College students' perceptions of learning and knowledge transfer in problem-based video instruction: A case study

Hee Jun Choi
Hongik University
KOREA
heejun.choi@gmail.com

Abstract

The purpose of this study was to investigate college students' perceptions of learning and knowledge transfer in problem-based video instruction. To achieve this purpose, this study compared students' interview data of learning and knowledge transfer in problem-based video instruction (PBVI) that was produced for an undergraduate course of the special education field with those in two other kinds of instruction: (a) problem-based text instruction (PBTI) and (b) problem-based video instruction without group discussion (PBVI w/o GD) by using the constant comparison method. This study implies that the use of video in problem-based instruction can positively affect college students' perceptions of learning and knowledge transfer and that group discussion should be carefully structured in order to improve its effectiveness in problem-based instruction.

Keywords
*problem-based video instruction; perception of knowledge transfer;
perception of learning; group discussion; the use of video*

Introduction

Problem-based learning is a learner-centered educational strategy using contextualized realistic problems and peer support to enhance practical applications of what students have learned (Barrows, 2000). McMaster University, a Canadian medical school, first adopted problem-based learning as a pedagogical approach in 1968. At that time, McMaster University adopted problem-based learning as a means to solve the problem that students were unable to apply their scientific knowledge to clinical situations (Neufeld & Barrows, 1974). In other words, problem-based learning was adopted in order to enhance transfer of learning, the degree to which learners effectively apply the skills, knowledge, behaviours, and attitudes gained in a class to either similar or new situations in their real life (Baldwin & Ford, 1998; Haskell, 2001; Wexley & Latham, 1981). The main objectives of problem-based learning are to motivate students; to promote collaboration, self-regulation, long-term retention, and problem solving skills; and to ultimately afford an opportunity to prepare a more competitive workforce (Bechtel, Davidhizar, & Bradshaw, 1999; Vernon & Blake, 1993). In problem-based learning, learners are encouraged to explore and find solutions to complex, contextualized, authentic, and ill-structured problems that reflect a higher order of thinking through small group activities (Barrows, 1985; Bechtel et al., 1999; Bruning, Schraw, Norby, & Ronning, 2004; Camp, 1996).

The most typical problem-based learning model might be Barrows' model (1985, 2000), containing three major features: (1) using a problematic situation, (2) encouraging student-centered learning, and (3) utilizing small group discussions. Although Barrows (1985, 2000) proposed a well-defined model of problem-based learning, it might be difficult to provide an inclusive definition of problem-based learning that will fit its various applications. The application of problem-based learning has been expanding from medical education to business education,

engineering education, and K-12 mathematics classes. However, the major components and the format of problem-based learning differ from one learning setting to another based on the goal of the program or the nature of the subject matter (Boud, 1985).

Despite its diversity, general problem-based learning requires students to work in small groups to analyze and resolve problems (Allen, Duch, & Groh, 2001). According to the meta-analysis by Springer, Stanne, and Donovan (1999), small-group discussion can positively affect students' academic achievement, attitudes toward learning, and social maturation in comparison with traditional methods. However, other empirical studies show that small-group discussion does not have statistically significant and positive impacts on students' academic achievement (DeClute & Ladyshewsky, 1993; Keeler & Voxman, 1994; O'Brien & Peters, 1994). These inconsistent research findings imply that group discussion does not always play a key role in enhancing students' academic achievement.

Constructivists contend that problem-based instruction that adequately uses instructional media will be very effective for the enhancement of knowledge construction and transfer (Jonassen, Peck, & Wilson, 1999). Among the variety of instructional media, video technology is believed to be particularly useful and suitable for problem-based learning because it can convey setting, characters, and action in a more interesting way and can portray more complex and interconnected problems (Anderson, Armbruster, & Roe, 1989; Cognition and Technology Group at Vanderbilt, 1992a; Overbaugh, 1995). In addition, video stories can help learners more easily understand and remember content in comparison with expository materials (Jonassen et al., 1999). The research of Baggett (1984) and Kozma (1991) supports this argument. According to their findings, information obtained visually is more memorable, and the simultaneous processing of both auditory and visual information increases learner comprehension and retention. Consequently, the use of video in problem-based instruction that requires learners to understand contextual information could have many benefits for enhancing learning and knowledge transfer.

A few studies have empirically investigated the potential of problem-based video instruction (Cognition and Technology Group at Vanderbilt, 1992b; Shyu, 2000). However, they failed to identify which aspect of the video technology or the pedagogical approach embedded in the instruction actually affected students' learning and attitudes (Choi & Johnson, 2007). Therefore, Choi and Johnson (2007) explored the actual effects of the two major components of problem-based video instruction (i.e., video and group discussion) on students' learning by using a research design that can differentiate between the pedagogical approach and the video technology embedded in the problem-based instruction. Even though the study of Choi and Johnson (2007) further contributed to the current body of research on problem-based video instruction, it could not provide in-depth information on students' reaction to the instruction, which can provide insights on how the two major components of problem-based video instruction could help students learn. Accordingly, this study aims to investigate students' perceptions of learning and knowledge transfer in problem-based video instruction in order fully to understand the potential of the instruction.

Research questions

What are learners' perceptions of learning in each method of instruction (i.e., problem-based video instruction, problem-based text instruction, and problem-based video instruction without group discussion)?

What are learners' perceptions of knowledge transfer in each method of instruction (i.e., problem-based video instruction, problem-based text instruction, and problem-based video instruction without group discussion)?

Methods

Research design

In order to explore participants' perceptions of the effectiveness of problem-based video instruction (PBVI), in comparison with that of other instructional methods; problem-based text instruction (PBTI), problem-based video instruction without group discussion (PBVI w/o GD), the author randomly assigned the participants to one of the three groups. Each group of the participants received the instruction on the undergraduate course "Introduction to Mental Retardation" in Fall, 2005 by the assigned instructional method.

PBVI was the instructional method based on constructivist learning principles. In PBVI, students were first asked to view a video that represented how challenges related to that week's lesson appear in real life. They were then required to form small-groups of five students and participate in the small-group discussion. Students were given a guideline for the group discussion. The guideline informed students how to approach several issues in the video and sequence for problem-solving activities. The sequence of problem-solving activities reflected the processes used in the real application. In other words, the guideline included purposeful discussion tasks related to problem-solving activities. During the group discussion, students had to find and solve problems related to real-life challenges presented in the video through collaboration with their peers. Each problem was integrated from a variety of disciplines with regard to that week's lesson. Accordingly, students had to apply multiple disciplines in order to solve each problem. There was no one solution to the problem. In addition, a facilitator tried to make students actively participate in the group discussion. Finally, students were individually asked to generate and synthesize the key principles of what they had learned. The video that was used in PBVI focused on a lesson about the issues that the family of a person with mental retardation might confront, such as initial adjustment, services, unique reactions, aging parent, and collaboration issues. The video, a nonfiction documentary of a person with mental retardation, included major issues related to contents of the lesson in order for students to solve open-ended problems about the issues. Consequently, PBVI reflected the situations to which the knowledge that students have learned would be transferred.

Meanwhile, the problem-based text instruction (PBTI) was identical to PBVI except that the real-life challenges that were shown in the video of PBVI were presented in a text format. The text story of PBTI was based on the narrations, interviews, and subtitles in the video of PBVI. Content in the text story of PBTI was identical to that in the video of PBVI. In addition, the problem-based video instruction without group discussion (PBVI w/o GD) was identical to PBVI except that the problem-solving activity was individually conducted rather than through group discussion.

Sample

The sample was 15 undergraduate students majoring in a social science field at a large midwestern university. The sample was selected through a convenience sampling procedure, selecting participants based on their availability for the study (Henry, 1998). An instructor who teaches a course titled "Introduction to Mental Retardation" indicated willingness to participate in the study. Thus, the sample for this study consisted of students who registered for this course which was offered in the department of special education in fall, 2005. A total of 15 students from the three groups who voluntarily agreed to participate in the interviews were interviewed at the end of the semester.

Data sources and analysis

The primary data sources for this study were in-depth interviews with 15 participants who registered for the course. At the end of the semester, the author recruited 5 students from each group (by a convenience sampling procedure; Henry, 1998) and individually interviewed them to gather in-depth information on their perceptions of the learning and knowledge transfer gleaned from the instruction. A semi-structured interview protocol was used in this study. The examples of interview questions are as follows; Do you think that the use of video in the problem-solving activity was helpful to your learning? Why or why not? Would it be equally effective if the story had been presented with a text format? The interview questions were reviewed by an expert in qualitative research in order to verify that the instrument was designed to obtain needed information for this study. The interviews were recorded after getting the participants' permission, and the recorded audiotape was transcribed.

The qualitative data were analyzed using reflective analysis, a process in which the researcher relies primarily on intuition and judgment in order to portray or evaluate the phenomena (Gall, Gall, & Borg, 2003), and the constant comparison method which makes the opinion of the participant more prominent (Strauss & Corbin, 1990). Constant comparison method was used to make it easy to discern similarities and differences of individual experiences in each group. The qualitative data were categorized to answer the two research questions through open coding. Based on this analysis method, the following results were abstracted and presented in a way that similarities and differences of participants' reaction according to the type of instruction that they had could be recognized. In addition, the researcher tried to include the students' direct statements as much as possible in order to provide readers with a deeper understanding of students' perceptions of learning and knowledge transfer.

Results

Participants' reactions to learning in each method of instruction

According to the 15 students' responses, learning was interpreted in terms of comprehension and retention. The key factors that can affect learners' perceptions of comprehension and retention for each method of instruction were extracted through reflective analysis and constant comparison method of the interview data. Based on the interview data, learners who participated in the PBVI and PBVI w/o GD perceived that the use of video and problem-solving activities through group discussion or individual work were the major factors that contributed to enhancing their learning.

PBVI participants' reactions to the impact of video on learning

In general, the participants from the problem-based video instruction perceived that the use of video was helpful in enhancing their understanding and retention because the video made them pay attention to it, allowed them have a vicarious emotional experience, and gave them motivation to learn further. The major reactions of the participants to the use of video were as follows:

> The use of video in the activity was very helpful to my learning. I am still able to remember the video 40 days later, and it was fun to watch. I felt like I got a very real and insightful look into a person who has mental retardation and his family. There are some things that words (a text format) cannot express such as love, its extent, and emotions. The video helped us to feel those emotions involved.

> If the story had been presented with a text format, I may have skimmed a text and missed some key points that I saw in the video. I am a visual learner and watching videos would be a typical, frequent, and normal activity of college students.

> Visuals help me understand things fully and seeing direct interactions and emotions of the people rather than just reading about them. A text format is okay for basic knowledge, but movies give a visual understanding and draw me closer to a situation.

PBTI participants' reactions to the impact of the text story and video on learning

The participants from the problem-based text instruction overall perceived that the text story was helpful to their learning because it illustrated the real-life example. However, they perceived that a video story might be more effective in enhancing their learning because they believe that audiovisual materials might help them to better understand and remember the situation. The participants' perceptions of the use of the text story and video were as follows:

> I think the use of the text story was helpful because it illustrated the real-life example, but I would have liked it better if it was a video, so I could actually see the situation visually. I prefer video-based learning because it is more entertaining and therefore more interesting.

> When I watch something, I remember it better because I am watching it "played out." When reading, I get distracted easier and it takes more work to retain it than hearing and seeing something.

> The text story helped me understand the real world situation. The text story really helped me imagine the situation. I think a video also has a positive impact on learning.

PBVI w/o GD participants' reactions to the impact of video on learning

The participants from the problem-based video instruction without group discussion also perceived that the video story was very helpful to their learning. They responded that the visual with emotion helped them better understand and remember the situation because a video format better illustrates certain key points or examples. The participants' major reactions to the use of video were as follows:

> The video made it easier to remember certain situations where services for the family could be used. If it was a text format, I doubt I would have remembered the story very vividly.

> The video definitely helped my attention because seeing the people instead of reading text out of a book made it more interesting and enjoyable to learn. It made me care much more about the topic because I could empathize with people in the video.

> With a video format, I could see a visual with emotion that gave me a much better understanding. It is just not as powerful as when you can see a person cry as opposed to them saying they cried.

Participants' perceptions of the impact of group discussion on learning

As for group discussion, seven of 10 participants from the two groups that used group discussion (i.e., PBVI and PBTI) perceived that group discussion positively affected their learning. Four of five participants from the group without group discussion (i.e., PBVI w/o GD) also answered that group discussion might be helpful to their learning. The participants who showed positive reactions to group discussion believed that group discussion might be able to better reinforce their learning by exposing them to different thoughts and perspectives. However, four of 15 participants from the three groups perceived that individual activity might be more beneficial for their learning than group discussion, due to their learning style, so that they can pay more attention to individual activity.

Positive reactions to group discussion

Eleven of 15 participants from the three groups perceived that group discussion could enhance their learning because they think that group discussion allows them to share a variety of opinions and thoughts and to generate new knowledge. The following were the major positive responses to the group discussion:

> Group discussions provide different perspectives that an individual might not think about. There were some details that group members were able to bring up that were important to the responses.

> I could share my thoughts in a group and see how others react and how they build on my idea offering other suggestions. I feel I learn more from interacting with others and it helped me generate new knowledge.

> The group discussion would also help grab the minor details of the story. When we talked about the specific parts of the story, each person said something about what they thought. I could see the different perspectives, so it gave me a broader range of how people think.

Negative reactions to group discussion

Four of 15 participants answered that group discussion may not be helpful to their learning because they can pay more attention in an individual activity and learn best by working on their own. In particular, one participant responded that she felt ignored by a more talkative group member, so her group discussion was not effective. The main negative reactions to group discussion of the participants from the three groups were as follows:

> I did not really know my group members. I think that made it difficult to work together. Actually, I do not like teamwork because I cannot pay attention to something in a group. It usually takes a longer time to complete something in group work.

> Most people did not open up and share with the group. Only one talkative student expressed her thoughts in the group activity. I felt ignored by the students. My group was quiet, so we did not discuss much.

> I prefer individual work to group work because I am comfortable when I am doing something individually. That is my learning style.

Participants' reactions to knowledge transfer in each method of instruction

In the interview, the participants were asked whether they could apply what they learned from the instruction to similar situations, and whether they learned anything from the instruction that might be useful in different contexts. All participants from the two groups that used the video story (i.e., PBVI and PVBI w/o GD) expressed high confidence in their ability to transfer the learning to similar and different contexts. However, three of five participants from the group that used the text story (i.e., PBTI) were not sure whether they could apply what they learned to similar and different contexts. Consequently, the video story more positively affected learners' perceptions of knowledge transfer than the text story in problem-based instruction.

PBVI participants' perceptions of knowledge transfer

The participants from the problem-based video instruction responded that they were able to apply what they learned from the instruction (i.e., how to help a person with mental retardation and his/her family who have a different cultural background) to similar and new contexts. Their high confidence in knowledge transfer was because they perceived that the problem-solving activity

through video helped them relate what they learned to a real-life situation and develop applicable knowledge to different contexts. The responses of the participants from the problem-based video instruction were as follows:

> I can apply what I learned from the instruction to similar situations because I was able to learn appropriate and kind ways to behave and love towards people with mental retardation, modeling after his mom from watching the video.

> Activities like this allow us to see the situation from a different perspective and be able to put ourselves into that situation. I think this instruction was valuable because often times we cannot relate what we learned to our own lives. I think the general understanding of the struggles that a family can go through can be useful in the future. Upon seeing a video like this, one is now aware of cultural differences and able to attribute those to future circumstances. This can be translated to various contexts in life and not simply with mental retardation or disabilities.

> Having watched the video makes it easier to understand complex things or emotions. Those things are not so easily seen in a text. So yes, I feel that it would be helpful in enhancing my applicability to both similar and new situations.

PBTI participants' perceptions of knowledge transfer

Three of five participants from the problem-based text instruction expressed low confidence in their ability to transfer the knowledge they learned in this lesson. They answered that they cannot apply what they learned from the instruction to both similar and different contexts because they do not remember large portions of the instruction. They thought that they needed to see or experience something related to the content to improve their ability to apply it to similar and new situations. However, two participants perceived that they could apply the knowledge to similar and new contexts because they learned what to do and what not to do. The major responses of the participants from the problem-based text instruction were as follows:

> I do not think that I can apply what I learned through the instruction to similar and different contexts. After I experience or see something related to the content, I might be able to apply it to my life. Actually, I do not recall the majority of the lesson, so I am not confident in applying it to real contexts.

> I am not sure that I can apply it to real-life situations because I forgot large portions of what I learned. I think I am better able to recall things that I have seen and heard.

> I learned what to do and what not to do when dealing with someone like him through the instruction. I think I will be able to apply those to real situations.

PBVI w/o GD participants' perceptions of knowledge transfer

All participants from the problem-based video instruction without group discussion perceived that they can apply what they learned from the instruction to both similar and new contexts because what they saw in the video and experienced in the learning activity helped them better understand and remember the content. The responses of the participants from the problem-based video instruction without group discussion were as follows:

> I think that I would be better equipped to help someone from what I learned. I now have some knowledge about those situations, so I feel more comfortable and capable with helping someone. What I saw in the video and experienced in the learning activity gave me such confidence.

I think if I was in contact with a person with mental retardation, this lesson would help me better understand him and what services should be provided for him. I think it would be helpful to my career in terms of having experience with a family dealing with mental retardation. I remember the interactions between family members, their feelings, and problems they should deal with.

I can effectively deal with a person like him in the video with respect and kindness. Emotional parts in the video led me to be able to apply what I learned to similar situations. I learned that sympathy is a must.

Conclusions and Discussion

Conclusion 1: Students perceive that video is a more effective medium than text to present real-life situations through problem-based instruction in order to enhance their learning

According to this study, the use of video more positively affected students' perceived learning in terms of comprehension and retention than the use of text in problem-based instruction. This result is supported by the following studies. Research regarding the Jasper series, which was conducted by Cognition and Technology Group at Vanderbilt (1992b) and Shyu's study (2000) showed that video-based anchored instruction helped students understand what they learned through the improvement of problem-solving skills. Choi and Johnson (2007) investigated whether problem-based video instruction can help enhance student satisfaction, comprehension, and retention. In their study, the problem-based video instruction was more effective for learner satisfaction, comprehension, and retention than the problem-based text instruction. Baggett (1984) and Kozma (1991) also contend that the simultaneous processing of both auditory and visual information can help learner retention. Jonassen et al. (1999) argue that video stories can help learners more easily understand and remember content in comparison with expository materials. Consequently, the previous research findings and researchers' arguments are congruent with the participants' perceptions of learning that video is a more effective medium for student comprehension and retention than text as a delivery means of real-life situations in problem-based instruction.

Conclusion 2: Students perceive that group discussion does not necessarily improve their learning more than individual work in problem-based instruction

According to the findings, approximately one-third of the participants perceived that individual activity might be more beneficial for their learning than group discussion whereas the rest of the participants perceived that group discussion might be able to better reinforce their learning by exposing them to different thoughts and perspectives. These participants' responses are congruent with the previous inconsistent research findings. Some research findings indicate that small-group discussion has significantly higher positive effects on students' learning (Springer et al., 1999) whereas other empirical studies show that small-group discussion does not have significant positive impacts on students' learning (DeClute & Ladyshewsky, 1993; Keeler & Voxman, 1994; O'Brien & Peters, 1994).

The following arguments explain the reasons why group discussion is not always beneficial to student learning. Aamodt and Keller (1981) contend that group discussion might not be helpful to those students who are quiet and shy by nature. Allen et al. (2001) also argue that group discussion does not benefit students who feel less responsibility for collaborative learning. According to the interview data from this study, some students reported that they usually pay more attention to individual activity than to group discussion and learn best by working on their own. These students might feel a much bigger responsibility for their individual learning, so the group discussion could

not be a catalyst to enhance their academic achievement. In addition, students probably need to have prerequisite activities that promote an ideal atmosphere for collaborative learning before small-group discussion because it might be intimidating for students who were not familiar with group learning (Johnson, Johnson, & Smith, 1998). Such prerequisite activities might lead to more productive learning through small-group discussion (Johnson et al., 1998). The empirical study of Choi and Johnson (2007) support these arguments by showing that the effect of small-group discussion on student learning was not different from that of individual work in problem-based instruction.

Conclusion 3: Students perceive that the use of video more positively affects students' perceptions of knowledge transfer than the use of text regardless of group discussion in problem-based instruction

The findings of this study show that students who saw real-life situations through a video format (i.e., students in PBVI and PBVI w/o GD groups) expressed higher confidence in their ability to transfer the learning to similar and new contexts than students who saw them through a text format (i.e., students in PBTI group). In this study, some students reported that video creates empathetic or vicarious experience with the real-life situations while a text format is usually dry and uninteresting, so they can better understand and remember the situation when they see, and hear it. They mentioned that these advantages of video helped them to build confidence in the knowledge transfer. These statements are congruent with the belief that mastery of the original subject (i.e., the level of students' understanding and retention) might be the most basic factor influencing transfer (Bransford & Stein, 1993; Klahr & Carver, 1988; Littlefield, Delclos, Lever, Clayton, Bransford, & Franks, 1988).

The findings from this study are also supported by the inductive integration of the following researchers' arguments and research findings. Johnson (1995) argues that learning should reflect the situations to which the knowledge or skills will be transferred in order to be useful outside the classroom. The research findings of Anderson, Reder, and Simon (1996) also indicate that transfer can be enhanced by having learners see the potential transfer implications of what they are learning. Consequently, video that reflects the situations to which the knowledge or skills will be transferred has the potential to enhance students' confidence in knowledge transfer.

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