The Effect of Problem-Based Video Instruction on Learner Perceptions of Learning and Knowledge Transfer

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The purpose of this study was to investigate the effects of video and group discussion in problem-based video instruction on learner perceptions of learning and knowledge transfer. To achieve this purpose, this study compared learner perceptions of learning and knowledge transfer in problem-based video instruction (PBVI) with those in two other kinds of instruction. This study implies that the use of video in problem-based instruction can positively affect adult learners' learning and knowledge transfer.

Keywords: Problem-Based Learning, Video and Group Discussion, Knowledge Transfer

Problem-based learning is a learner-centered educational strategy using contextualized realistic problems and peer support to enhance practical applications (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, behaviors, and attitudes gained in a class to either similar or new situations in their real life (Baldwin & Ford, 1998; Haskell, 2001).

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 as follows: (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 a small group 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 catalytic 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.

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This study investigated the impacts of the two major components of problem-based video instruction (i.e., video and group discussion) on students' perceptions of learning and knowledge transfer in order to further contribute to the current body of research on problem-based learning.

Research Questions

For the purposes of this study, the following questions were addressed:

1. 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)?
2. 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 on 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 course "Introduction to Mental Retardation" in Fall, 2005 by the assigned instructional method. All the participants majored in a social science field at a large midwestern university.

Problem-based video instruction (PBVI). 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. 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. 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. The video, a nonfiction documentary, included every issue related to contents of the lesson.

Meanwhile, the problem-based text instruction (PBTI) was identical to PBVI except that the real-life challenges were presented in a text format. 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.

Data Sources

The primary data source of this study was 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. The interviews were recorded after getting the participants' permission, and the recorded audiotape was transcribed

Interview protocols. The author used a semi-structured interview protocols. The examples of interview questions are as follows; Do you think that the use of *video in* the 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. It took 30 minutes to conduct each one-on-one interview.

Data Analysis

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 constant comparison method that makes participant's opinion more prominent (Strauss & Corbin, 1990). The participants' responses in the interview protocols were analyzed to discern similarities and differences of individual experiences and then were synthesized to answer the two research questions. 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 learner comprehension and retention for each method of instruction were extracted through reflective analysis of the interview data. Based on the interview data, learners 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.

Participants' Reactions to the Impact of Video on Learning

Fourteen of 15 participants from the three groups responded that the use of video was or might be helpful to their understanding and retention. They indicated a high value for the capability of video technology to effectively transmit people's emotion and sophisticated interactions or relationships. All participants from the two groups that used the video story in the activity (i.e., PBVI and PBVI w/o GD groups) responded that the video helped them understand and remember the content. In addition, four of five participants from the problem-based text instruction (PBTI) group said that the use of the text story in the activity was helpful to their learning, but it would have been more effective if the story had been presented with a video format. Only one participant from the problem-based text instruction responded that there would not be a big difference in learning effectiveness between the text and video stories because the text story helped her imagine the situation. This participant responded that a text story usually makes her imagination active, and the advantages of a video story mentioned by other participants could be matched by such an occurrence. The following are the relevant statements made by the participants, taken directly from the interview recordings.

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:

> *I think the video was easier to understand and remember rather than a text format because I feel that I learn visually. 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.*
>
> *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.*
>
> *Because we were learning about a person with mental retardation, it is much easier to relate with or see what he has to go through. I don't feel this would have been presented as well on text. The video was easy to watch and pay attention to and did motivate me to think about the topic.*

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 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."*
>
> *The text story gave me a personal feel. However, a video format would be more effective because I learn better from visuals. If I saw what I read, I would better understand and remember the situation.*
>
> *The text story was helpful to learning because it was kind of a case study that covers specific situations and then we could discuss about. If there was a video with the story, it would be more effective because visual aspects would help us understand and remember the situation.*
>
> *I think there would not be a big difference in learning effectiveness although it was a video story. The text story really helped me imagine the situation. A text story usually helps me have an active imagination. It would be the biggest merit of reading.*

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:

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. With reading or rather a descriptive written format of emotion, it is not as easily understood how much it really affects the person.

The video would be much better in remembering the situation surrounding the people. I think learning from visuals is always good. The text story would not be effective because I cannot see what his mother is feeling, the relationships between the two brothers, and other emotional aspects.

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:

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 a group work.

Most people did not open up and share with the group. Only one talkative student expressed her thought in the group activity. I felt ignored by the student. 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. I am somewhat quiet (by nature), so I prefer working on my own.

Reactions to the Impact of Individual Problem-Solving Activities on Learning

The participants from the problem-based video instruction without group discussion responded that individual problem-solving activities really helped them understand and remember the information because it made them pay more attention to the learning. The major responses were as follows:

Individual problem-solving activity was definitely helpful in the video lesson because a lot of times we may watch the video while missing a certain thing. But I carefully watched the video in order to answer the questions.

Individual activity was helpful because when I find and solve the problems, it helped me understand and remember it. The learning activities were really helpful because solving the problems was reinforcing what I saw and understood.

The video kept me interested while the individual problem-solving activity forced me to think about, review, and analyze what I had just seen. You gave us the worksheet, and that really helped reinforce the information because you gave it to us right away. The learning (individual) activity gave me a chance to critically think about what I learned.

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 might be able to apply what they learned from the instruction 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:

The video activity was definitely a strong reinforcement for what the class learned because it helped me to relate the content to the real-life situations. In addition, the video activity was very helpful in developing generalized knowledge useful for different contexts. I believe I learned knowledge that I can apply to different contexts in my future life.

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. 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. 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 really remember what was in the instruction. If I saw the situation I read, I would probably understand it much better than when it is in text. When I see something, it comes to mind easier. Frankly speaking, it will be difficult for me to apply it to real situations for now.

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.

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.

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:

What I saw in the video and experienced in the learning activity gave me such confidence. I am going to graduate school for social work, so I think the information I learned will be very beneficial. If I work in a hospital or other social institution, I will surely encounter people in situations like the video and new situations. I will know how to help them because I experienced how to solve the problems the family faced.

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 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: Video can Be a More Effective Medium Than Text to Present Real-Life Situations Through Problem-Based Instruction in Order to Enhance Students' 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 (2005) investigated whether video-based instruction can help enhance student retention. In their study, students reported that the video-based instruction was more memorable than the traditional text-based instruction. Baggett (1984) and Kozma (1991) also argue that information obtained visually is more memorable, and that the simultaneous processing of both auditory and visual information can aid learner retention even though it is not based on the statistical testing of hypotheses. Jonassen et al. (1999) contend 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: Group Discussion Does not Necessarily Improve Students' Perceptions of 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).

There might be three major reasons why small-group discussion is not always beneficial to student learning. First, small-group discussion does not benefit students who tend to be quiet and shy by nature. Aamodt and Keller (1981) argue that students can be segmented into two types: students who have either a high probability of discussion group participation or a low probability of discussion group participation. They suggest that those students who have a low probability of discussion group participation should be advised to take a course without group discussion. Ultimately, small-group discussion might not be helpful to those students who were quiet and shy by nature.

Second, small-group discussion does not benefit students who feel less responsibility for collaborative learning. Small-group discussion can make students feel cheated by inactive group members or discounted by more aggressive group members (Allen et al., 2001). 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.

Third, it might be intimidating for students who have not experienced group learning to undertake small-group discussion. The students who participated in this study had never experienced small-group discussion in the course before the treatment. There were also no stated guidelines for creating a good discussion atmosphere, such as group ground rules and roles of responsibility within their groups. Students probably need to have prerequisite activities that promote an ideal atmosphere for collaborative learning before small-group discussion. Such prerequisite activities might lead to more productive learning through small-group discussion (Johnson, Johnson, & Smith, 1998). In addition, students should be asked to feel accountable for their own performance by establishing group ground rules and taking on roles of responsibility in their groups (Allen et al., 2001).

Conclusion 3: The Use of Video can More Positively Affect 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 other words, group discussion was not an influential factor that can affect students' perceptions of knowledge transfer. 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.

Implication in HRD

According to the findings of this study, the use of video in problem-based instruction can contribute to enhancing learner perceptions of learning and knowledge transfer. These findings can provide Human Resource Development (HRD) practitioners with insights about which medium is effective for learning and knowledge transfer, which is a major concern of organizations seeking better outcome of training. Ultimately, HRD practitioners need to consider the use of video as a delivery medium of real-life situations in their problem-based instruction in order to enhance its effectiveness.

HRD practitioners in organizations can get the following insights from this study in order to develop effective problem-based instruction. This study showed that the inconsistent impacts of group discussion on learners' perceived learning in problem-based instruction. Small-group discussion might not be beneficial to those who tend to be quiet by nature and prefer to learn on their own. Accordingly, the instructor needs to provide learners who are quiet and shy with support in order to improve their performance in group discussions, so that they can be successful in the overall problem-based instruction. In other words, the instructor needs to arrange moderators who will encourage more frequent interaction among the quiet learners and provide them with special training for active group participation. In problem-based instruction, group discussion also did not benefit those students who feel less responsibility for collaborative learning. The instructor should carefully plan and organize group discussion for these students. As a means to promote learner responsibility in group discussion, the instructor needs to make a detailed guide for group discussion that includes each group member's role and tasks, the rewards and punishments according to contribution level, and the equal division of individual presentation time (Cooper & Mueck, 1990). Structured group discussion will be able to improve the effectiveness of group discussion in problem-based instruction by helping learners more actively participate in the group discussion.

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