WHAT MAKES AN EFFECTIVE CASE IN CASE-BASED LEARNING?:
Our Debates At a Constructivist Teaching Studio

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Abstract. Case-based learning was adopted in a constructivist teaching studio. In this experimental class, teachers and students used cases for mutual learning in many ways. A significant question was debated in this class: “What makes an effective case in case-based learning?” This investigation studies students’ active construction of the meaning. The answer at the didactic teaching class will be quite different from ours. However, this investigation seeks to share our discussion and experience about this topic.

1. Introduction

This investigation describes debates at a constructivist-teaching studio, which adopted case-based learning as a design methodology. A significant question was raised: “What makes an effective case in case-based learning?” This study concentrated on students’ responses and outcomes in a constructivist learning environment established for undergraduate education students studying design with Case-Based Reasoning (CBR) in an engaged studying program at Ling-Tung College. CBR has increasingly been applied in teaching, and was gradually accepted as a progressive and welcome design method at the time of this study. The class used computer systems established with CBR-Works4 software for electronic display of words and pictures, with the intention of engaging students in learning in different types of situations. This study is based on the debates of the members’ discussions with respect to the effectiveness of various cases in the case library and was designed to measure the success of established cases with a view to changing it in response to students’ feedback.
2. Research Background

This study employed case-based teaching for education to a class of students, and embedded it within constructivist teaching approach (Merseth, 1991; Riesback, 1996), according to CAAD educationists’ theories (Savery and Duffy, 1996; Kalisperis and Pehlivanidou-Liakata 1998; Jonassen, 1999). Students are increasingly viewed as active participants in the learning process, actively constructing meaning through their own experience. We believe that how teachers teach students is as important as what teachers teach. Since the didactic method of teaching has been shown to be unsuccessful in developing students’ conceptual understanding (Waxman and Walberg, 1991), practitioners have called for a shift in the focus of instruction from mechanical drill and practice towards teaching for understanding (Driver and Oldham, 1986). Learning involves the student actively constructing meaning and cannot be imparted by the teacher.

3. Case-based Learning

An architectural case is a building with plans, elevations and other pictures and explanations. A case is also a design strategy for a real-world site, situation or experience connecting particular situations, faced by a single individual or many, to more general principles, theories, methods or standards. Therefore, when students engage in case-based learning, they partially simulate real world problems in controlled environments (Miller and Kantrov, 1998; Orngreen, 2005).

In the studio of this investigation, a case-based learning environment, which is a kind of situated learning (McLellan, 1991), was established. Education in this design studio uses the language of cases to understand our practice, and, indeed, case-based learning ultimately takes advantage of this human tendency to make sense of the world through sharing, comparing, blending or denying design. Effective design provides alternative methods for the mind to structure and record information, elaborates existing understandings and potentially transforms one’s professional perspective.

4. What makes an effective case?

Gradually, effectiveness of a case is understood to depend on the subject’s concept, form and function. Hence, every professional and academic user has his own case library for particular interests. Sykes and Bird (1992) stated that each profession has its own challenges, central ideas, and environment that may require rethinking and restructuring of general case-based instruction. CBR is a branch of Artificial Intelligence modelling human problem-solving using a case database—a
representation of profiles and solutions. The answer to a problem is the answer to
the “most similar problem” archived in the case database. Case-based answers are
adapted from the nearest matching cases, ranked by case score, and displayed to
users in an ordered prioritized list. Such a concern with modelling “similarity”
makes CBR a strong source of matching and scoring schemes.

During the debates, students increasingly participated and realized the principles
of case-based learning, leading to the main question: What makes an effective case
in case-based learning? Which case is effective: an authentic case or an incomplete
case? All participants in the studio answered the question, and the answers are
interesting and inspiring.

First, an effective case is realistic and relevant, helps engage students’
imaginations and provides application resources. As an emerging issue from the
domain, embedding provides students with chance to investigate and apply current
design concepts and idea. Second, a case should be ambiguous and disorganized,
requiring designers to identify, analyze and address multiple contributing factors
and possible solutions. Ideally, a case includes ambiguities, requiring designers to
“fill in the blanks”, and to think more than usual. Third, the design element—
alternative solutions of the design problems and the morphological components—
should be embedded in the case-library and the supporting creation. Current
researchers recommend that cases should require student groups to handle conflicting
values and multiple perspectives through collaboration, broadening their own
knowledge bases and developing the teamwork skills essential to many professions.
Finally, cases should frame the necessity for students to support all assumption and
design solutions with evidence, and to predict and address the consequences of
various courses of action.

5. Conceptual Cases

Cases were categorized as cases according to two main foci Conceptual cases explore
a conceptual or problematic issue within a design process, while morphological
cases contain rich and extensive descriptions of the optimal practice for investigation
and emulation.

At the studio, students discussed what makes a case effective for designers. The students were taught the basic theories about case-based learning, such as the
4Rs in CBR circle, and were asked to apply a CBR system, created by CBR-Works4,
as a design study tool. At the start of the experiment, the main problem was to
apply the computer-mediated case-based learning system. Many students were not
initially familiar with its operation. Later, after overcoming the technological
problems, the students were asked to discuss the primary subject of this paper:
“What makes an effective case in case-based learning?” Two examples showing
their opinions and discussions follow.
“I need cases to be usable not just only for one time, but for many other situations.” – Student A.
“Good cases must be of more use than a typical or local problem; and they must have general applicability.” – Student B.
“If cases have generality, I can retrieve them for many situations.” – Student C.

Conclusion: An effective case is general, and should have generative power for design, meaning that if a designer has many good cases for referencing, he can easily do his job. The second discussion is outlined as follows.

“I prefer an essential case, which is easier to hold my attention, rather a long one.” – Student D.
“I can not stand up with plethoric explanation or data of cases.”—Student E.

Conclusion: An effective case is short and essential. When the important facts of the cases are introduced, the readers’ attention must be considered. If the case needs a long introduction, users should have the option to either read detailed information or just the information stage.

For brevity, this study does not write down all the students’ conversation. Therefore, it outlines the conclusions of their discussions.

5.1. INFORMATION

An effective case gives the right information.
A case must satisfy the requirements of users, and provide accurate information about itself. The case provides how designers created the architectures and the goal that designers want to obtain.

5.2. ISSUE

An effective case shows design issues.
Design issues are embedded in resolutions. Designers always have good strategies to solve problems and challenges. An effective case always explains how designers exploit resources and convert them into successful solutions.

5.3. TIME

An effective case can explain modern issues.
Cases involving modern building engineering must address modern technologies. Unless a case is about current issues, and the student may feel that the problem is insignificant, and it has little explanatory power.
5.4. MULTI-DISCIPLINE

An effective case creates ideas for many applications. Notably, a creative case always provides many possibilities for different usages. In particular, design involves many domains, such as buildings, furniture and industrial products. A case can provide applicative ideas, it does not ask for making the outlook attractive but giving more inspiration which entails the attributes of the characters.

5.5. COMMENTS

An effective case includes comments. The most effective way to understand a design and to acquire knowledge about the designer is to read the designer’s comments published in newspapers and magazines. Comments give us the authoritative opinions on the design. An effective case provides comments about itself.

5.6. STUDENT-RELEVANT

An effective case is relevant to the student. Cases should involve situations that students know or are likely to face, enhance the credibility of cases and make them worth studying. Thus, for a graduate student, a case involving people arguing about modernity and globalization of architecture is of greater interest than basic drawing with conventional tools.

5.7. PEDAGOGY

An effective case must have pedagogic meaning. Maybe only a teacher would notice the pedagogy, but it is significant. What purpose does the case serve? What is the point of the case in a student’s education? Why must students know about it? Can the case be introduced better?

5.8. CONTROVERSIAL

An effective case provides controversies for discussion. No perfect case lacks controversy. Without controversy, no discussion would be needed. Different responses from designers and other persons always appreciated in the discussion. If cases are chosen based on various levels of agreement and disagreement, further discussion can occur.

5.9. DECISION

An effective case concerns choices and decisions.
Not all cases, at the initial design stage, have dilemmas that must be solved, but designers’ choices and decisions are interesting. These choices could concern morphological frameworks or functional outlets. In cases with dilemma or decision, students can not avoid choices, and they must know the cost of decisions. Without a dilemma in the case, a student can easily miss the turning point result in completely different resolutions. When they have to make a decision, they understand the case.

6. Morphological Cases

Morphological cases were also thoroughly discussed. The students and teacher had more agreements and fewer arguments on what makes an effective morphological case than on what makes a conceptual case. Learning cases from their morphological data, a designer must know his plans, elevations and sections. However, a designer does not have to know all of them when he just wants a particular item, regardless of how it is retrieved. An effective case includes rich and extensive data. The discussion is outlined as follows.

6.1. SPACE INFORMATION

An effective case contains information on space for design reference, such as pictures, elevations, plans, sections, perspectives and location and site maps. Additionally, modern technology for displaying the space of architecture is very popular. Cases can be displayed by virtual reality methods, allowing cases to be perceived vividly and dynamically. Designers particularly need this when comparing many similar cases on their space layouts and overall appearance.

6.2. CONSTRUCTION INFORMATION

An effective case provides construction information, explaining when and who constructs the case. What is the cost of construction? Introducing the construction process, the case describes the stages and explains the construct technologies.

6.3. CULTURE INFORMATION

An effective case gives cultural information. Conventional cases or historical cases always include cultural information. Such cases must be viewed from the correct cultural aspects to be understood. Additionally, cultural information always includes social and historic data, which significantly affect cases.
7. Discussion

After answering the main question in this study, clear and student-oriented suggestions about what an effective case’s attributes are were obtained. In the above sections, cases were classified according to two primary foci, conceptual cases and morphological cases, both of which are discussed in terms of the main subject of this study. Teachers and students are typically not familiar with case-based learning. Therefore, significant effort was made on communicating and modifying the course. Mistakes were also made when learning. Case-based learning can be very time-consuming, particularly for design studios without good guidance.

8. Conclusion

Many studies have put considerable effort on CBR. Research, experiments and professional applications of CBR are very popular at academic schools and institutes. This study concentrates on a fundamental question: “What makes an effective case in case-based learning?”

This study outlines five requirements for a suitable case.

1. An effective case is realistic and relevant.
2. Cases should be ambiguous and disorganized.
3. The design elements should be embedded in the case-library and the supporting creation.
4. Cases should frame the necessity for students to support all assumption and design solutions with evidence.
5. Cases predict and address the consequences of various courses of action.

For conceptual cases, an effective case has some successful features.

1. An effective case is general.
2. An effective case is short and essential.
3. An effective case gives the right information.
4. An effective case shows design issues.
5. An effective case can explain modern issues.
6. An effective case creates ideas for many applications.
7. An effective case includes comments.
8. An effective case is relevant to the student.
9. An effective case must have pedagogic meaning.
10. An effective case provides controversial for discussion.
11. An effective case concerns choices and decisions.

For morphological cases, an effective case has some successful features.
1. It contains information on space for design reference.
2. It provides construction information.
3. It gives cultural information.

The research and answers in this paper came from a constructivist-teaching studio in a college. Teachers and students brainstormed to discuss the question, producing very interesting and exciting results. Students learn from their own experience as part of a design team. Although the course was found to be very time-consuming, teachers and students all learned from each other. This study presents here the discussions in the course seeing a good understanding about cased-based learning. The answers may discover future applications for studio’s case-based learning.

References

Orngreen, R. 2005, CaseMaker: An Environment for Case-based e-Learning, available on http://www.cbs.dk/staff/orngreen