

CaseBox: A Tool for Case-Based Learning

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Abstract. *This study reports on the development and experiment of CaseBox for case-based learning. Due to many advantages of the case-based reasoning, the authors create a learning environment for both teachers and students. In the digital era, multimedia and web-based education methodologies emerge auspiciously in schools. Teachers and students no longer satisfy paper-based documents, they research with case-based reasoning on the internet. CaseBox is proposed as a learning environment, which supports: 1) Teachers introduce cases. 2) Students study and reuse cases. 3) Members discuss design on the web. CaseBox is still under development and this study reports on the efforts and discoveries at the recent stage, and shares the debates of ideas and problems of case-based e-Learning.*

Keywords. *Case-based learning, design studio, education.*

Introduction

This work reports on a study of a case-based learning system, CaseBox, in an architectural design studio. It can be considered as a Case-Based Design (CBD) tool which provides cases for users' reuse of cases in record. Owing to many profound CBD theories, Case-Based Learning (CBL) is a relatively new educational paradigm with lots of notice. It is based on a mutual learning theory between teachers and students. However, instead of providing cases' information to users in one way, the advantage of this tool is to allow the user to communicate with other users in this system. Although this system still needs refine and more development, it has provided a mechanism for interaction and knowledge exchange between teachers and students.

After an explanation of the structure underlying CaseBox, this research discusses the main

issues about on-line CBL. This section points out two questions, how modern technology can enhance case-based e-learning, and what are the advantages of case-based learning? Because of there are several good development of some similar systems (ex. DYNAMO), which are easily available nowadays, this research focuses the debates and discussions during the development of this CBL system for educational purpose. These discussions come from authors' observation, analysis and discussion. This work describes three main components of the tool: the cases, the underlying structure and the user interface. Besides, CaseBox is compared with other CBL tools that have been developed in the field of architectural design.

Related works review

Within the field of CBL, there are at least four available systems that show several similarities

with CaseBox.

To our knowledge, first, DYNAMO, the tool focuses on students representing and indexing design information in a clear and comprehensible way. Secondly, Archie-II is the longest running and most developed CBD tool for conceptual building design. A third CBD tool is MEMORABILIA (Oxman and Oxman, 1993). This system stores memorable design cases that have the status of precedents in order to provide student-architects with meaningful concepts for museum design. The fourth, a similar user-defined approach to indexing is found in EDAT. It is conceived as a centralized store for information gathered by student designers in the early stages of the design process.

These related works continue to study and provide various design environments for teachers and students. Some of these works still need more effort on the implement of CBR cycle; however, in this study, this work do not suffer to do fulfill the entire CBR theory, because this research focus on providing a tool for e-Learning and case-based learning, rather than to let all the 4Rs of CBR be realized.

Idea of CaseBox

Convinced of the importance of local cases in architectural design, the leader of this study decided to develop a design tool in which the local design projects play the central role. The tool, which is intended to assist students in a design studio, contains more domestic and local cases than foreign cases. Therefore, it provides students with a rich source of domestic designers' information, inspiration, ideas and construction technology for their future career. Its next-step objective is to cater to professional architects' need; therefore, if students become licentiate architects, they can continue to use this system and know well about cases in their careers.

CaseBox consists of several sub-systems, which perform different functions of case-based

learning. It includes two parts, "student-domain" known as Case-User; and "teacher-domain", known as Case-Developer. Each of these two areas has their functions, interfaces and facilities available (fig. 1).

The cases in the CaseBox contain buildings' information (established designs and projects). With an eye on a broad applicability, prolongation to include other branch of design - to the top with the urban design and in bottom with the elements of building - should be possible. For each case, all information available is gathered on an exchange, dynamically webpage with the correspondence classifies. To employ a sequence-based approach enables us to combine traditional media, such as the text, images and graphs, with 3d-models, computer animation, video and sounds. The advantages of this combination are varied. Compared with the text, the visual and 3d representation of architecture adapts better the manner of the architect of the thought. Primarily, a design occurs by the handling of not-verbal information: the originator knows, thinks and works in a visual way. Moreover, the combination of several modes of representation provides to students an experiment of richer study, having for result a better comprehension of the design. In other word, the use of the hypertext enables us to link the tool to the external resources of information on the Web, which increases considerable range of its contents.

Issues

After the two-semester experimental courses at Ling Tung College, this study expatiates on these experiences and presents two important issues:

How can modern technology enhance case-based e-learning?

Computer-mediated case-based learning promotes active engagement through the use of what Jonassen calls "mindtools"—"computer applications [e.g., databases, computer conferenc-

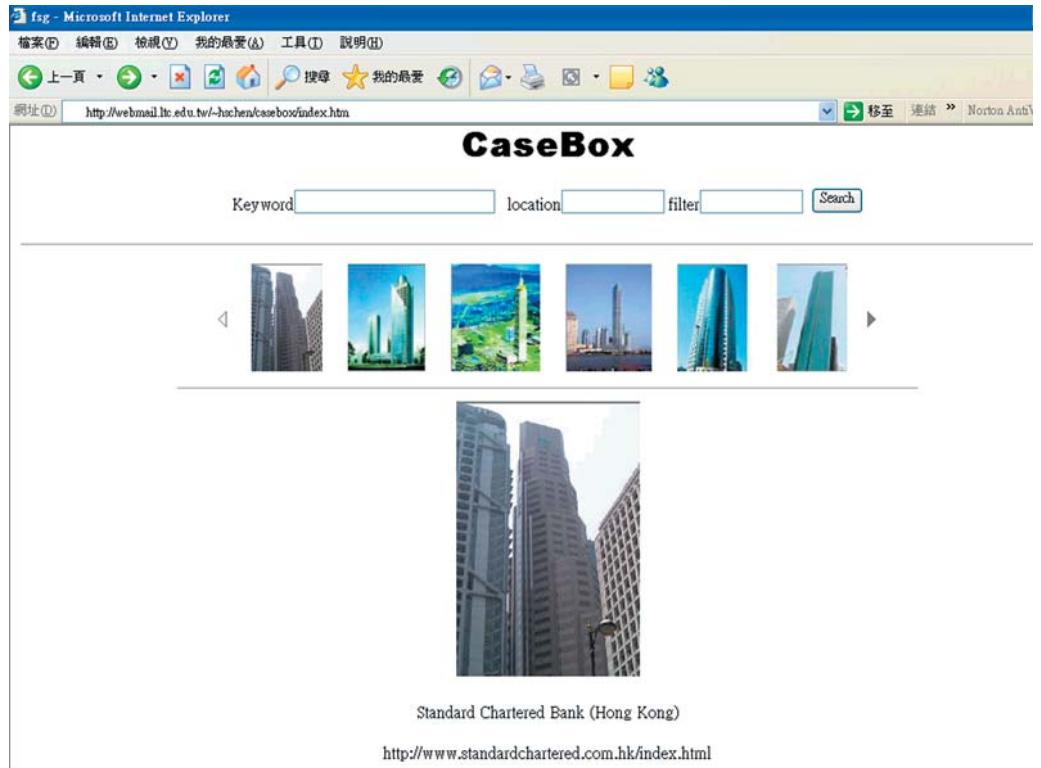


Figure 1. CaseBox web interface.

ing, probabilistic causal modeling] that require learners to interpret and organize...knowledge...in order to use it" (Jonassen et al., 1995). Jonassen (1996) further states that such tools enable learners to manipulate a large range of variables within a case scenario and thus better approximate real-world complexity. CaseBox is set up by CBR-Works4, which organize the reasoning and learning process on the Internet. And the new technology brings some advantages and disadvantages to the course.

Teachers need to organize their courses, for example, the schedule, assignments, grading and commands in a course. Recent researches concentrate on how we can make the dialogue, interaction and activities on the internet. One of

the famous course management systems, which make this approach more simply, is moodle (<http://moodle.org>). However, a shortcoming of using an opened e-learning source is the lack of technical support. Users, who use an opened source system, must have a more high technical level and tracing error ability, thus participants center on their learning successfully. The cost of developing and purchasing e-learning solutions has excluded many smaller or nonprofit organizations from taking advantage of this new approach to improve their work performance.

What are the advantages of case-based learning?

Case-based learning provides realistic and

complex issues in a safe context for students to explore alternatives and judge their consequences (Benham, 1996; Hazard, 1999; Jonassen, 1996). In a design class, students are required to actively involve with the content and empower themselves for attaining to the authorities and arbiters of judgment (Barnett and Ramirez, 1996; Benham, 1996; Cunningham, 1995; Grupe and Jay, 2000). Such involvement also tends to engender greater intrinsic motivation for learning (Silverman and Wetly, 1996). Using CaseBox, the students learn the method constructing communities of self-learning and developing collaborative skills needed for professional practice. Students come to brain-storming conversation and develop mutual respect as they develop their abilities to articulate and defend their positions (Hazard, 1999; Kinzie et al., 1998).

Nowadays, many studios, courses and schools use computers to assist training instructors and participants. Examples include job aids and programs on a shared drive, web-based training electronic bulletin boards, blogs, and email service. These are prosperous modern technologies for peoples' learning environment.

Observation

While the program started, the studio began the transition from a dictation program to a case-based learning program. The students in the program have to try to use the new system that was brought online and the school learning how to integrate the curriculum with the new capabilities.

It was once an option whether to take online courses or not. The online courses were primarily used by people who either could not attend courses due to location or by students who needed classes that were not being offered at their preferred location (and time). Some students did not fit into either of those categories; they did not have a need to take the online courses so they do not have experience with the full-time online courses.

After a few terms at school, they begin to make

changes toward using a relatively hybrid system. The case-based learning system contains an on-line portion of the course and an online portion. Much of the case work is done on-site with the other students and instructor. Gradually the hybrid program has been changed quite a few times. Teachers use the online system for graded discussion threads, submission of projects, quizzes, grade book, and communication.

Some educationists assert that deep and effective learning is best supported by situating learning in authentic activity (CTGV, 1993; Williams, 1993). Case-based learning, project-based learning, problem-based learning, and other constructivist teaching methodologies for classroom practice all focus on putting students into situations where they must make hypotheses, collect data, and reuse the data in the process of solving a new problem or discuss with each other by the modern communication technology. The majority of students are willing to use case-based learning methodology and paying attention to their studies. The observation results in this study are similar to Blumenfeld et al. (1991) and Hmelo (1995) that students participating in these learning activities are more motivated to learn by themselves. More encouragingly discoveries are what they learn is more usable than the knowledge learned by students carrying out rote activities, and that they tend to learn higher order thinking skills better than those students do in the other learning environment.

Discussion: educational implications of the case-study approach

Commonly speaking, the students have good response to the application of CaseBox system. They have a lot of discussion that would not have occurred in a typical classroom setting due to the time. With the threads being graded, students are required to make a specific number of posts during a given week.

On the other hand, theory based courses are

much better performed at the online forums. Our successful example is “Traditional Taiwan Architectures” for third-year students. It is a course where you can learn the theories of traditional constructors’ thoughts, “feng shui” in layouts and design details. The instructors have collected more than 200 cases in the CaseBox for students, and they spend time on discussing the pros and cons of good cases. For the first time, this course is established with on-line platform. Students could discuss the topics as they have time during the week and then other people can respond to them and so on. This allows them to discuss freely and to learn outside of the classroom.

Another course that fit well in our school is a course called “Environmental Visual Design” for second-year students. Students need to make visual analyses, then to summarize formulas and information, and finally to compare it to the real world. They have appealing discoveries and discussion with other classmates; also they learn more from the online discussions, with researching design and posing questions.

With CaseBox, the overall experience on case-based learning at Ling Tung College is inspiring and positive. We have some bumps in the roads but it will be expected with new technologies. This work offers an e-Learning environment and looks forwards a good knowledge to gain an insight of CBL.

Conclusion

CaseBox, inspired by the users, is developed as a system for creating intelligent mechanism – a system which is able to reason by reference to the previous design experiences. Such system owns the potential to behave like a expert than a traditional expert system does. Reasoning based on experience allows us to be more flexible and less brittle than rule-based systems. CaseBox has shown to be a useful assisting tool. It provides an internet-based tool that students can learn by

themselves with modern computer technology.

This study addresses some key issues in case-based teaching from an architectural design school point of view. However reusing case in education and the design functionalities of CaseBox described here, has quite-general applicability. For example, visual communication design and industrial design have similar problems and opportunities as architectural design. In this study, cases are prepared by whole members, then studied in smaller groups and finally discussed in the class. The discussion in the class is regarded as an important part of the case-based learning process.

In conclusion, this research presents the development of a case-based learning tool for students and teachers at an architectural design school. CaseBox is a tool still under development and in try-and-error period. It is not perfect enough to be a good paradigm; however, this study honestly presents here the advantages by using such case-based learning tools at an architectural design studio.

References

- Barnett, C. and Ramirez, A.:1996, *Fostering critical analysis and reflection through mathematics case discussions.* in J. A. Colbert, K. Trumble, and P. Desberg (eds), *The Case for Education: Contemporary Approaches for Using Case Method*, Boston, MA: Allyn and Bacon, pp.1-13.
- Benham, M. K. P.:1996, *The practitioner-scholars’ view of school change: A case-based approach to teaching and learning.* *Teaching and Teacher Education*, 12(2), pp. 119-135.
- Blumenfeld, P., Soloway, E., Marx, R., Krajcik, J., Guzdial, M. and Palincsar A.:1991, *Motivation project-based learning: sustaining the doing, supporting the learning.* *Educational Psychologist*, vol. 26 (3 and 4), pp. 369-398.
- CTGV. 1993: *Cognition and technology group at Vanderbilt, anchored instruction and situated cognition revisited.* *Educational Technology*,

- 33(3), pp. 52-70.
- Cunningham, P. S.:1995, Teacher knowledge, cognitive flexibility and hypertext: Case-based learning and teacher education. Second International Technological Directions in Music Education Conference, San Antonio, Texas.
- Grupe, F. H. and Jay, K. K.:2000, Incremental cases: real-life, real-time problem solving. *College Teaching* ,48(4), pp. 123-128.
- Hazard, H.:1999, An “action learning” teacher reflects on case teaching [Electronic version]. *ECCHO: The House Journal of the European Case Clearing House* 22(Autumn/Fall), pp. 5-8.
- Hmelo, C. E.:1995, Problem-based learning: development of knowledge and reasoning strategies. in *Proceedings of the Seventeenth Annual Conference of the Cognitive Science Society*. Hillsdale NJ: Erlbaum.
- Jonassen, D. H.:1996, Scaffolding diagnostic reasoning in case based learning environments. *Journal of Computing in Higher Education* 8(1), pp. 48-68.
- Jonassen, D., Davidson, M., Collins, M., Campbell, J. and Haag, B.:1995, Constructivism and computer-mediated education. *The American Journal of Distance Education* 9(2), pp. 7-26.
- Kinzie, M. B., Hrabe, M. E., and Larsen, V. A.:1998, Exploring professional practice through an instructional design team case competition. *Educational Technology Research and Development* 46(1), pp. 53-71.
- Oxman, R. and Oxman, R.:1993, PRECEDENTS: Memory Structure in Design Case Libraries. in U. Flemming and S. Van Wyk (eds) *CAAD Futures '93, Proceedings of the 5th International Conference on Computer-Aided Architectural Design Futures*, pp. 273-287.
- Silverman, R. and Wetly, W. M.:1996, Teaching without a net: using cases in teacher education. in J. A. Colbert, K. Trumble, and P. Desberg (eds), *The Case for Education: Contemporary Approaches for Using Case Methods*, Boston, MA: Allyn and Bacon, pp. 159-171.
- Williams, S. M.:1993, Putting case based learning into context: examples from legal, business, and medical education. *Journal of the Learning Sciences*, 2, pp. 367-427.