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Evaluation of an Open-Source Web-Based Learning Environment (Future Learning Environment - Fle3)

MSc in Interactive Multimedia (IMM)
Dissertation (2001/2002)
by

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Abstract

The title of this dissertation: 'An evaluation of an Open-Source Web-Based Learning Environment (Fle3)- Future Learning Environment', describes a study which explored students' responses and reactions to web-based learning environment in supporting the student-centred and collaborative approach. The Future Learning Environment is design to produce an Internet-accessible applications to support learning and thinking, producing web-based multimedia learning material concerned with New Media, and developing the publishing process of network-based multimedia learning material. The study was using the latest version of Fle3 which is more specific as a server software for supporting computer supported collaborative learning (CSCL). The study was undertaken among undergraduate students in Sultan Idris, University of Education, Malaysia (UPSI) and postgraduate students at Department of Computing and Electrical Engineering (CEE), Heriot Watt University. The finding revealed that while the majority of the students saw valued to be gained from learning in a student-centred and collaborative setting, many expressed a preference for learning in more conventional teacher-directed forms. The study also sought to explore the potential of the environment to develop problem-solving skills and to determine factors, which impeded students' success and achievement.

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My greatest acknowledge is for my beloved husband (Zaidi Ibrahim), who always be by my side and never give up to give me all the spiritual and moral support I need.

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CHAPTER 1 : Introduction to Virtual Learning Environment and Collaborative Learning

1.0 Introduction

Virtual Learning Environment application are commonly used in the world as part of the media that help to conduct courses material, assessment, tracking student performance and etc, and widely used in the 'Online learning environment'. Virtual learning environments (VLEs) are a relatively new development in the provision of online learning. Initially, VLEs were developed for distance learning, providing alternatives to traditional teaching situations such as seminars and tutorials by using email and other communication software to support student-tutor and student-student interaction, and providing access to course materials over the Web. Practitioners soon realised that these tools could also support a traditional, campus-based course and not only are specifically used for the online learning environment. A bigger number of students in a particular courses and limited lecture hall or classroom in university campus, were one of the reasons that contribute to the used of VLE in campus-based learning environment. However, there are lots types of VLE that been offer by many difference companies or developed by the universities and each of them offer variety of tools that suit different needs. As a user, we need to look at each area that really suits the environment where they are going to be used it.

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1.1 What is Virtual Learning Environment?

The Virtual Learning Environment term was described as software, which resides on a server and integrated solution to managing online learning, providing a delivery mechanism, student tracking, assessment and access to resources [1]. Where by the server software either provided by the vendor or home based development are either sits behind an existing web server or includes its own web server in the package. At a minimum level the server are usually capable of creating and serving up dynamic html pages, will allow messages to be posted up to conferences or a web notice-board and will maintain a database of information relating to users, groups, learning materials and course structure.

Types of Virtual Learning Environment:

- Material-centred
- Learner-centred
- Collaboration-centred

1.1.1 Material-centred VLEs

In this type of VLE, all the learning materials are intends to put and place at the centre of the system. There are sets of tools provided as the learner progression, which can be used through out the learning material. The delivery, transmission and accessibility of the learning material were been developed by this system centrally.

---

[1] ***By Colin Milligan***, Delivering Staff and Professional Development Using Virtual Learning Environments, Institute for Computer Based Learning, Heriot-Watt University.

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Examples of such commercial packages include:

- WebCT (http://www.webct.com/)
- TopClass (http://www.wbtsystems.com)
- Lotus Learning Space (http://www.lotus.com/)

1.1.2 Learner-centred VLEs

This type of VLE is using a learner centred approach. The set of tools provided in this VLE, allow the learner to construct around themselves in an environment for effective learning, by collecting together and constructing a set of resources relevant to the way in which they have understood the learning material.

Examples of this type of VLE include

- COSE (http://cose-www.staffs.ac.uk/)
- Learning Landscapes (http://toomol.bangor.ac.uk/ll/)

1.1.3 Collaboration-centred VLEs

An extension of this learner centred model can be found in environments, which support collaborative learning. Collaboration may be synchronous (through the use of video conferencing, audio communication or white boards) or it may be asynchronous (through the provision of shared workspaces).

An example of this type of VLE is CoMentor (http://comentor.hud.ac.uk/).

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1.2 Collaborative Learning Approach

Collaborative Learning encourages active student participation in the learning process. It encompasses a set of approaches to education, sometimes also called co-operative learning or small group learning. It creates an environment "that involves students in doing things and thinking about the things they are doing",[2] and reaches students who otherwise might not be engaged.

A lot of discussions on beneficial of collaborative learning have been done and they argue that it promotes active learning, critical thinking, conceptual understanding, long-term retention of material and high levels of student satisfaction. All-collaborative learning experiences is a distinctive set of assumptions about what teaching is, what learning is, and what the nature of knowledge is which knowledge is created through interaction, not transferred from teacher to student.

In computer supported collaborative learning, the traditional role of the teacher as information deliverer is changed to a role of facilitator and co-learner. What this means is it can facilitate collaboration between students, encouraging them to monitor their understanding (without directly giving them information), communicating with them and carefully examining knowledge produced by the students. This can help students to understand the information as part of learning experience.

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[2] *Bonwell, C., & Eison*, J. (1991). Active learning: Creating excitement in the classroom (ASHE-ERIC Higher Education Report No. 1). Washington, DC: George Washington University, p. 2.

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1.2.1. Effectiveness in collaborative learning approach[3]

1.2.1.1.Group Composition :

The first factor that contributes to the efficiency of collaborative learning is the composition of the group. This can be defined by several variables such as the age and levels of participants, the size of the group, the difference between group members and etc. It was agree that a small groups seems to function more well than large groups. In the large group situation some members would intend to be 'asleep member' or excluded from interesting interactions.[4]

It is easier to maintain and keep track the student performance in smaller group because the tutor or teachers can spend more times concentrate on them. Small group teaching is considered as a situation in which students interact interactively with each other and engage sets of learning goals.[5] Member of the groups can work together to attain shared goals, although individual learning goals will also be important.

1.2.1.2.Task features

Collaboration during group learning may be face-to-face or distant, synchronous or asynchronous and may be discussion-based or focused around shared external tasks or material. In the collaborative learning, there will always be tasks involved. Some tasks are inherently distributed and lead group members to work on their own, independently from each other. Interaction occurs when assembling partial results, but not during each individual's reasoning process. Without interaction, there will be a problem in having the task succeed and done. Some tasks are so straightforward that they do not leave any opportunity for disagreement or misunderstanding. Some tasks do not involve any planning and hence create no need for mutual regulation. Some tasks cannot be shared, because they rely on processes (e.g. perception) which are not open to introspection or on skills (e.g. motor skills) that leave no time for interaction.

When in the distance learning environment, the teachers would want to take these features into account. By using collaborative learning in giving tasks it will get its optimal efficiency. Another solution is to modify the task to make them more suited for collaboration. For instance, the 'jigsaw' method consists of providing group members with partial data. This method artificially turns a monolithic problem into a task, which requires collaboration.

Task features also include the environment in which the task has to be performed. This is especially important in computer-based tasks. The software features may modify interactions among learners. For instance, if a computer-based task provides the learner immediately with a feedback on their actions, it may prevent them to discuss the consequences of their action

---

[3] **Dillenbourg, P. & Schneider, D.** Collaborative learning and the Internet, TECFA (unit of Educational Technology), School of Psychology and Education Sciences, University of Geneva, Switzerland.

[4] **Salomon, G. & Globerson, T.** (1989), When teams do not function the way they ought to. International journal of Educational research., 13 (1), 89-100.

Mulryan, C.M.(1992), Student passivity during co-operative small group in mathematics. Journal of Educational Research., 85 (5), pp. 261-273.

[5] **N.Hammond & C. Bennet,** (2002), ICT to support group-based leaning. Blackwell Science Ltd, journal of Computer Assisted learning,, 18 (1), pp 55-63.

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1.2.1.3.Communication media

Whatever task and group members have been selected, the collaboration may not work because the medium used for communication is not adequate. Basically, most of current widely available Internet-based tools use text-based communication, synchronous or asynchronous, with mostly fixed graphics and images. Voice and video interaction or voice and video mails are of course available, but the overload of standard networks and the limits of currently available hardware have postponed their larger use in current distance education.

The cost of interaction being higher with text, the group members may reduce the number of disambiguating sub-dialogues used in social grounding. At the opposite, in asynchronous text messages, they have more time to build sentences, which are less ambiguous. Without video link, members' also loose facial expressions, which are useful to monitor the partner's understanding. Even with video images, they may see their partner but ignore where the partner looks, something which is important for understanding what she refers to. Some video system support eye contact with appears to be related to meta-cognitive aspects.

1.3 Collaborative Knowledge Building

The process of knowledge building in collaborative learning, first explored by Harasim (1989), involves mutual exploration of issues, mutual examination of arguments, agreements and disagreements, mutual questioning of positions, dynamic interaction and weaving of ideas (Harasim 1989; Kaye 1992; Sorensen 1997). Mason (1993) finds this view to be in agreement with the communicative potential of the online environment, although she also points out the weaknesses of the online dialogue being that it quite often never reaches synthesis or closure (Mason 1993).

In the principles of collaborative learning, the process of learning is viewed to be a fundamentally social phenomenon, regardless of the varying theoretical emphasis in each single approach (Dillenbourg et al. 1995). Several other learning theories confirm this view, e.g. Etienne Wenger in his latest book, "Communities of Practice" (Wenger 2000).

1.3.1 Collaborative Knowledge-Building Communities

The idea of developing this communities it was believed that schools should be restructured as communities which knowledge is constructed as a collective goal (Scarmadia & Bereiter, 1994). The main focus of the activities within these environments is on developing the collective knowledge base of the community and improving the problem-solving expertise of the learners. Bowen et. al, (1992) characterised knowledge-building communities with four traits ;[6]

- A focus on knowledge and the advancement of knowledge rather than tasks and projects.
- A focus on problem solving rather than performance of routines.

[6] **Nancy J. Gilbert & Marcy P. Driscoll,** (2002), Collaborative Knowledge Building: A Case Study. Educational Technology Research & Development (ETR&D),Vol.50,No.1,pp.59-79.

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- Dynamic adaptation in which advances made by members of the learning community change the knowledge conditions requiring other members to readapt, resulting in continual progress.
- Intellectual collaboration as members pool intellectual resources, making it possible for communities to solve larger problems than can individuals or small groups.

1.3.2 Criteria of Collaborative Knowledge Building in Web-Based Learning [7]

In view of the generally recognised difficulties in fostering online student dialogue that converges (e.g., synthesising) rather than diverges (noted by Mason), Stahl (1999) suggests a set of factors that characterise quality in the KB process:

- *Brainstorming* is the introducing of new ideas that relate to the topic or task and offer a perspective not previously considered;
- *Articulating* includes explaining complex or difficult concepts;
- *Reacting* provides an alternative or amplified perspective on a concept previously introduced by a student;
- *Organising* refers to assembling existing thoughts or perspectives in such a way that a new perspective emerges;
- *Analysis* includes comparing or contrasting previously articulated views or puts new understanding on existing data;
- *Generalisation* takes comments or data already presented and extracts new information or knowledge that applies to a broader set of conditions.
- Implementing these learning quality criteria of collaborative KB requires a corresponding meta-functional pedagogy or instruction that facilitates and motivates such collaborative dialogue.

There are some increasing attentions which are concern to how computers can be used to support and facilitate learners as they interact and solve problems (Pea, 1994). This concerns are related to the design of tools that contribute to collective activity, and is characterised by authentic, collaborative work facilitates through the use of networked computers. The use of this networked computers provide alternatives to traditional teaching and learning as we move from single classroom to the concept of knowledge-building community of learners.

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[7] **Elsebeth K. Sorensen & Eugene S. Takle** , Collaborative Knowledge Building in Web-based Learning: Assessing the Quality of Dialogue. IITAP (International Institute of Theoretical and Applied Physics.)

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1.4 Dialogue and Learning[8]

Laurillard (1993) analyses different approaches to teaching and learning including intelligent tutoring systems, apprenticeship learning and situated cognition. She points out that these approaches all tend to emphasise the ability to abstract from a new concrete examples to novel situation and agrees that this is an appropriate approach for certain domains:

"Learning in naturalistic contexts synergistic with the context; the learning outcome is an aspect of the situation, an aspect of the relation between learner, activity and environment, so it is learning about the world and how it works."

(Laurillard, 1993,p22)

However she goes on to say that learning in many educational contexts is crucially different, particularly in higher education. It requires learning about descriptions of the world, knowledge derived from someone else's experience and from understanding someone else's arguments. Every academic discipline faces the challenge of encouraging learners to go "beyond the information given"- beyond their own experience. Education must be situated in the context of reflecting upon experience. The research reported here aims to understand exactly what is happening during this reflection, particularly through discussion and listening to discussion.

Dialogue is fundamental to education. It is, of course possible to learn without such discussion, but it is proposed that there are important aspects of learning, often called higher order thinking, which are only gained through this activity particularly by a novice. Through discussion the ability to use language as a tool of thought as the highest level of development (Piaget, 1952; van der Veer & Valsnier, 1991), will be develop and once it is developed, it will be the primary tool for acquiring new knowledge whether through speech with others, reading or private internal thought.

On the other hand, it seem that much of the learning which come through dialogue is being squeezed out the formal educational system particularly in higher education, often because of the growing emphasis or the use of educational technology to deliver content and activities. By exploiting the potential of the emerging networked communities, this component can be introduced and even expanded for those students who would not otherwise have had the opportunity at all, such as distance learners.

Having established the importance of dialogue as part of learning, a theoretical explanation of why it is crucial and what it contributes to the learning process, which cannot be easily squired in other ways, will be developed. Traditionally, logic was developed as theory of communication, specifically of argumentation, and this traditional view has much to offer as a conceptualisation of educational dialogue.

1.4.1 Why observing learning dialogue maybe beneficial

Why should observation ever better than actively participate? There are two distinctions in play- voyeurism versus participation and consumption versus construction. These two are not independent but neither are they identical. The voyeur as well as the participant may be actively engaged in constructions, checking them against those of the participants. The participant may be merely engaged in fact consumption.

[8] **J.Mckendree, K. Stenning, T.Mayes, J.lee & R.Cox , (1998),** Why Observing a dialogue may benefit learning, Journal of Computer Assisted Learning ,Vol : 14, Pg: 110-119

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It is suggested that in the struggler to understand a new topic, being able to 'play the voyeur' may be offering some important advantages. When speculating, there is a 'lower processing load' both emotional and cognitive. The student is not as emotionally caught up in trying to defend a position for struggle with a new idea publicly. There is less of a cognitive load when they concentrate on the content and process of what is being said. It allows a unique opportunity to reflect on the roles of the teachers and earner and to view each other from the others' perspective. In general, it allows focusing on the unfamiliar role of social derivation without the added stress of participating.

It is argued that situated learning is critical to unite learning with the real world in which the student must apply the knowledge. However, education involves more than applying knowledge to everyday situations. Educators are constantly striving to get students to take their knowledge beyond the current situation and to consider ideas, which they may never encounter during daily activities. It is also known to be possible to transfer learning to new situation. What needs to understood is how best to encourage this to happen.

Therefore, what is needed is to find better ways to help students easily move in and out of the new and different representations of the world at various levels of abstraction. The capture and reuse of particularly in interesting learning dialogues as a new learning resource for students is being investigated. Their ability to access these vicarious experiences can be used to help show them how derivation is done in an unfamiliar world as well as hearing the ' language in use'. They can see their peers and tutors modelling the process of interpretation and application; they can analyse and compare their own understanding to that of others. To see their peers struggling and benefiting from the struggle may help exhibit to them the social nature of the quest for understanding and demonstrate that they needn't view it, indeed shouldn't view it, as something they must conquer alone.

1.5 Student Centred Learning

1.5.1 Student Centred Learning (SCL) - working definition

"Student Centred Learning is an active and dynamic process through which students develop deep approaches as learners, taking responsibility for their own learning. It is an approach to teaching and learning which recognises the student as an individual and his/her personal development as important. The teacher - student relationship is characterised by collaboration, consultation and negotiation where students are seen as a learning resource and participants in a transparent process. The interaction quality between student and teacher is essential so that framework and objectives are agreed upon."

SCL is about students more actively participating in the learning process. A student centred learning environment will enable students to become more responsible for, and more fully involved in, their education. Their learning environment will be as stimulating as it is diverse in its accessibility and flexibility. In summary, it's about students becoming more active players in an academic environment where learning can take place anywhere, at any time, in many forms and by many means.

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Table 1: Concepts of SCL

Teaching methods	Students as participants
Active teaching methods,	Students identify learning needs
Active learning, student activity	Identify own strengths and weaknesses (self-assessment)
Learning by doing Research based learning	Students' needs in focus Self-directed
Problem based - not didactic	Feedback
Varied teaching methods flexibility	Students responsibility for shaping and completing task
Computer Assisted Learning (CAL)	Reflection on learning process
Group work	Development of skills

The working definition of student centred learning points at interactivity, activity and participation as well as more problems based and less didactic teaching. A difference from the working definition is that the working definition brings forward the relationship between teacher and student, which was never mentioned, in the departmental definitions.

A very detailed definition can, however, become an obstacle when trying to find good examples of SCL; if something does not exactly fit into the definition, it might be put aside. A literature review of concepts that can be relevant to reach such a definition will therefore be helpful. If academic disciplines are to be accessible to students with diverse learning styles, efforts must be made to provide varied methods of instruction and evaluation. Smith and Kolb (1986) have provided examples of preferred learning situations for those with strengths in the different learning styles:

- **Concrete experience:**
  Value methods such as games, role-plays, peer discussion and feedback and personalised counselling.
- **Reflective observation:**
  Value lectures, observing, seeing different perspectives and tests of their knowledge.
- **Abstract conceptualisation :**
  Value theory readings, studying alone, well-organised presentations of ideas.
- **Active experimentation:**
  Value opportunities to practice with feedback, small group discussions, and individualised learning activities.

1.5.2 Why student centred learning?

One important issue of why the university should move towards a more student centred learning approach that universities should "give high priority to developing learning and teaching strategies which focus on the promotion of students' learning". This includes a focus on educational philosophy, provision of learning and teaching and learning methods. The interviews provided material for the first

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and last of these three, however the provision of learning is left out, since mainly full-time courses were focused on.

1.5.3 Learning and Teaching philosophy

The learning and teaching philosophy expressed in the interviews is rather diverse, like the different apprehensions of SCL expressed earlier in this report. However, there seem to be a connection between learning philosophy and method of teaching. Teachers, who are focused on student centred learning, tend to be concerned about the experiential moment of learning. It can be expressed in terms of 'learning by doing', learning to learn, applying knowledge, giving feedback. It is also about an attitude towards the students, where the students are seen as 'colleagues' and participants and where the dialogue between teacher and student is important.

Many of these teachers also have an 'open door policy'. Students are invited to come and talk and ask questions when they need to. This was seen to be important because it gives the teacher a chance to meet the students as individuals and in that way it decreases the distance between teacher and students that often appear in lectures with very big classes. Another opinion that was expressed is that it is important that students can see that the teachers are not against them, but with them. One way of showing this is to show trust in the students, in their abilities, in that they will not cheat and to treat them as grown ups. If the teacher relies on the students, they also have to rely on each other, and in that way the individualistic thinking that has been complained about may decrease.

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Some of the suggestion to undertaking an SCL approach:

- Deep learning instead of surface learning
- By making students aware of their learning they become more effective learners
- Interactivity make people talk and get to know each other so that there is less misunderstanding.
- Interactivity can make people get to know each other. Even if the teacher might not be able to keep track of each student, the students might be able to keep track of each other, so if someone has a problem, there is an 'infrastructure' to receive the signals and help that person.
- Some methods like self and peer assessment can make students get more aware of what they are actually good at, and in that way improve their self confidence.
- Awareness of how the learning makes us direct our energy to the right things.

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1.6 Educational Modelling Language

1.6.1 Introduction EML

The work of Educational Modelling Language (EML) has been carried out by the Open University of the Netherlands (OUNL). The educational modelling comes from an R&D project funded by the Dutch national government through their structural funds for universities. The R&D work on learning technologies is paid from these funds with the objective of innovating education through the use of ICT. OUNL research is academic and independent of any vendor or other commercial stakeholder. Besides the work on EML, the OUNL's research and development activities in learning technologies include; competency based learning, new models of assessment (e.g. portfolio's), printing on demand, and others. The main outputs are specifications, prototypes and publications.

1.6.2 Brief explanation on EML

EML is the first system to achieve no comprehensive notational system exists that allows one to codify units of study (e.g. courses, course components and study programmes), in an integral fashion. EML describes not just the content of a unit of study (texts, tasks, tests, and assignments) but also the roles, relations, interactions and activities of students and teachers. The major EML implementation is in XML (eXtensible Mark-up Language), an internationally accepted meta-language for the structured description of documents and data.

Various kinds of specifications with which educational content may be codified are under development. Examples are initiatives taken by IMS, IEEE-LTSC, Dublin Core and ADL-SCORM. EML does not make these initiatives superfluous, nor does it run contrary to their aims. If anything, it takes many of the ideas voiced by them one step further by developing more comprehensive notational system.

EML allows variety modelling of pedagogies for education. One may use EML to model for instance a competence-based pedagogy, problem based learning, performance support, self study packages or even traditional face-to-face teaching. When using EML there is no need to worry about the delivery mode during content development. EML guarantees that investments in content will last for a long time; because of the uniformity of notation that EML brings, an instrument for comparative research on the effectiveness of educational structures emerges. Shortly, EML ensures the interoperability, re-usability, and compatibility of learning materials in the future.

1.6.3 Real Practice

From the time the OUNL started the design of EML as the solution to educational problems (e.g. inter-operability and re-usability), the R&D programme on Learning Technologies has been engaged in repeated testing and validation of the concepts behind EML. During this R&D phase of the EML project, companies and schools have been actively involved in pilot trials. Then after two years of internal development within the OUNL, EML version 1.0 was published in December 2000 as a free and open format for external use in education.

Now, for further engineering activities, tools for using EML are being taken up by commercial parties, but not on an exclusive basis. Organisations wishing to build these EML tools, for instance import/export filters are invited to do so and several companies are currently engaged in such engineering activities. For implementation, further testing and validation, there are collaborations with other

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institutions, such as the Consortium Digital University in the Netherlands and Flanders, and the University of South Africa (UNISA).

The OUNL itself aims to use EML as future format for all course development. Within the OUNL a number of courses from a variety of scientific domains have already been modelled and implemented in EML. All these pilots have produced real educational material that has been used in actual teaching practice by students and teachers. The outcomes have been thoroughly evaluated for learning effectiveness. So, the EML as developed by the OUNL, has already proven its effectiveness and flexibility under a variety of pedagogical models and in a number of different settings (both distance learning and mixed-mode delivery).

1.7 Conclusions

Collaborative Learning provide student with opportunity to think for themselves, compare their thinking with others, conduct small research projects, investigate subject matter with fellow students. It can be practice by using a higher level cognitive thinking skills and also by providing activities that encourage students to confront the logic of their own thinking, their own beliefs and accuracy of their understanding about the previous or current learning. A collaborative learning-building approach offers an alternative model for both the designs of classroom environments and distance courses. Educator have recognised the need of cultivate higher-order thinking skills and alternate views of teaching and learning even though they have disagreed about how to achieve these ends.

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