Learning Communities in Cyberspace -- A New Dimension in Learning

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1   Introduction

Web-based teaching is one alternative modern technology has developed to augment traditional learning and teaching at all educational levels. Although dependent on many specific requirements, this web-based technology has become a major component that will dramatically affect the future of education. With the proper systems in place, including adequate technology and support, sufficient funds, and the cooperation of educational administrators, parents, students and the government, Web-based teaching can amplify current educational systems in remarkable ways. While captivating the next generation of students and educators, this present-day trend is sure to expand indefinitely into the future, altering our current system of education in count less ways. (Tetiwat, O. et al., 2000: p.30)

The implication of Web-based learning, as emphasized above, will change the way we teach and learn in many ways. The learning environment could be for supplementing the traditional synchronous environment of normal classroom-based teaching and learning. There are options in Web-based learning applications. It could be a part of coursework, which is done asynchronously through the Web, or it could be for a complete asynchronous environment for distant learning purposes. To be successful in Web-based education the specific requirements suiting these various learning situations have to be carefully studied, planned and executed. This paper deals with a situation where part of the coursework on 'Marine Refrigeration & Air-conditioning' is being planned asynchronously. As this Advanced Diploma Course in the Maritime Technology & Transportation Department of Singapore Polytechnic, deals with post-sea international students with diverse backgrounds, an adaptive learning environment is planned, which could support individual requirements. Additionally, the site would endeavourer to simulate a social community club environment for supporting collaborative learning using a learners' forum and a members' area for social interaction. As Piaget (Piaget, 1928 and Piaget, 1932) pointed out, collaborative learning has a major role in constructive, cognitive development. His theory is consistent with the other popular learning theories

(Vygotsky, 1978 and Thomas & Funaro,1990) in emphasising the importance of collaboration and interaction between peers.

This paper outlines the plans for this Web-based learning club, which is presently being developed with the help of students and should be put on actual trials during the July to December semester of this year.

2   New Issues When Teaching and Learning Leave the Classroom

"When teaching and learning leave the classroom, it is up to the instructor to create a container within which the course proceeds by posting goals, objectives, and expected outcomes for the course, initial guidelines for participation, thoughts and questions to kick off discussion and assignments to be completed collaboratively. Then it is time to take a back seat and gently guide the learners in their process by monitoring the discussion and entering it to prod participants to look at the material in another way or to gently steer the conversation back on course if they should stray. " (Palloff and Pratt, 1999: 17-18).

While discussing effective strategies for online learning, Kerka relates some of the following new issues, which, he claims, are to be managed, when teaching and learning leave the classrooms (Kerka, 1996):

➢ Understand the technology's strengths and weaknesses

➢ Provide technical training and orientation

➢ Plan for technical failures and ensure access to technical support

➢ Foster learning-to-learn, self-directed learning, and critical reflection skills

➢ Develop information management skills to assist learners in selection and critical assessment

➢ Mix modes--e.g., combine e-mail discussion with audio/video methods to enhance the social aspect

➢ Structure learner-centred activities for both independent and group work that foster interaction

Some of the key issues to be considered, while planning a Web-based learning site, including the above-mentioned issues, raised by Kerka, are discussed in more detail in the following sub-sections.

2.1   Technology Issues

The aim of computer mediated education should be to keep the technology as a means, which will not complicate the teaching and learning processes, instead simplify these and be an aid to our pedagogic thrusts.

We have many students, who have never interacted in a course through the use of computers. So, one of the main issues in this technology area would be to allay the fears of these students and guide them to be more confident in the use of the technology. The students are to be introduced to the online package during the first two sessions while they are also given an overview of the course structure and its expected outcome. All the user interfaces are to be explained and the students are given hands-on sessions before they are left on their own to explore through the course.

From the point of view of course developers, the tools should be simple and with short learning curves. There are many reputed authoring tools available, which can produce impressive compute-based learning (CBL) packages, yet they require substantial time investment for learning these tools and then again many tedious developing hours to produce the required teaching CBL package as outputs. To edit or update these packages, which could be a requirement every semester, is again not simple and may require help from programmers. In this paper I describe a plan for an Internet-based courseware, which could be developed using simple tools with no programming

requirement. The courseware generated may not have professional graphics, but could be built with sound pedagogic principles and the site could still be made attractive and educationally useful for our students.

Another issue, which should be taken into consideration while developing web-based packages, is the limitation of the present bandwidth of communication links. The emphasis should be to maintain reasonable downloading time and hence, the temptation to use many sound, video and large graphic files should be avoided.

In the next section I discuss an important aspect of web-based education, which is found to be suitable platform for developing community of learners and thus support social learning.

2.2   Importance of Community

"In distance education, attention needs to be paid to the developing sense of community within the group of participants in order for learning process to be successful. The learning community is the vehicle through which learning occurs online. Members depend on each other to achieve the learning outcomes for the course. If a participant logs on to a course site and there has been no activity on it for several days, he or she may be may become discouraged or feel a sense of abandonment --- like being the only student to show up for class when even the instructor is absent. Without the support or participation of a learning community, there is no online course. " (Palloff and Pratt, 1999: 29).

In this course, only part of the coursework is being planned asynchronously. But still, to bring a sense of belonging to a community and to provide a feeling of kinship, an exclusive members' area is maintained, where a list of members and their e-mail addresses are available. Members are also encouraged to build their own homepages and link the same to this main site, where more details of their interests should be available. An easy Web page builder is hyper linked to the site for this purpose. The Web page builder is sited at http://homestead.com/ .

The site has good reviews and site building does not require any knowledge of html programming as stated below in one of the reviews by Yahoo! Internet Life Magazine.

"The days of using HTML code to hang your shingle in cyberspace are gone, thanks to free page-hosting sites that make erecting a home on the Web as easy as typing your name. Homestead's drag-and-drop tools are idiot-proof, and what you see on the screen while you're building your site is exactly what you get on the web: no unpleasant surprises." (Yahoo! Internet Life Magazine, January 2000)

The homepage idea is to make space for increased involvement of members by bringing out personal issues and interests in an online course. According to Palloff and Pratt (1999: 29), this must be done deliberately and fostered throughout the course.

Some of the desired outcomes of developing an online community, which should be expected from an online course, again quoting Palloff and Pratt (1999: 32), are:

- ➢ Active interaction involving both course content and personal communication
- ➢ Collaborative learning evidenced by comments directed primarily student to student rather than student to instructor
- ➢ Socially constructed meaning evidenced by agreement or questioning, with the intent to achieve agreement on issues of meaning
- ➢ Sharing of resources among students
- ➢ Expressions of support and encouragement exchanged between students, as well as willingness to critically evaluate the work of others.

Apart from e-mails and student home pages, threaded discussion groups are powerful knowledge builders. These have mushroomed on the Internet over the last decade and have championed the cause of dynamic knowledge generation and knowledge sharing. It

is easy to set up such a discussion group at an Internet site and therefore, it should be an essential component for all learning sites. In the next section, I discuss this issue of discussion forums.

2.3   Discussion Forum

Learning on the computer could pose an isolated environment for the learner compared to the classrooms, where the very presence of the classmates and the facilitator create a social ambience, necessary for the social context in learning (Vigotsky, 1979). Vigotsky refers to the social interaction, as he claims that only through this interaction does the learner acquire both meaning and utilization of important symbols and thereby develop his or her thinking abilities. A threaded discussion forum is incorporated in the site to simulate this social interaction. Threaded discussion forums allow students and instructors to share ideas using the Web's hypertext capabilities. Discussion forums link messages by subject. Thus, all messages on one topic are grouped together, allowing users to follow connected threads of thought. To create a thread you 'Post a Message', including your name, e-mail address, subject and message. When you click the "Submit" button, the Forum writes and links your message. Others may read your message by clicking on it. You can extend the discussion thread by submitting 'Follow-ups' to any of the posted messages. A 'Follow-up' is a response to a message by another student in the class or perhaps by the instructor.

These open-ended discussion forums could be useful tools in building learning communities. But it should be monitored and the facilitator should step in and set limits if the participation is waning or is heading in the wrong direction (Palloff and Pratt, 1999: 107)

The site, which was used for hosting the discussion forum, is sited at

http://network54.com/Create/

The forum site could be hosted without any programming knowledge and the services are usually free.

2.4   Useful Links

In an online course the availability of hyperlinks to other Web-based sites provides an important dimension to the content given at the course site. This outward links allow for "guided discoveries" (Boyle, 1997: 49) in the subject area by the learners. The learners are encouraged to suggest more links to consolidate the site. These could be initially placed on their own homepages. If they are really considered useful, the facilitator could add these links to the main site. Example 1 in the Appendix shows the refrigeration-related sites, which are presently listed, at the main site.

Additionally, Example 2 in the Appendix shows a set of links, which is also added to the site for general interest of the learners. It could be argued that these sites may pose as distracters as they are not directly related to the learning objectives. However, looking at the learning habits of today's youngsters, who usually carry their portable stereo music-sets everywhere they go, it appears, this may not be a bad idea to attract the learners to the site. Additionally, as these sites are given as options, one may or may not choose to access them. These considerations could be seen as marketing strategies to attract the learners, where learning material is packaged with goodies to pamper today's demanding learners.

3   Capturing Experiential Profile of Learners

While conducting this course in refrigeration and air-conditioning for these mature students, many times I find learners having rich diverse experience on a number of topics of the course curriculum. Some of these experiences leave deep impressions in the learners' mind. So, when I might think I am introducing new ideas for the subject in hand, I might be trying to substitute the learners' old belief systems, which could have been right in the first place but were viewed from different perspectives by the learners. Their old belief system could also be wrong and the learners needed convincing to modify or replace those wrong notions. Hence, it is clear that there is a need for individual intervention for each learner and a requirement to establish the learner's existing experiential profile before the course material is presented.

One simple approach to obtaining student profile is through performance measuring. Performance measuring checks a student's domain related knowledge by looking at solutions they come up with for the problems presented to them in the subject area. Scores from these measurements will then represent the present student model. Although this is a straightforward method of measuring a student's performance, it gives reasonable clues about what type and how much information the learner may need in the subject area to cover the intended learning objectives of the course.

One way of doing that would be to expose the learners through leading questions for example by using a number of objective type questions together with meaningful feedback, which may prompt the learners to re-live their experience on the topic-in-hand. This should encourage reflection and if required, modification of learner's existing knowledge base. From the outcome of such a transaction further learning steps could be

planned in an adaptive manner, which will cater more precisely to the learners' needs while accrediting prior learning of the learners on the topic-in-hand. In the next section I discuss the methods used for getting student profiles using open-source-code educational software, created by the Language Department in University of Victoria, Canada.

3.1   Use of Educational Software from University of Victoria, Canada

Student profile is obtained by using the educational software 'Hot Potatoes' suite, which has a set of six authoring tools, created by the University of Victoria CALL Laboratory Research and Development team, which is supported by University of Victoria, Canada. (http://web.uvic.ca/hrd/hotpot/)

With 'Hot Potatoes' suite one could create interactive Web-based exercises of the following six basic types of questions without the knowledge of any html programming.

JBC   – Creates a multiple-choice quiz

JQUIZ – Creates a short-answer quiz

JCLOZE – Creates a fill-in the blank exercise

JMIX – Creates a jumble sentence exercise

JCROSS – Creates a cross-word puzzle

JMATCH – Creates a matching exercise

A multiple-choice, browser-based example is shown in Example1 in the Appendix, which was developed by JBC multiple-choice quiz-builder of 'Hot Potatoes' software suite.

The user-friendly JBC-interface of 'Hot Potatoes' is shown in Example3 in the Appendix, which shows the possibilities of including feedback for every answer selected by the learner. Thus, carefully chosen feedback could make up for the absence of facilitator in an asynchronous environment.

"Hot Potatoes" designer, Martin Holmes's (**http://web.uvic.ca/langcen/staff-pages/index.html**) view of the motivational aspect of this program is as follows:

The main difference between computer-based and paper-based exercises is the immediate interactivity. For example, if you write GOOD multiple-choice exercises in JBC, with useful, detailed feedback for every answer, then the student can work through the exercise, learning as he or she goes; it's a little like having a teacher at your side all the time, checking all your answers and helping you. With a paper-based exercise, you have to wait for the teacher to mark it, and no teacher is going to respond to every wrong answer on every student's paper, giving helpful comments; that would be impractical.
 (Holmes, personal email to Steven Yoell Jan 13th 2000
http://www.yoell.fsnet.co.uk/HotPotatoes.htm#aretheygood)

In the next section, I discuss the implementation plans, which are used to capture the student profile.

3.2   Capturing Student Profile.

To capture student profile in a subject area, some planning is necessary. For example, in the subject area of 'thermostatic expansion valve', following classification could be made:

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                    ┌─────────────────────┐
                    │   Exapansion Valve  │
                    └─────────────────────┘
          ┌──────────────────┼──────────────────────┐
┌──────────────────┐ ┌─────────────────────┐ ┌──────────────────────────┐
│     Function     │ │ Types & Construction│ │ Operation & Fault Finding│
└──────────────────┘ └─────────────────────┘ └──────────────────────────┘
```
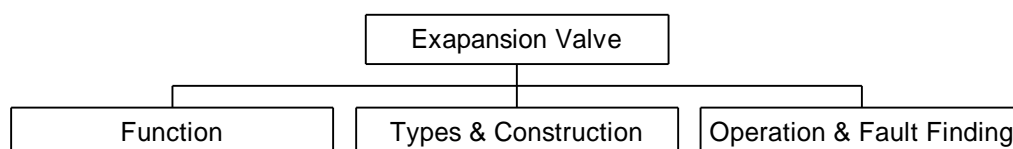
Figure 1. The knowledge classification for an expansion valve.

To get a representative profile of the learner, at least three types of questions are set. As an example, for the classification 'function of the expansion valve', a multiple-choice quiz, a fill-in the blank exercise, and a matching exercise are used. Scores from these exercises are then averaged to get the learner's profile with respect to the knowledge area 'function of expansion valve'. In the end, a typical student profile for the knowledge area 'expansion valve' may look like the following.

Table 1. A typical student profile

Student: X Knowledge Area: Expansion Valve	
Classification	Score (%)
1. Function	87
2. Types & Construction	30
3. Operation & Fault Finding	40

For such a case, the learner seems to have an adequate knowledge on the function of the expansion valve but requires additional knowledge in the areas of 'Types & Construction' and 'Operation & Fault Finding'.

The 'Hot Potatoes' suit from the University of Victoria does not do these score calculations but as the software is provided with an open-source-code, these additional functionalities could be added using Javascript programming. The student scores are stored on the client side using Javascript cookies. Tutorials for Javascript cookies are given at the following site.

(http://javascript.about.com/compute/javascript/msub_tutorials_cookies.htm)

4   Arranging Adaptive Course Material

" Knowing the value of adaptability is not enough, however, to carry out the task of meeting the needs of all students in the classroom environment. Time with students for one-on-one interaction is an additional ingredient required to adapt curriculum to an individual student. In the current U.S. public education system, there are factors, which contribute to the lack of individualized instruction time. An increase of student to teacher ratios in many school districts is a simple mathematical reason for a decline in individualized instruction. Furthermore, upon examination of the mandate that teachers have to meet the goal of covering all of the material in a given course, we recognize the conflict that exists between the necessity to deliver all of the curriculum to the students, and the need to pause for individualized instruction, to help those in the class who do not 'get it'. If the teacher pauses too often to help those who may only lack a solid foundation in the topic at hand, then, the teacher runs a risk of falling behind in the 'delivery' of curriculum. . " (Mann, 1999: 15).

Mann (1999) conducted the above study to provide new knowledge about adaptive hypermedia systems (AHMS) and the adaptive navigation support technique of link hiding. Similar principles, using Dynamic HTML, are being adopted to arrange the course material to suit the individual needs of the students.

For the typical student profile X, mentioned under 3.2., the student would only need to study the knowledge areas 'Types & Construction' and 'Operation & Fault Finding'. The course material for the expansion valve is arranged with blocks of text and graphics in the three classified areas, namely, (1) expansion valve functions, (2) types and construction and (3) operation & fault finding. The links to these three blocks are controlled using DHTML techniques. So, for this student profile the block (1) expansion valve functions would be hidden and the other two blocks would be made visible. The programming code for this hide and show activity for a block is rather straightforward and is available at a tutorial at the following site.

http://www.wdvl.com/Authoring/DHTML/CB/Objects/test.htm

Thus, as the student progresses through the course, the student profile could be monitored and the course material could be dynamically altered to suit the changing needs of the student.

5   Online Transformative Learning

" *The transformative learning process is one that moves a participant from student to reflective practitioner. It begins with the practice of acquiring knowledge. Students, by enrolling in an online course, commit to that process. They enter the online environment and begin to form new relationships, which deepen as students post material to the course site and are acknowledged for their ideas and their participation. As the result of acknowledgement and feedback, students perceive that value has been added to their contribution. Their contribution has been recognised and appreciated by the group. Consequently, their ideas may be supported and expanded, or they begin to branch off in another direction of inquiry. They then begin to question why this has happened. Why should I begin to look at this idea in anew way? Do I need to? As a result, they begin to develop new ways of explaining their ideas and the material with which they are interacting. This creates a web of learning through which new ideas and means of reflection provide a feedback mechanism regarding the ideas being studied and the learning process itself.* " (Palloff and Pratt, 1999: 131).

The transformative learning is the process of making meaning of one's experience (Mezirow, 1991). This takes place in learners when they critically reflect on their experiences. It may be possible to have transformative learning in traditional classrooms, but the scope for such practices are normally not provided. In online situations, one could deliberately provide spaces for electronic reflections on the topic of discussion and additionally, provide spaces for self-reflection. As Mezirow points out (1990) the perspective views on a topic is seen from different vantage points as learners encounter, what he terms *disorienting dilemmas* --- dilemmas that cause learners to review the discrepancies in the areas of the nature and use of the knowledge.

Thus, this process of reflection on the subject matter and the self-reflection provide a new perspective of the knowledge domain and one's own position in that domain.

Mezirows (1997) states that transformative learning occurs when individuals change their frames of reference by critically reflecting on their assumptions and beliefs and consciously making and implementing plans that bring about new ways of defining their worlds. Mezirow's theory is found as primarily rational, analytical and cognitive (Garabov, 1997, pp. 90-91).

Another perspective of transformative learning is based primarily on the work of Robert Boyd (Boyd and Myers, 1988). According to Boyd, transformation is *fundamental change in one's personality involving [together] the resolution of a personal dilemma and the expansion of consciousness resulting in greater personality integration* (Boyd, 1989, p.459, cited in Taylor 1998, p.13).

These two views of transformative learning may look contradictory on the surface, but both use rational processes and incorporate imagination as a part of a creative process. When transformation learning is the goal of education, Susan Imel (Imel, 1998) gives the following guidelines on the roles of teachers, learners and on the role of the rational and the affective aspect of transformative learning, which should be followed while setting up an online learning environment.

♦ The role of the teacher

The teacher's role in establishing an environment that builds trust and care and facilitates the development of sensitive relationships among learners is a fundamental principal of transformative learning (Taylor, 1998). Loughlin (1993) emphasises the responsibility of the teacher to create a "community of knowers", individuals who are "united in a shared experience of trying to make meaning of their life experience" (pp.

320-321). As a member of that community, the teacher also sets the stage for transformative learning by serving as a role model and demonstrating willingness to learn and change by expanding and deepening understanding of and perspectives about both subject matter and teaching (Cranton, 1994).

♦ The role of the learner.

It should be explained to the learners that they also have an active role to play in creating a conducive environment, which promotes transformative learning. If the participants are, for some reasons, unwilling to co-operate in collaborating or sharing this responsibility, the likelihood of transformative pedagogy is null and void (Taylor, 1998, p.60).

♦ The role of the rational and the affective aspects.

Transformative learning has two layers that at times seem to be in conflict: the cognitive, rational and objective and the intuitive, imaginative, and subjective (Grabov 1997). Both the rational and affective aspects play a role in transformative learning. Although the emphasis has been on transformative learning as a rational process, teachers need to consider how students connect the rational and the affective aspects by using feelings and emotions both in critical reflection and as means of reflection (Taylor, 1998).

Reading this section, a teacher might find the transformative learning process to be a challenging task to simulate in an online environment. However, it is claimed (Palloff and Pratt, 1999, p. 142) that the process will take place, whether or not an instructor purposefully facilitates it, *when the course is designed to allow participants to explore beyond the confines of the course material.*

I think a fitting conclusion to this section would be to quote Palloff and Pratt again on online transformative learning (1999, p. 142):

" *When the students are empowered to become experts at their own learning, they cannot help but be transformed as people. Their self-esteem rises, as does their confidence in their abilities. They learn about areas* (that) *they never thought possible before, one of which may be technology. The main task of instructors as facilitators of this process is to bring forth their best instructional practices and then get out of the way. If an instructor is willing and able to give up control of the process, amazing things can happen. Students who may sit quietly and not do well in the traditional classroom may emerge as the leaders in the online classroom, presenting thoughtful and knowledgeable material for others to consider. Rather than a process to be feared, the transformative learning process is one of the most exciting aspects of online learning.*"

6 Conclusion

"In talking about distance learning, I keep stressing that our focus is on the learning process and not the technology. Many institutions are jumping on the technology bandwagon so as to become a part of the information superhighway. In doing so, their goal is to use the technology to transmit a tired and stale pedagogy over fibre optics cable --- as if the fibre optic cable will somehow transform the pedagogy." (Don MacIntyre, President of the Fielding Institute, cited in Palloff and Pratt, 1999, p. 163).

The technology must be utilised to improve our teaching and learning processes. Hence, the need for developing a community of learners. A learning community creates an environment of dynamism in learning, which an online Web-based platform is capable of supporting. An online approach challenges our conventional teaching and learning practices, when perhaps the education is seen more individualistic and one's education is confined to one's own self. In a classroom situation we are normally trying to meet these expectations and as such, knowledge sharing never becomes a priority in such context. On the other hand, in a successful online learning environment, it becomes important to instil a sense of a learning community. In such a community, meaning making, knowledge generation and knowledge sharing are the primary activities that one needs to foster. These activities drive the learning community to push forward in diverse

directions in the subject domain, and with its group synergy, the community enables itself to cross many boundaries, which an individual may take much longer time to achieve. Hence, it should be stressed that unless we are able to build a vibrant learning community in the online environment, we would not be doing something new to justify e-learning.

This paper presented a technology-based approach to introduce cyber-learning to meet the diverse needs of post-sea students doing Advanced Diploma Course in Marine Engineering at the Singapore Polytechnic. The use of Web-based asynchronous teaching method, at least initially as a supplement to the traditional classroom-based teaching, is being seriously considered now in our department. Here, I endeavoured to bring out the various issues relating to this e-learning platform, which may have to be tackled carefully while developing Web-based learning sites.

Additionally, I discussed a simple method of student profiling using a modified version of the open-source software from University of Victoria, Canada. Finally, I suggested a method to create an adaptive learning environment using dynamic html.

In conclusion, perhaps one could state, that the impact of technology in teaching & learning is expected to be significant over the coming decades. However, collaborative approaches of sharing and learning these new techniques should help us to harness this technology in providing more efficient learning platforms for our students.

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Appendix

| Sites Relating to Refrigeration & Air-Conditioning	Address
1. Institute of Refrigeration, UK	http://www.ior.org.uk/
2. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)	http://www.ashrae.org/
3. Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH)	http://www.airah.org.au/
4. United States Environment Protection Agency: Ozone Depletion Homepage	http://www.epa.gov/spdpublc/index.html
5. United States Environment Protection Agency: Global Warming Site	http://www.epa.gov/globalwarming/index.html
6. US Navy Converts Fleet To Ozone-Friendly Refrigerant	http://www.navyseic.com/ozone/hfc134a.htm
7. US Navy Shipboard Environmental Information Clearinghouse	http://www.navyseic.com/

Example 1. WWW Sites Relating to Refrigeration & Air-conditioning provide the outward links, which cater to the additional domain knowledge beyond the content area covered in the course.

Sites for General Interest	Address
1. Music Television (MTV Online)	http://www.mtv.com/
2. MP3 Site for Music	http://www.mp3.com/
3. Discovery Channel	http://www.discovery.com/
4. National Geographic	http://www.nationalgeographic.com/index.html
5. CNN	http://www.cnn.com/
6. BBC	http://www.bbc.co.uk/
7. Weather	http://weather.yahoo.com/
8. Computer News (ZDnet)	http://www.zdnet.com/
9. Computer News (Cnet)	http://www.cnet.com/
10. Home page building	http://homestead.com/

Example 2. WWW sites relating to general interests provide other links, which are not content related, but could work as catalysts in bringing the learners to this site. To justify these links, one could argue that as learning is being promoted as a life-long activity, it should not be seen separate from other functions of life.
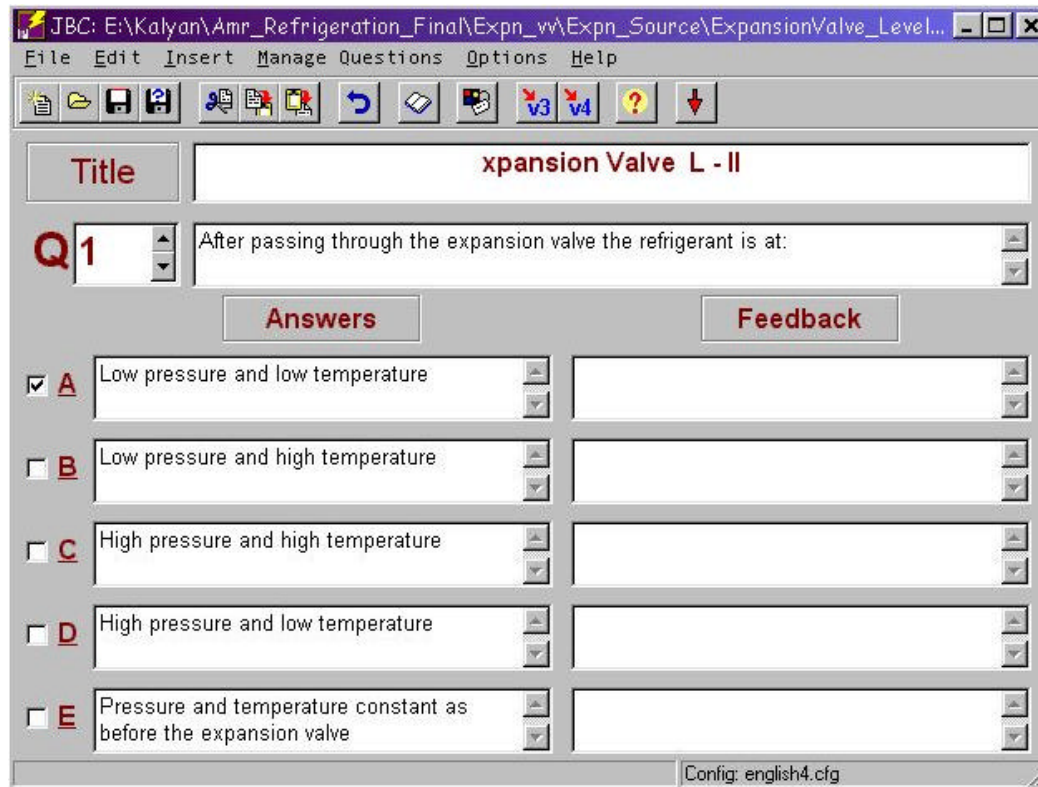
Example 3. User-friendly JBC input-screen of 'Hot Potatoes' provides opportunity for feedback for every answer selected by the learner. Thus, there is ample scope to interact individually with the learner depending on the choice of his/ her answer.
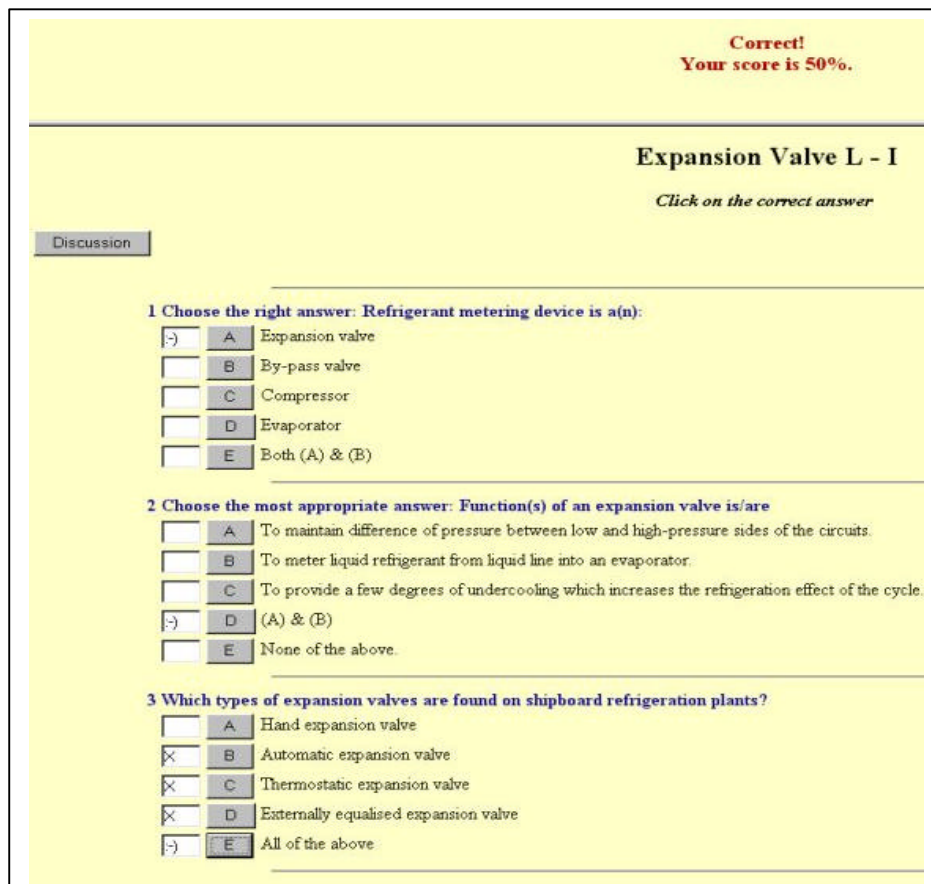
Example 4. A multiple choice quiz example on browser platform created by JBC quiz-builder of 'Hot Potatoes' suite.