence	108	4	0.893
Satisfaction	109	5	0.899
Total	106	21	0.940

Demographic information revealed that the respondents comprised of 31 males and 79 females. Fifty-six of them are married, 51 unmarried and others are divorced.

Student Perceptions on E-Learning Multimedia Materials

Table 3 shows the mean value and standard deviation of students' perception on each strategy applied in the development of the e-learning multimedia material provided. The mean value for all strategies recorded values of more than 3.5. This indicates that the strategies applied in both the e-learning multimedia materials provided for the courses received a higher perception from the students. The confidence strategies recorded the highest overall mean of 3.96. This shows that this strategy does play a significant contribution in boosting the learners' understanding of the related subjects.

Table 3 Students perceptions on strategies applied

Item strategies	Mean	Standard deviation
Attentions	3.5127	0.5914
Relevance	3.5955	0.6278
Confidence	3.9606	0.7348
Satisfaction	3.6312	0.7207

Table 4 shows the students' course perceptions on the strategies applied according to course. The mean value for all strategies recorded figures of more than 3.0 and confidence strategies for JIM105 course recorded the highest mean value of 4.09. This indicates that the strategies applied in both of the e-learning multimedia material provided for the courses are significant in contributing to an effective e-learning multimedia material.

Table 4 Students' perceptions on strategies applied according to course

Item strategies	Course (N)	Mean	Standard deviation
Attentions	JIM 105 (36)	3.7778	0.4505
	JTP 201 (74)	3.3838	0.6111
Relevance	JIM 105 (35)	3.7673	0.6701
	JTP 201 (72)	3.5119	0.5930
Confidence	JIM 105 (34)	4.0956	0.46878
	JTP 201 (74)	3.8986	0.8244
Satisfaction	JIM 105 (35)	3.7486	0.53653
	JTP 201 (74)	3.5757	0.7903

Effectiveness of the Strategies Applied

Statistical analysis in this section represents the perception of students or learners in DE regarding the effectiveness of the specific items in the strategies applied in the e-learning multimedia material provided to them. These specific items such as the attention strategies, the relevance strategies, the confidence strategies and the satisfaction strategies are considered to have an important role in making the most effective learning material.

Table 5 shows the specific items in attention strategies that received the mean value of more than 3.0. This indicates that the overall attention strategies applied in both of the e-learning multimedia material provided for the courses received a positive perception. However, there are 4 specific items in this attention strategy that should be improved. These items show that less than 50% of the students in both of the courses agreed and strongly agreed that the material was not effective enough to attract the students' attentions during the learning process. Some of the feedbacks for JTP 201 stated that the low volume, lack of illustrations or visuals and inconsistency in design elements were the key problems. While for JIM105, too many colours, unsystematic listing and crowded background could distract students' attention from its main objectives.

Table 5 Effectiveness of the attention strategies

Specific items	Courses	Disagree and very disagree	Neutral	Agree and very agree	Mean
This material immediately attracts my attention when presented	JIM105	0.0%	27.8%	72.2%	3.80
	JTP201	9.5%	44.6%	45.9%	3.38
Interesting presentation table of contents by various media	JIM105	0.0%	36.1%	63.9%	3.80
	JTP210	9.5%	36.5%	54.1%	3.50
This material intrigues me to continue and focus on in this subject	JIM105	0.0 %	13.9%	86.1%	4.00
	JTP201	9.5%	43.2%	47.3%	3.42
This material has unexpected elements	JIM105	8.3%	47.2%	44.4%	3.36
	JTP201	16.3%	47.3%	36.5%	3.22
This material has various examples to demonstrate concept / formula	JIM105	2.8%	19.4%	77.8%	3.92
	JTP201	16.3%	33.8%	50.0%	3.41

Table 6 shows seven specific items that can be used to recognize the effectiveness of the relevance strategies in developing e-learning multimedia materials. Four items recorded mean values of more than 3.75. This indicated that these items such as the objectives of the material, and relevance of content and information provided were effective, significant and efficient in helping the students in their studies. On the other hand, items related to learner's previous experience, knowledge and expertise showed opposite feedbacks. The development of e-learning multimedia material should therefore put more emphasis in these relevance strategies to make it more effective and desirable.

Table 6 Effectiveness of the relevance strategies

Specific items	Courses	Disagree and very disagree	Neutral	Agree and very agree	Mean
This material associates with my field	JIM105	11.4%	20.0%	68.6 %	3.78
	JTP201	2.8%	17.8%	79.5 %	4.00
This material provides what I want to learn about this subject	JIM105	0.0%	14.3%	85.7%	4.11
	JTP201	5.4%	21.9%	72.6%	3.82
Learning objective is presented at the beginning of the presentation	JIM105	0.0%	20.0%	80.0%	3.97
	JTP201	4.1%	27.4%	68.5%	3.76
Learning objective is clear	JIM105	0.0%	8.6%	91.4%	4.11
	JTP210	5.4%	20.5%	74.0%	3.79
This material is related to my previous expertise	JIM105	11.4%	25.7%	62.8%	3.51
	JTP201	18.0%	52.8%	29.2%	3.04
This material related to my previous experience	JIM105	14.3%	28.6 %	57.2%	3.43
	JTP201	20.5%	52.1%	27.4%	3.00
This material related to my previous knowledge	JIM105	14.3%	25.7%	60.0%	3.46
	JTP201	13.7%	52.1%	34.2%	3.20

Table 7 shows that e-learning material for JIM105 has recorded mean values of more than 4.00. This could be due to the effectiveness of the material developed which incorporated all items required to introduce confidence in the student's learning process. A feedback stated that the examples used to demonstrate the concepts were useful and were explained clearly to stimulate learning. Besides that it also increases students' confidence in pursuing the mathematical steps until the solution is achieved or until the end of the subject discussed. The material for JTP201 also recorded positive feedbacks because it includes diagrams, subtopic titles and is clearly applicable to boost student's confident on the subject.

Table 7 Effectiveness of the confidence strategies

Specific items	Courses	Disagree and very disagree	Neutral	Agree and very agree	Mean
I have a chance to revise this material anytime	JIM105	2.8%	8.6%	88.6%	4.15
	JTP201	8.2%	16.2%	75.6%	4.05
This material has elements/activities that can measure my comprehension	JIM105	0.0%	8.9%	91.1%	4.09
	JTP210	12.2%	17.6%	70.2%	3.77
This material increases my comprehension of this subject	JIM105	0.0%	8.6%	91.4%	4.03
	JTP201	5.4%	20.3%	74.3%	3.86
This material increases my knowledge in this subject	JIM105	0.0%	8.6%	91.4%	4.12
	JTP201	4.0%	20.3%	75.7%	3.91

Table 8 indicates the specific items in the satisfaction strategies to be incorporated in developing effective e-learning multimedia materials. The results showed that more than 50% of the students in both courses agreed and strongly agreed that the materials provided to them did provide satisfaction in their learning process. All of the specific items in this strategy received the mean value of more than 3.0.

Table 8 Effectiveness of the satisfaction strategies

Specific items	Courses	Disagree and very disagree	Neutral	Agree and very agree	Mean
Knowledge from this material can be applied to a real situation	JIM105	2.8%	28.6%	68.6%	3.74
	JTP201	6.8%	32.4%	60.8%	3.70
This material strengthen my knowledge is in this subject	JIM105	0.0%	20.0%	80.0%	3.97
	JTP210	9.4%	25.7%	64.9%	3.64
This material motivates me to continue learning	JIM105	2.8%	14.3%	82.9%	4.0
	JTP201	10.8%	18.9%	70.3%	3.70
This material is enough for the discussed topic	JIM105	14.3%	25.7%	60.0%	3.49
	JTP201	12.2%	32.4%	55.4%	3.47
This material is enough to meet my learning needs	JIM105	11.4%	25.7%	62.9%	3.54
	JTP201	16.2%	33.8%	50.0%	3.36

In conclusion, there are four strategies in Keller's motivation model which serve as important roles in developing an effective and desirable e-learning multimedia material. Each has its own elements and criteria to be integrated so that the end product will achieve the targeted objective.

Concluding Remarks

The nature, coverage, style of explanation, and methodology used in developing e-learning multimedia materials vary from one subject to another. However incorporating the strategies suggested by Keller as one of the constructivist approaches, would make the e-learning multimedia materials more attractive, effective and desirable for students in an e-learning environment. The constructivist approach requires application of several strategies such as attention, relevance, confidence and satisfaction strategies to make the learning process more meaningful and achieving the objective of the materials. Application of these strategies with the use of recent and advanced technology will certainly provide a supportive, safe and motivating environment. Subsequently, this environment will lead the e-learners especially in the distance education learning system to solve

problems, interact with others, and assess their learning effectively and efficiently.

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References

Abu Daud Silong, Daing Zaidah Ibrahim and Bahaman Abu Samah. 2001. Practices that facilitate learner control in an online learning environment. *Malaysian Journal of Distance Education* 3(2): 75–101.

Baharuddin Aris, Rio Sumarni Shariffudin and Manimegalai Subramaniam. 2002. *Reka bentuk perisian multimedia*. Skudai: Universiti Teknologi Malaysia.

Backroad Connections. 2003. *Definitions of key terms used in e-learning* (Version 1.00). Australian Flexible Learning Framework Quick Guide Series, Australian National Training Authority. http://flexiblelearning.net.au/guides/keyterms.pdf/ (accessed 20 October 2008).

Brandon. 2004. *Applying instructional systems processes to constructivist learning environments.* http://www.elearningguild.com/pdf/2/062904DES.pdf/ (accessed 12 August 2008).

Dabbagh, N. 2005. Pedagogical models for E-Learning: A theory-based design framework. *International Journal of Technology in Teaching and Learning* 1(1): 25–44.

Davis, L. 2005. Articulate presenter: Plan, package and publish powerpoint presentations for e-Learning. *The e-Learning Developers' Journal* http://www.elearningguild.com/ (accessed 20 October 2008).

Hasmawati, H., Zuraini, Z., Norziani, D., Wan Asna, W. N. and Fatimah, H. 2008. Creating rapid e-learning materials the easy way in CD-Proceeding for Amazing e-Learning II, Suan Dusit Rajabhat University, Bangkok, Thailand.

Keller, J. M. 2004. *Instructional technology global resources network.* http://www.ittheory.com/keller1.htm/ (accessed 18 October 2008).

Mohamed Ally. 2004. Foundations of educational theory for online learning. In *Theory and practice of online learning*, eds. T. Anderson and Fathi Elloumi. cde.athabascau.ca/online_book/ (accessed 20 September 2006).

Nagy, A. 2005. The impact of e-Learning. In E-Content: Technologies and perspectives for the European market, eds. P. A. Bruck, A. Buchholz, Z. Karssen and A. Zerfass, 79–96. Berlin: Springer-Verlag.

Noorhuzaimi@Karimah Mohd Noor, Suryanti Awang, Mohd Ariff Ameedeen, Jasni M. Zain and Mazlina Abdul Majid. 2006. Kestabilan rangkaian komputer dalam proses pembelajaran e-learning: kajian kes. In *Prosiding konvensyen teknologi*

pendidikan ke-19 (jilid 2): Reka bentuk, pembangunan, penggunaan dan penilaian teknologi instruksional, eds. Hanafi Atan et al. Persatuan Teknologi Pendidikan Malaysia (PTPM).

Reginamary, M., T. Kayalvily, N. Sarasvathi and N. Mohona Narasimha. 2005. Instructional design consideration for e-learning content. CD-Proceeding International Symposium On E-Learning 2005 (ISEL2005), Universiti Malaysia Sabah, Kota Kinabalu Sabah.

Reeves, T. C. and P. M. Reeves. 1997. Effective dimensions of interactive learning on the WWW. In *Web based instructions*, ed. B. H. Khan, 19–27. Englewood Cliffs, New Jersey: Educational Technology Publication.

Rosenberg, M. J. 2000. *E-Learning*. New York: McGraw-Hill.

Rozinah Jamaludin. 2003. *Teknologi pengajaran (instructional technology)*. Kuala Lumpur: Universiti Sains Malaysia and Utusan Publications & Distributors Sdn. Bhd.

Selim, H. M. 2005. Critical success factors for e-learning acceptance: Confirmatory factor models. *Computer and Education* 45(1): 35–37. www.elsevier.com/ (accessed 20 September 2006).

Valentine, D. 2002. Distance learning: Promises, problems and possibilities. *Online Journal of Distance Learning Administration*, V(III). Distance Education Center, State University of West Georgia. http://www.westga.edu/ ~distance/ojdla/fall53/valantine53.html/ (accessed 07 October 2008).

Yusup Hashim and Razmah Man. 2005. Do you need instructional design to produce multimedia learning materials? CD-Proceeding Seminar Kebangsaan ICT Pendidikan 2005 (Ict@Edu 2005). Fakulti Teknologi Maklumat dan Komunikasi, UPSI.