

Colloquium

Collaboratively developing instructional activities of conceptual change through the Internet: Science teachers' perspectives

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Introduction

Internet technology illuminates some potential ways of innovations in education. Currently, it is very common for teachers to search some on-line information to enrich their instruction. However, they may find a plethora of information on-line but not always find something very useful for teaching. The Internet opens another avenue for teachers to enhance their instruction; that is, the Internet may provide an effective medium for teachers to develop instructional activities collaboratively. This study describes a web-based system allowing teachers of various experiences, specializations, and in different locations to contribute their ideas collaboratively. This challenges traditional pedagogical practice that teaching relies mainly on the teacher's personal plans, experiences and, at most, the teacher may acquire some ideas from his or her colleagues within the school. However, any innovation in education can not ignore teachers' perspectives toward the implementation. Through interviewing twenty junior high school science teachers, this study explored teachers' views about collaborative instructional design through the Internet, in general, and their views about a related web system, in particular.

Misconceptions and conceptual change

Over the past two decades, the most important contribution of science educators may have been to assess students' "misconceptions" or "alternative conceptions" (Wandersee, Mintzes and Novak, 1994). From the perspective of "misconceptions," science learning does not simply add correct information; rather, it should discard some strongly held conceptions (ie, misconceptions) and then encounter the process of accommodation or "conceptual change" (Posner *et al.*, 1982). Many science educators agree that conceptual change is a complicated and difficult process for students. Teachers need to consider carefully the origins of students' misconceptions and try to clarify the incongruence between the misconceptions and accepted scientific conceptions. Tsai (2000a) has proposed a conflict-based model to help students' conceptual change, including:

1. The use of discrepant events
2. Teaching the scientific conception

3. Resolving the conflict between the misconception and the scientific conception
4. Using other supportive examples for the scientific concept

Tsai (2000a) also proposed that the Internet-based environment could provide environments where science teachers could collaboratively design appropriate instructional activities for conceptual change. In the paradigm of constructivism, learners are encouraged to work collaboratively with their peers (Tsai, 2000b). Similarly, science teachers should be encouraged to work with other teachers and then to acquire broad perspectives of implementing science instruction. This study is an initial attempt to achieve this.

Method

Internet-assisted system for collaboratively developing instructional activities

The system used in this study provided an environment in which science teachers can collaboratively develop instructional activities by using each misconception. Each component of the aforementioned conflict-based sequence has a “post activities” and “read activities” icon. And, when reading each activity, there are two function icons in the web frame: “comment on this activity” and “modify this activity” icons. Teachers can also read “posted comments” and “modified activities” that were suggested by other teachers in the web system. The system was performed by retrieving and storing information in a database through a CGI program. In the future, the web system will set the deadline for submitting instructional activities about the target misconception. After the deadline, the web system will ask the teachers to come to the system again and to vote on the best activity in each part of the conflict-based sequence.

Subjects and data collection

The subjects for this study included twenty junior high school science teachers in Taiwan. They came from thirteen different schools, with teaching experiences ranging from 2 years to 18 years. One of the major purposes of this study was to report teachers' orientations toward using the system described above. In order to acquire broader perspectives, this study interviewed a variety of teachers who might accept or reject the use of the system. Consequently, the study did not ask teachers to actually develop the activities through the system. The researcher showed it to each of the teachers individually, and then asked the teacher to try its functions and viewed some pre-installed examples. Hence, this study can be viewed as a part of formative evaluation of the system. The interview explored not only teachers' views of using the system, but also their general perspectives toward the idea of collaboratively developing instructional activities through the Internet.

Results

This study divided teachers' views toward the idea of collaborative Internet-based teaching design and the use of the system into three categories: teachers who accept, teachers who consider, and teachers who reject. After analyzing the interview data, it was found that, among the twenty interviewed teachers, nine showed a warm

acceptance, seven showed a consideration but some reservation, while four expressed rejection. Some representative interview responses are presented below.

Teachers who accept:

Views about using the Internet to collaboratively develop instructional activities:

- I think through the Internet, teachers can stimulate more ideas from others' work.
- I appreciate such ideas. Through the Internet, I can have connections with other teachers, especially experienced teachers.
- For novice teachers like me, we need to have an effective environment to learn some instructional ideas from other teachers and to share ideas with others. I think Internet technology is a good tool for achieving this.

Views about the system:

- The framework is concrete and each interface is specific to one misconception. I think it is useful.
- It is wonderful to have such a system and I will try some activities other teachers designed.
- I can expect there will be a lot of activities in the system and many of them will be useful for classroom use.

Teachers who consider:

Views about using the Internet to collaboratively develop instructional activities:

- Teachers may not have time to do this, but I can not deny that this is a good possibility.
- We have different types of students. The activities designed by others may be useful for other students, but not necessarily for my students.
- I need to agree that this is a good opportunity for teachers of different schools, but in practice, I don't think many teachers will involve this. We have a lot of work in regular teaching.

Views about the system:

- The concrete examples help me understand the instructional sequence and the framework. If I have time and have my personal computer at office, I may try to use the system. But it is hard for me to find time and available computers.
- Although the system seems well organized, I had bad experiences in using the Internet. I always got lost or out of control when using the Internet. I need an experienced person nearby when using the Internet.

Teachers who reject:

Views about using the Internet to collaboratively develop instructional activities:

- I am not confident in using the Internet. That's young teachers' business. I have taught science for decades. My students can learn well in my way. I never use the Internet.

- I don't think the Internet can help this, as many teachers are still never on-line though they are encouraged to do so. They, including me, are very anxious about using the Internet.

Views about the system:

- I can just say that the system may be good for others, but not for me. I never use technology for my instruction.
- I may not use the system, as I do not have good confidence in using the Internet. The Internet is like an alien in my world.

It is encouraging that almost about a half of the interviewed teachers showed interest and positive responses toward the ideas of Internet-based collaboration in instructional design and toward the system. Teachers in the other categories, in general, did not show negative responses about the system. However, their concerns about collaborative Internet-based teaching design may have come from the following: time constraints, the lack of technical support or the anxiety of using the Internet, and a total rejection of using Internet technology in assisting instruction. That is, for some teachers, their rejection of use did not come from their perceptions about the system but rather from their rejection for the use of Internet technology as a whole.

According to the responses presented by the "teachers who accept," the Internet-based collaborative teaching design system may be more useful for novice teachers. They may need more experienced teachers' guidance and practical experiences. Internet technology offers a potential way for them to have connections with experienced teachers. It is further hypothesized that to facilitate teachers' collaboration on developing instructional activities, the web system needs to provide a clear framework or instructional sequence, as the one proposed in this study. Concrete examples are also required. If the topic is too broad or too vague, the collaboration may not achieve satisfactory quality. This system will soon begin its actual implementation by a group of junior high school science teachers across a variety of schools in Taiwan. Its effectiveness will be evaluated and reported in the future.

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