Designing and implementing a PBL course on educational digital video production: lessons learned from a design-based research

Päivi Hakkarainen

Published online: 25 April 2007
© Association for Educational Communications and Technology 2007

Abstract This paper reports on a design-based research (DBR) process for designing, implementing, and refining a problem-based learning (PBL) course on educational digital video (DV) use and production at the University of Lapland’s Faculty of Education. The study focuses on the students’ learning processes and outcomes from the viewpoint of meaningful learning. The research subjects included two pilot students and ten students enrolled in the course. To promote the reliability of the findings, data of various kinds and from multiple sources were used, including video recordings of the PBL tutorial sessions. The results suggest that PBL offers a good model to support students’ knowledge and skills in producing and using educational DV. In addition, the results suggest that DV production can be used as a method to learn about the subject matter of the DVs.

Keywords Design-based research · Meaningful learning · Problem-based learning · Students-as-video-producers

Introduction

Aim of the research

This paper reports on the first cycle of a design-based research (DBR) process for designing, implementing, and refining a problem-based learning (PBL) course on educational digital video (DV) use and production for the media education curriculum at the University of Lapland’s Faculty of Education. A special feature of the course is that the students design and produce educational DVs for the teachers of the Faculty of Education
to be used as course material. Therefore, the research also tests a new model of educational DV production for the Faculty.

During the first stage of the DBR process, two media education students (hereafter ‘pilot students’) piloted the educational DV production process as part of their studies. The task was assigned to them by the teacher-researcher responsible for designing the PBL-based Digital Video course. For the DVs the pilot students interviewed experts on educational program production. The aim of the first stage of the research process was (1) to examine, from the viewpoint of meaningful learning, the pilot students’ experiences of the DV production process, and (2) to use these experiences in the Digital Video course design. During the second stage of the research process, the Digital Video course was implemented for the first time with an aim (1) to examine, from the viewpoint of meaningful learning, the students’ learning processes and learning outcomes, and (2) to use the research results in refining the course.

The article begins with a discussion on the background and previous research and a presentation of the design framework. After this, a description of DBR, the course design, and the implementation procedure is provided. The article then presents the research questions and reports on the data collection and analysis procedures. The results are discussed according to the two stages of the DBR cycle: designing and implementing the PBL course. Finally, general conclusions are drawn.

Background and previous research

The general aim of this research has arisen from challenges faced by higher education, resulting from changes in working life and the advancement of DV technology. In addition to domain-specific knowledge and skills, students will need to develop their generic skills especially in self-directed learning, learning-to-learn, collaboration and co-operation, creative thinking, problem-solving (National Centre for Vocational Education Research, 2003; Poikela & Poikela, 2005b; Tynjälä, 2001), and information literacy (Bruce, 1998). It has been argued that PBL is a valuable approach that has potential to meet these challenges (Poikela & Poikela, 2005b).

During the past decade, DV has developed from an expensive and rather clumsy medium to a cheaper and user-friendly one. Non-specialist teachers and students are now able to produce and distribute DVs more easily than before (Kearney & Schuck, 2005; see also Fraser & Oram, 2003; Jonassen, Howland, Moore, & Marra, 2003). Despite the technological advancements, the pedagogical possibilities in higher education afforded by students’ DV productions are still largely unrealized in fields other than arts, media studies, and communication sciences (for exceptions, see Schwartz & Hartman, in press). Accordingly, the amount of in-depth research on students as producers of DV is scant within the area of higher education (Jonassen et al., 2003; Kearney & Schuck, 2005; Schwartz & Hartman, in press). The main focus of research has been on the use of DV in higher education (e.g., Brophy, 2004). However, the small body of research on university students as producers of DV suggests that the production process can promote the active (Hung, Keppell, & Jong, 2004; Hakkarainen, Saarelainen, & Ruokamo, 2007), intentional, constructive, authentic, cooperative, creative (Hung et al.), collaborative, conversational, contextual, and emotional aspects of students’ meaningful learning processes (Hakkarainen et al.). Research results from the field of participatory design of computer applications, software, multimedia, or hypermedia learning materials suggest that engaging university
students (Kiili, 2005; Strobel, 2006) or school pupils (Jonassen et al., 2003) in design and production processes can increase their understanding of the subject matter.

Design framework

The pedagogical model for teaching and meaningful learning

The pedagogical model for teaching and meaningful learning (TML) (Fig. 1), developed by Hakkarainen et al. (2007) on the basis of the integrated model of network-based education introduced by Vahtivuori et al. (2003; see also Vahtivuori-Hänninen et al., 2004), was used as the general design framework. According to the model, meaningful learning refers both to the student’s learning process and to the expected outcomes (for a more detailed description of the model, see Hakkarainen, 2006; Hakkarainen & Saarelainen, 2005).

A special focus of the research is information literacy, which is defined as one of the expected learning outcomes of meaningful learning in the TML model. Information literacy can be summarized as skills in determining the extent of information needed and thereafter accessing, evaluating, and using the information effectively and critically (Association of College & Research Libraries, 2000).

Problem-based learning

The Swedish Linköping University PBL model, as modified by Poikela and Poikela (2005a, pp. 36–38) (Fig. 2), was also used to develop the Digital Video course. This design model works mainly on the operational level and shares the ideas of the TML model. In this cyclical model, the learning and problem-solving cycles are structured into eight

Fig. 1 TML model for teaching and meaningful learnings

© Springer
phases. A PBL cycle consists of collaborative learning achieved in two tutorial sessions: the first session covers phases 1–5 and the second phases 7–8. Independent knowledge acquisition (phase 6) is situated between the two tutorial sessions.

PBL starts from dealing with problems arising from professional practice. Accordingly, the PBL curriculum is organized around problems rather than according to topics or academic disciplines (Poikela & Poikela, 2005b). Authentic, ill-structured problems, which are understood as learning tools, are encountered by small groups before any study has taken place (Barrows, 1996). Student-centeredness, small-group work, self-directed learning, experiential learning, and the tutor’s role as a facilitator have been identified as core characteristics of PBL. In addition, PBL emphasizes the crucial importance of critical and reflective thinking skills, contextual knowledge, and the integration of disciplines (Barrows, 1996; Hmelo-Silver, 2004; Poikela & Poikela, 2005b).

The importance of assessment and evaluation systems, including the students’ self-evaluation, is emphasized (Dochy, Segers, Van den Bossche, & Gijbels, 2003; Poikela & Poikela, 2005b). In addition, the active role of the students is considered crucial. The active role also means being a subject in the assessment processes (Poikela & Poikela, 2005b). Finally, the “in time” approach, as opposed to the “in case” approach, to learning is an important aspect of PBL: students “learn what they need, when they need to know it” (Kwan, 2000, p. 2).

Design-based research

The research is conducted as a DBR process, which in this study is understood as developing, testing, investigating, and refining (1) the learning environment designs, such as the technological tools, curriculum, learning activities, software, school organizations, and school community collaboration, and (2) the theoretical constructs, such as the

Springer
pedagogical models that support learning and illustrate and predict how learning occurs (Barab & Squire, 2004). It has been argued that this dual goal of meeting local needs and advancing the theory is the critical component of DBR (Barab & Squire, 2004; Collins, Joseph, & Bielaczyc, 2004; the Design-Based Research Collective [DBRC], 2003; Edelson, 2002; Wang & Hannafin, 2005). According to Wang and Hannafin (2005), the goal of DBR is to generate pragmatic and generalizable design principles.

In addition to the dual goal of DBR, its iterative nature has been underlined (Barab & Squire, 2004; Cobb, Confey, diSessa, Lehrer, & Schauble, 2003; Edelson, 2002; Wang & Hannafin, 2005). According to Edelson (2002), the DBR process proceeds through iterative cycles of design and implementation, and the researcher uses each implementation as an opportunity to collect data to support subsequent design. Within DBR, multiple methods can be used to analyze the outcomes of an intervention and to refine it (Cobb et al., 2003; DBRC, 2003: Wang & Hannafin, 2005).

Designing and implementing the course

Course design

The first stage of the DBR process meant piloting the educational DV production process with two students in order to identify the critical elements of the PBL course on educational DV production. The pilot students, both of them first-year students of media education, had no prior experience of DV production. The students were 30 and 35 years old and they were both female. They produced the DVs as part of their local Project Studies course realized during January–May 2006. The course is part of the Educational Use of ICTs inter-university study program. The students received guidance and feedback both from their local course and from the inter-university program. The guidance focused on managing and evaluating the project from the point of view of project management.

The University of Lapland provided the students with technical how-to sessions on editing (3 h), individual guidance on shooting and editing (2 h), and an introduction to the PBL approach (4 h). The students used basic technology in the DV production: laptops, a DV camera for non-professional use, a tripod, an external microphone, and Microsoft Movie Maker editing software. The teacher-researcher commissioned the production and provided coordination and guidance on the DV production process. The coordination and guidance consisted of one PBL tutorial cycle that included two tutorial sessions of 90 min each. The problem that the students solved during the PBL cycle was the following: How does one produce a digital video that supports the teacher in his or her everyday work and is available to everyone? Between the sessions the students engaged in independent knowledge acquisition for a period of 1.5 weeks. The PBL approach applied was not an orthodox realization of PBL, but rather an experiment on the adaptability of some of its elements. Since the tutorial group was just a dyad of students, the central element of PBL—small-group work—could not be used.

Outside the PBL sessions, the teacher-researcher met with the students three times and provided guidance through e-mail. The teacher-researcher also designed the PBL course for which the DVs were produced. For the DVs, the students interviewed three experts on educational program production at YLE—the Finnish Broadcasting Company. All in all, to accomplish the project the students co-operated with a network of 12 professionals, with their fellow students, and with their personal acquaintances. The PBL course on
educational DV production was then designed on the basis of the design principles derived from the TML and PBL models and the pilot students’ experiences.

Course description

The full name of the course is Digital Video: Supporting Meaningful Learning through Using and Producing Digital Videos. It is a new and optional course for a master’s degree in media education. The participants are primarily pre-service teacher students and undergraduate students of media education. The students receive five ECTS (European Credit Transfer System) credits for completing the course, which is graded pass/fail. The aim of the course is that the students will be able to (1) recognize and analyze the pedagogical functions of producing and using DVs from the viewpoint of meaningful learning, (2) produce and use DVs in a way that supports meaningful learning, and (3) negotiate the copyright issues related to DV productions. During the course the students will produce, in pairs or in small groups, educational DVs as a commissioned work for Faculty teachers. In addition, the students will analyze the pedagogical functions of the DVs they produce. The students take care of the whole production process: writing the manuscript, shooting, editing, and negotiating the copyright issues. The course is supplemented by a website [http://ktk.ulapland.fi/MKAS2211/] with links to suggested learning resources and to the DVs produced by the students. The designer of the course is also the responsible teacher and PBL tutor of the course.

Ten students (7 female, 3 male) aged between 20 and 36 enrolled in the first implementation of the course in September–October 2006. The students were second- to fifth-year students. Seven of them had one prior experience of shooting and editing a DV as part of their studies. During the six-week course the students produced in pairs five educational DVs for four Faculty teachers. In terms of the classification of educational video genres by Schwartz and Hartman (in press), three of the DVs were commentary and expository videos featuring a local professor, adult educators, and students discussing and explaining issues relating to teaching and learning. These DVs included also video footage of real-life classroom teaching and learning activities. The other DVs included a trigger video for PBL and a step-by-step demonstration of a handicraft technique. The length of the DVs varied from 1.5 to 10.5 min and they were produced for use as streaming videos over the Internet.

The course started with an introductory meeting, after which the students participated in three PBL tutorial cycles (Fig. 2) that were realized through weekly tutorial sessions (n = 4). The problems to be solved by the students during the PBL cycles were the following: (1) How can we support meaningful learning by using and producing DVs? (2) How to scriptwrite an educational DV? and (3) How to avoid the most typical beginner’s mistakes in shooting a DV? Between the tutorial sessions the students engaged in independent knowledge acquisition in workshops on scriptwriting (8 h), filming (8 h), editing with Microsoft MovieMaker software (4 h), and copyright issues (8 h). In addition, the students used the Internet and the library and attended a 30-min mini-lecture on the role of DVs in meaningful learning. At the end of the course a final assessment meeting was organized.

Research questions

The research questions were the following: (1) From the student perspective, how do the designing and producing of DVs as a commissioned work support meaningful learning? (2)
What implications do the students’ experiences have for the PBL course design? (3) How does the designed PBL-based Digital Video course support the meaningful learning process and outcomes, especially information literacy? And (4) What implications do the results have for the refinement of the PBL course?

Data collection and analysis

To promote the validity, reliability and applicability of the research, data of various kinds and from multiple sources were used (Cobb et al., 2003; DBRC, 2003; Wang & Hannafin, 2005). Because the DBR study focused on a single course and did not seek statistical significance, quantitative analysis was applied as a tool for describing and interpreting the data, and making their internal generalization more explicit. The data were collected and analyzed through the following procedures:

- **Questionnaire to the pilot students.** The questionnaire focused on the emotions that the students experienced during the DV production process. It included 21 Likert-scale questions (0 = not at all, 4 = to a great extent) focusing on the students’ emotions (for a more detailed description of the questionnaire, see Hakkarainen et al., 2007; Hakkarainen & Saarelainen, 2005). The students were asked to indicate to what extent they had experienced a given emotion during the process, and to specify the reasons for this emotion. The students completed the questionnaires four times during the process. The questionnaire data were analyzed quantitatively by extracting the mean values of the students’ ratings and qualitatively by analyzing and categorizing the reasons the students gave for the various emotions.

- **Questionnaire to the students enrolled in the Digital Video course.** Nine of the ten students enrolled in the course completed the questionnaire, which included 23 statements concerning the meaningfulness of the learning process and 13 statements concerning the learning resources and learning outcomes. The students completed the questionnaire two weeks after the course had ended and they had received their grades. They were asked to evaluate the statements using a five-point Likert scale. The statements concerning the meaningfulness of the learning process were operationalized according to the characteristics of meaningful learning chosen for this study, utilizing in part the already existing operationalizations by Nevgi and Tirri (see Nevgi & Löfström, 2005). In addition, 21 five-point Likert-scale questions focused on the students’ emotions (see previous research instrument). The questionnaire data concerning the meaningfulness of the learning process, learning resources and learning outcomes were analyzed quantitatively with SPSS statistical analysis software. The mean values, standard deviations, and percentages of the students’ ratings were calculated. The emotions were analyzed by extracting the mean values and the standard deviations from the students’ ratings. In addition, the reasons given by the students for the various emotions were analyzed qualitatively and placed into thematic categories.

- **Audio recordings of pilot students’ interviews.** The students that piloted the DV production process were interviewed first in a 90-min pair interview in the middle of the process, and then individually in a 60-min interview at the end of the process. The topics of the interviews were specified in advance. The audio data were first transcribed word for word and analyzed according to themes relevant to the TML model.
• **Teacher-researcher's observation journal.** The observation journal had nine entries containing her thoughts and questions evoked by the meetings with the pilot students during and outside the tutorial sessions. These questions also influenced the themes discussed during the research interview. The journal was analyzed qualitatively with respect to the themes relevant to the TML model.

• **Video recordings of the four PBL tutorial sessions and the final assessment meeting of the Digital Video course.** The video recordings comprised 9.5 h of video data. The length of the PBL sessions varied from 1.5 to 2 h. In two of the sessions, 5 min were left unrecorded because the cassettes ran out before the end of the session. One fixed digital camera was positioned at the front of the room to capture the student group and the tutor. The recordings were first transcribed word for word, noting also non-verbal communication (pauses, silences, laughter, humorous tones, hand gestures). Next, the data were analyzed according to the number of tutor comments and student comments. A comment was defined as a meaningful verbal comment ranging from a short "mmm...", indicating agreement, to comments that lasted several minutes. For the purposes of this paper, the student comments were then analyzed and coded into Bales-type function categories (Erickson, 2006). The coding scheme of these pedagogical function categories was mainly developed deductively from the functions constituting the PBL cycle (Fig. 2). In addition, the coding scheme was partly developed inductively to fit the data. A single comment could include units that belonged to two or three different coding categories. About 2.3% (n = 61) of the comments were coded in the category 'inaudible', because the students were talking simultaneously or too quietly or the technical quality of the recording was not adequate. NVivo qualitative data analysis software was used as a tool in analyzing and coding the data. To enhance the reliability of the coding procedures and categories, the entire collection of video data was first viewed several times and then coded in two rounds by the researcher. The video recording of the final assessment meeting (2 h) was first transcribed word for word in a similar way as the PBL sessions were. After this, the process and outcome evaluation performed by the students (n = 10), the commissioners (n = 2), and the workshop teacher (n = 1) was analyzed. In addition, the students’ suggestions concerning the refinement of the course were located and analyzed qualitatively with respect to their themes.

• **Digital Video course students' performance results.** The performance results included an analysis of the pedagogical functions that the students performed and the final products, that is, the educational DVs.

• **Digital Video course commissioners’ feedback.** Two of the four DV commissioners provided feedback to the teacher-researcher by e-mail, while two of them were able to attend the final assessment meeting to provide their feedback. The commissioner feedback was analyzed qualitatively.

**Results and implications**

In the following, the results and implications are presented according to the research questions and with respect to the design framework of the study.
From the student perspective, how do the designing and producing of DVs as a commissioned work support meaningful learning?

The results suggest that the DV production process supported most clearly the individual, contextual, collaborative, and co-operative aspects of meaningful learning. On the other hand, the creative and reflective aspects were not fully realized. The students' emotional involvement in learning was positively-toned, although positive and negative emotions fluctuated dynamically. The students reported having learned about the subject matter of the DVs, the technical processes of shooting and editing a DV, project management skills, and collaboration and co-operation skills. The results of this first research question will be discussed in the following in more detail.

The interview indicated that both students felt that the DV production process clearly supported the individual aspects of learning, since they were able to choose a project in which they were really interested. They emphasized that this was a chance to “learn something in practice,” which was seen as being very important. The contextual aspects—doing something “for real”—were the primary reasons why the students experienced intense positively-toned emotions, such as emotions of challenge.

The collaborative and co-operative aspects of learning were realized especially when shooting and editing the interviews. The analysis of the questionnaire as well as the teacher-researcher’s observation journal indicated that shooting the interviews at YLE was clearly a source of positively-toned emotions of enthusiasm on the one hand, and negatively-toned emotions, such as feelings of inadequacy, worry and stress on the other. However, the research interview indicated that the meaning of collaboration and cooperation at these points was crucial in that the students were able to provide emotional support and modeling to each other. In addition, the research interview indicated that both students had experienced the editing phase as highly collaborative, which confirms the findings of Reid, Burn, and Parker (2002). Both students engaged in collaborative knowledge construction—making judgments and reasoning what is important and relevant to the future viewers of the DVs. They based their editing decisions on this. However, the timing of the technical how-to-sessions on editing was considered one of the defects of the DV production process.

Previous research results concerning the creative aspects of university students’ DV production processes (Hung et al., 2004; Jonassen et al., 2003) were only moderately confirmed. The interview showed that the students thought that even though they had the possibility to practice their creativity in DV production, they did so only moderately. They highlighted that one first has to learn the basic rules of camera use properly before one can start experimenting more creatively. This echoes the views of several DV production experts (Fraser & Oram, 2003; Reid et al., 2002). However, both students saw the tutorials as a good environment that “provokes”, even “forces” one to develop ideas and solutions.

Reflectivity of learning through process and product assessment is a crucial element of both the PBL (Poikela & Poikela, 2005b) and the TML model. However, the systematic peer assessment between the two students and the tutor’s feedback to the students were not realized. This was evident on the basis of the audio recordings of the students’ interviews and the teacher-researcher’s observation journal. For one of the students, the final presentation and assessment meeting of the Project Studies course evoked neither positive nor negative emotions, whereas for the other, it evoked some negative emotions (cf. Fraser & Oram, 2003). She felt that too little time was spent on assessing the DVs and that the viewpoints of the commissioner should have been taken into consideration.
During the second interview the students concluded that scriptwriting was the most difficult part of the process and also a cause for negatively-toned emotions. In addition, when the students were acquiring knowledge independently and focusing on scriptwriting, they had spotted a shortcoming in the existing information. According to the students, no information could be found for "amateur" teachers and students producing DVs as a method of learning. This lack of information has also been reported by Schwartz and Hartman (in press).

What did the students think about their learning outcomes? The interview showed that the editing phase was experienced as the most successful one with respect to learning the subject matter of the DVs. The finding tentatively confirms the research findings in the field of participatory design (Kiili, 2005; Strobel, 2006) and DV production at the K-12 level (Kearney & Schuck, 2005; Jonassen et al., 2003), according to which engaging students in the design and production processes can increase their understanding of the subject matter. Both students reported having learned the technical processes of shooting and editing DVs. In addition, they emphasized that they had learned "real-life" project management, collaboration, and co-operation skills. These learning outcomes have also been reported in K-12 contexts (Kearney & Schuck, 2005; Reid et al., 2002).

What implications do the students' experiences have for PBL course design?

Based on the students' experiences, the following development needs summarize the main lessons learned concerning PBL course design:

- Make use of commissioned DV production, in pairs or in small groups, as a learning resource to promote the contextuality of learning and students' emotional involvement as well as the collaborative, co-operational, and conversational characteristics of learning.
- Design PBL tutorial cycles with authentic problems that support the learning of scriptwriting and shooting of DVs.
- Provide adequate support in PBL tutorials and in "in time" workshops (Kwan, 2000, p. 2) for the stages at which negatively-toned emotions are likely to occur, that is, scriptwriting and shooting the DVs.
- To promote the reflectivity of learning, (a) include student-centered assessment practices to the tutorials (Dochy et al., 2003; Poikela & Poikela, 2005b), and (b) organize a final assessment meeting outside the tutorials in order to celebrate the work done, to enhance the emotional involvement of the students (Fraser & Oram, 2003), and to discuss the commissioners' viewpoints on the final products.

How does the designed PBL-based Digital Video course support the meaningful learning process and outcomes, especially information literacy?

The results suggest that the PBL course supported meaningful learning as defined and operationalized in this research. The realization of most of the process characteristics of meaningful learning were either moderately or strongly supported by the research data analysis. However, the abstract and critical aspects of learning were not, according to the students' experiences, realized to the same extent as the other characteristics of meaningful learning (Table 1). The students reported having learned skills similar to those learned by
<table>
<thead>
<tr>
<th>Process characteristic of meaningful learning</th>
<th>Mean value</th>
<th>Standard deviation</th>
<th>Moderately agree/agree %</th>
<th>Statement in the questionnaire focusing on the process characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Active</td>
<td>4.67</td>
<td>0.50</td>
<td>100.0</td>
<td>Students’ role was to actively acquire, evaluate, and apply information.</td>
</tr>
<tr>
<td></td>
<td>4.89</td>
<td>0.33</td>
<td>100.0</td>
<td>My partner and I were personally responsible for our video production process.</td>
</tr>
<tr>
<td>2. Self-directed</td>
<td>4.67</td>
<td>0.50</td>
<td>100.0</td>
<td>I was able to influence the content and realization of our video assignment.</td>
</tr>
<tr>
<td></td>
<td>4.44</td>
<td>0.53</td>
<td>100.0</td>
<td>The students directed their own studying process in the PBL sessions.</td>
</tr>
<tr>
<td></td>
<td>4.00</td>
<td>0.00</td>
<td>100.0</td>
<td>I was able to evaluate my own learning during the course.</td>
</tr>
<tr>
<td></td>
<td>4.89</td>
<td>0.33</td>
<td>100.0</td>
<td>My partner and I were personally responsible for our video production process.</td>
</tr>
<tr>
<td>3. Constructive</td>
<td>4.67</td>
<td>0.50</td>
<td>100.0</td>
<td>I was able to utilize my prior knowledge about the course topics.</td>
</tr>
<tr>
<td></td>
<td>4.44</td>
<td>0.73</td>
<td>88.9</td>
<td>The course deepened my understanding of what I had learned before.</td>
</tr>
<tr>
<td>4. Individual</td>
<td>4.22</td>
<td>0.97</td>
<td>88.8</td>
<td>It was possible for me to study according to my own personal style that suits me.</td>
</tr>
<tr>
<td></td>
<td>4.22</td>
<td>0.97</td>
<td>88.8</td>
<td>I was able to apply my own practical experiences during the course.</td>
</tr>
<tr>
<td></td>
<td>3.89</td>
<td>1.27</td>
<td>66.6</td>
<td>Studying enabled the achievement of my personal goals.</td>
</tr>
<tr>
<td>5. Collaborative</td>
<td>4.89</td>
<td>0.33</td>
<td>100.0</td>
<td>The students were committed to collaboration.</td>
</tr>
<tr>
<td>6. Co-operational</td>
<td>4.44</td>
<td>1.01</td>
<td>88.9</td>
<td>Co-operation with my partner was successful.</td>
</tr>
<tr>
<td></td>
<td>4.56</td>
<td>0.53</td>
<td>100.0</td>
<td>Co-operation with the commissioner of the video was successful.</td>
</tr>
<tr>
<td>7. Conversational</td>
<td>4.56</td>
<td>0.73</td>
<td>88.9</td>
<td>PBL tutorials helped me to learn.</td>
</tr>
<tr>
<td>8. Contextual</td>
<td>4.78</td>
<td>0.44</td>
<td>100.0</td>
<td>The video assignment helped me to learn.</td>
</tr>
<tr>
<td></td>
<td>4.44</td>
<td>0.53</td>
<td>100.0</td>
<td>The course promoted the learning of skills and knowledge needed in working life.</td>
</tr>
<tr>
<td>10. Goal-oriented</td>
<td>3.89</td>
<td>1.27</td>
<td>66.6</td>
<td>The studying enabled the achievement of my personal goals.</td>
</tr>
<tr>
<td>11. Reflective</td>
<td>4.00</td>
<td>0.00</td>
<td>100.0</td>
<td>I was able to evaluate my own learning during the course.</td>
</tr>
<tr>
<td>12. Abstract</td>
<td>3.44</td>
<td>1.13</td>
<td>66.7</td>
<td>On the course practical examples were studied in a theoretical framework.</td>
</tr>
<tr>
<td>13. Multiple perspectives-oriented</td>
<td>4.33</td>
<td>0.71</td>
<td>88.8</td>
<td>The course helped me to understand different perspectives related to the topics under study.</td>
</tr>
<tr>
<td>14. Critical</td>
<td>3.56</td>
<td>1.24</td>
<td>55.5</td>
<td>The studying developed my critical thinking skills.</td>
</tr>
<tr>
<td>15. Experiential</td>
<td>4.22</td>
<td>0.97</td>
<td>88.8</td>
<td>I was able to apply my own practical experiences during the course.</td>
</tr>
<tr>
<td></td>
<td>4.44</td>
<td>0.73</td>
<td>88.9</td>
<td>I was able to utilize my own experiences as starting points for learning in the PBL tutorials.</td>
</tr>
</tbody>
</table>
Table 1 continued

<table>
<thead>
<tr>
<th>Process characteristic of meaningful learning</th>
<th>Mean value</th>
<th>Standard deviation</th>
<th>Moderately agree/agree %</th>
<th>Statement in the questionnaire focusing on the process characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Multi-representational</td>
<td>4.33</td>
<td>0.71</td>
<td>88.8</td>
<td>The targets of learning were examined through several forms of presentation (text, diagrams, pictures, video, etc.).</td>
</tr>
<tr>
<td>17. Creative</td>
<td>4.11</td>
<td>1.05</td>
<td>77.7</td>
<td>The PBL sessions encouraged creative thinking.</td>
</tr>
<tr>
<td></td>
<td>4.00</td>
<td>1.00</td>
<td>77.7</td>
<td>Our video assignment enabled creative thinking.</td>
</tr>
</tbody>
</table>

n = 9

5-point scale: 1 = disagree; 2 = moderately disagree; 3 = neither disagree or agree; 4 = moderately agree; 5 = agree

the pilot students with the exception of having also learned problem-solving skills. The students were less convinced that they had learned to acquire and evaluate information and to think critically, which are all essential information literacy skills. The results of this third research question will be discussed in more detail in the following paragraphs.

The analysis of the questionnaire data and the video recordings of the PBL tutorial sessions clearly showed that the course supported activeness and self-directedness in learning. The tutor’s comment units accounted for 19.2% (n = 537) of all the coded comment units (n = 2,791) of the tutorial sessions. This indicates that the students played a central role. In the analysis the students stated that their role was to actively acquire, evaluate, and apply information (M = 4.67, SD = 0.50), and that they were responsible for the DV production process together with their partners (M = 4.89, SD = 0.33). The students’ comments in the four PBL sessions (Table 2) were coded into categories “assessing information”, “processing suggestions”, “suggesting a new concept or its placement”, and “arguing against student comments”, and it can be argued that they call for the acquisition, evaluation, and application of information. The percentage of students’ comment units in the coding categories remained approximately the same in all four tutorial sessions. Therefore, the PBL tutorials clearly offer a procedure and an environment for students to assess information and knowledge acquisition as well as to use and develop their other information literacy skills. The active role of the students also meant that they offered their insights to refine the course, especially in the final assessment meeting. The analysis of the video data revealed 16 such comments. These insights are taken into consideration when answering the fourth research question of this study.

The specific pedagogical strengths of the PBL course seem to lie in the collaborative, co-operational, and conversational characteristics of the learning process. This was evident on the basis of the analysis of the questionnaire data and the video recordings of the PBL tutorial sessions. The students’ ratings on the questions focusing on these characteristics were very high (M = 4.44–4.89, SD = 0.33–1.01). In the four PBL tutorial sessions the largest number of units (n = 1,074, 47.6%) was coded in the category “processing suggestions”, which clearly indicates that the students were engaged in collaborative and conversational knowledge construction by explaining or commenting the suggested ideas, giving examples, or asking for clarifications or one another’s opinions. Co-operation, on the other hand, was most clearly manifested in the dividing of responsibilities and roles in DV production in pairs and in the PBL tutorial sessions (chairperson, secretary, observer). The coding category “processing suggestions” included clearly the largest number of comment units in all four tutorial sessions.
Table 2  Division of the students’ comment units into coding categories in the four PBL sessions

<table>
<thead>
<tr>
<th>Coding categories</th>
<th>Description of the coding category</th>
<th>Example from the data</th>
<th>Number and % of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing suggestions</td>
<td>Student processes a suggested concept, a preliminary idea or a working procedure by explaining, commenting, agreeing, giving examples, clarifying or asking for clarifications or the other students’ opinions.</td>
<td>“You mean, the manuscript is kind of like a blueprint for a house?”</td>
<td>1,074 (47.6%)</td>
</tr>
<tr>
<td>Suggesting a new concept or its placement</td>
<td>Student suggests a new concept, a preliminary idea or a working procedure for the ongoing stage of the PBL session. Student makes a suggestion concerning the placement of a concept or the relationship between concepts in a mind map.</td>
<td>“Could we think that this pre-planning is one big thing and the manuscript is subordinate to it—a subsection?”</td>
<td>332 (14.7%)</td>
</tr>
<tr>
<td>Addressing tutor</td>
<td>Student asks for instructions or replies to tutor’s comments.</td>
<td>“Okay, what are we supposed to do next?”</td>
<td>308 (13.7%)</td>
</tr>
<tr>
<td>Chairperson directing the process</td>
<td>Chairperson manages the group by keeping the discussion flowing and focused on the issues at hand and by summarizing the outcomes before moving to the next stage.</td>
<td>“Can you think of anything else—we’ve got a few minutes left?”</td>
<td>185 (8.2%)</td>
</tr>
<tr>
<td>Assessing the PBL tutorial session</td>
<td>Student assesses how the PBL tutorial session has proceeded and how the group has worked together towards the common goal, i.e., setting the learning assignment or solving the problem.</td>
<td>“It was a good thing that everyone could present their own thoughts, so, it wasn’t just agreeing on everything. It is quite an important thing in life, after all.”</td>
<td>89 (3.9 %)</td>
</tr>
<tr>
<td>Assessing information</td>
<td>Student describes, summarizes, and evaluates her/his prior information or the information she has found during the independent knowledge acquisition stage.</td>
<td>“Well, what I found was that a good manuscript answers the questions what, to whom, why, and how.”</td>
<td>59 (2.6%)</td>
</tr>
<tr>
<td>Arguing against student comments</td>
<td>Student argues against suggestions or their processing in a concise or elaborate way.</td>
<td>“But isn’t it then mostly an editing problem?”</td>
<td>53 (2.4%)</td>
</tr>
<tr>
<td>Assessing knowledge acquisition</td>
<td>Student describes and evaluates her/his independent knowledge acquisition stage.</td>
<td>“From the sources I noticed that the more sources of info you used, the more comprehensive the picture got.”</td>
<td>34 (1.5%)</td>
</tr>
</tbody>
</table>
Table 2 continued

<table>
<thead>
<tr>
<th>Coding categories</th>
<th>Description of the coding category</th>
<th>Example from the data</th>
<th>Number and % of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing the PBL session outcomes</td>
<td>Student assesses the outcomes of the PBL tutorial session, i.e., the learning assignment or the solution to the problem.</td>
<td>“I think there’s quite a lot of information in it.”</td>
<td>23 (1.0%)</td>
</tr>
<tr>
<td>Providing off-topic comments</td>
<td>Student makes a comment that is not related to the topics or working procedures of the PBL tutorial session.</td>
<td>“Where is the University Senate’s meeting room on the third floor?”</td>
<td>36 (1.6%)</td>
</tr>
</tbody>
</table>

Number of students: 1. session (n = 9); 2. session (n = 9); 3. session (n = 8); 4. session (n = 9)

The collaborative and conversational characteristics were the major reason why the students experienced the course as multiple perspectives-oriented. The students rated the statement “The course helped me to understand different perspectives related to the topics under study” very favorably (M = 4.33, SD = 0.71). The analysis of the tutorial video data revealed that when “assessing the PBL tutorial session” the students were often talking about how the PBL tutorials made the other students’ different perspectives visible.

The contextual (M = 44–4.78, SD = 0.44–0.53) and experiential (M = 4.22–4.44, SD = 0.73–0.97) characteristics of the learning process were also rated favorably by the students. These results indicate that the course is in accordance with these two core characteristics of PBL. The students’ rating for the statement “The video assignment helped me to learn” was very high (M = 4.78, SD = 0.44). It can be argued that the realization of the contextual and experiential characteristics during the course is associated with commissioned real-life DV assignments and PBL tutorials. The analysis of the PBL tutorial video data revealed that when “processing suggestions” the students were often referring to and reflecting on their own DV production experiences.

The analysis of the student questionnaire and video data showed that the students experienced positive emotions in their learning process. The students stated that satisfaction (M = 3.56, SD = 0.53), feelings of challenge (M = 3.33, SD = 0.71), feelings of interest (M = 3.33, SD = 0.71), and sense of community (M = 3.33, SD = 0.71) were the most intense emotions, associated with the topics of the course, the small-group work in PBL tutorials, the production of the DVs in pairs, and the DVs they had produced. Of the negatively-toned emotions, stress (M = 2.00, SD = 1.32), tension (M = 1.78, SD = 0.97), and frustration (M = 1.67, SD = 0.87) were reported as the most intensive ones. They were associated with: (1) the strict timetable of the course, (2) changes in the project plan, and (3) problems with the technical equipment. The mean values of the other negatively-toned emotions were very low (M = 0.22–1.56, SD = 0.44–1.23).

The analysis of the questionnaire data suggested that the reflectivity of learning was realized during the course to some extent. The students agreed moderately with the statement “I was able to evaluate my own learning during the course” (M = 4.00, SD = 0.00). In addition, the final assessment meeting was estimated as “useful and motivating” (M = 4.44, SD = 1.01). The analysis of the PBL sessions’ video data indicated that the students evaluated their learning processes and learning outcomes although the
percentage of units coded in the categories representing reflective functions was relatively low (6.4 %). What did the study reveal about the students’ learning outcomes? The analysis of the questionnaire indicated that according to the students the course had enhanced their skills and knowledge in project management \((M = 4.56, SD = 0.73)\), the subject matter of the DVs \((M = 4.44, SD = 1.01)\), co-operation and collaboration \((M = 4.33, SD = 0.71)\), and problem-solving \((M = 4.00, SD = 0.71)\). The students were less convinced that they had learned to acquire and evaluate information \((M = 3.56, SD = 0.53)\) and to think critically \((M = 3.56, SD = 1.24)\). Students’ performance results suggested that they had achieved the goals of the course relatively well. Every student pair managed to produce the commissioned DVs within the timeframe of the course. The commissioners’ feedback was favorable and they stated their intention to use the DVs in their teaching. Nevertheless, development needs were found in each DV and they were discussed in the final assessment meeting. In addition, the students’ analyses of the pedagogical functions of the DVs indicated difficulties in integrating theoretical viewpoints into the analysis.

What implications do the results have for the refinement of the PBL course?

The following refinement needs concerning the PBL course design constitute the main lessons learned from the evaluation.

- Enhance the abstract and critical aspects of learning by allocating more lecture and workshop hours to the theory of using and producing DVs to promote meaningful learning. In addition, consider the possibility of designing an advanced course, during which students will collaboratively perform a critical analysis of the DVs they have previously produced.
- Prepare the students better to cope with possible changes in the project plan and problems with technical equipment.
- Engage the commissioners more closely in planning the DVs with the students.
- Allocate more workshop hours to editing and set aside one extra week for shooting the DVs.

Conclusions

_PBL seems to offer a good model to support students’ knowledge and skills in producing and using educational DV. PBL accentuates the importance of the integration of disciplines and shared knowledge construction for producing multi-professional competence (Poikela & Poikela, 2005b). Educational DV production requires the development of knowledge and skills in multiple domains besides media pedagogy and media didactics, such as dramaturgy, video expression, video production, copyright laws and regulations, and journalism. These skills are mainly taught within different disciplines and programs at universities. The challenge is to integrate the teaching and learning of these skills in a single learning environment. The research results suggest that for this purpose PBL is a highly functional option. The PBL process that consists of collaborative learning in tutorial sessions and independent knowledge acquisition from multiple sources makes it possible to integrate the teaching and learning of various domains. The research indicated that the_
tutorial sessions supported the students in their learning and were one of the main reasons for their positive emotional involvement in the learning process. The tutorials seemed to function, to cite Sari Poikela (2005), "as a dynamo for learning" (p. 178). All in all, the PBL process supported especially the self-directed, active, collaborative, co-operational, conversational, multiple perspectives-oriented, constructive, contextual, and experiential characteristics of meaningful learning. The research focused specifically on whether the PBL-based Digital Video course supported the students' learning of information literacy skills. The results indicate that the PBL process offers a procedure and an environment for students to discuss and assess information and its sources as well as to use and develop their other information literacy skills. However, to simply offer an environment is not enough. The results showed that the students were not convinced that they had learned to acquire and evaluate information and to think critically during the course. To better support students' information literacy skills, the teaching of these skills can be integrated into the PBL course or PBL curriculum. In practice, this can mean collaboration between PBL tutors or teachers and librarians (Breen & Fallon, 2005; Poikela & Poikela, 2005a).

Authentic DV productions can be used as a method to learn not just about DV production, but also about the subject matter of the DVs. In addition, they can be used in the learning of generic skills. The results suggest that besides the technical skills needed in DV production, students can learn generic knowledge and skills in project management, collaboration, co-operation, and problem-solving. Similar learning outcomes have been reported also in K-12 contexts (Kearney & Schuck, 2005; Reid et al., 2002). In addition, DV production can be used to enhance students' understanding of the subject matter of the DVs. This finding tentatively confirms the research findings in the fields of participatory design (Kiili, 2005; Strobel, 2006) and DV production at the K-12 level (Jonasssen et al., 2003; Kearney & Schuck, 2005). The implication for teachers and course designers across disciplines is that university students' subject matter related DV production can be integrated with more traditional learning assignments, such as essays, reports, or literature reviews.

University students can be engaged in the production of educational DVs for university teachers. The research also tested a new model of educational DV production for the Faculty of Education at the University of Lapland. However, the results may have implications for other contexts as well. The findings suggest that both students and teachers, that is, the commissioners of the DVs, can benefit from the production process. Students can learn the knowledge and skills described in the previous paragraph and teachers can obtain DV material to be used on their courses. The production process can even be realized with very basic DV equipment for non-professional use, as was the case in this research. The expressive and technical quality of the final products of the Digital Video course was evaluated as good by the scriptwriting and shooting workshop teacher. There was room for improvement in aspects such as framing shots, editing in a way that the viewer grasps the meaning without difficulty, and using transitions. However, the quality of the final products should be assessed keeping in mind the time frame of the course, the technical equipment available, and the students' limited experience. Most importantly, the DVs should be adequate in quality to fulfill their intended pedagogical functions. The commissioner feedback was favorable in this respect and the commissioners stated their intention to use the DVs in their teaching.

To conclude, PBL offers a good approach to teach and learn how to use and produce DVs for meaningful learning. The future cycles of the design-based research process, the first of which is to start in 2008, will be taken as opportunities to refine the Digital Video course.

© Springer
Acknowledgements The study was conducted as part of (1) the LEVIKE—Network-based Higher Education project, funded by the European Social Fund (ESF), and (2) the Web-SeaL project, funded by the Academy of Finland (project no. 1110628). The author would like to thank the students of the Digital Video course for being enthusiastic students, research subjects and co-workers in the refinement of the course.

References


Author Biography

Päivi Hakkarainen is a researcher at the Centre for Media Pedagogy at the Faculty of Education, University of Lapland, Finland.