Implementing Project-Based Learning And E-Portfolio Assessment In an Undergraduate Course

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Abstract

In this case study, the aim was to implement project-based learning by utilizing e-portfolio assessment in a small-scale classroom (N = 8). The compulsory Design, Development, and Evaluation of Educational Software course in the curriculum of the Department of Computer Education and Instructional Technology was selected due to its strong relationship with real life while lending itself to addressing the major concern of project-based learning. Despite insufficient classroom size and students' challenges on animation software, it was found that project-based learning was an appropriate choice for conducting such a course. Moreover, e-portfolio assessment proved to be valuable in project-based learning. In the rest of the paper, findings from other research studies evaluating project-based learning are discussed and recommendations are presented. (Keywords: project based learning, e-portfolio assessment, educational software development.)

INTRODUCTION

Many educators struggle to discover proper teaching and assessment strategies for their students. A large number of research studies are conducted and various teaching and learning strategies are proposed to answer the question, "How can we teach more effectively?" This process started with the behaviorist approach, continued with cognitivism, and ended up with constructivist approach for the time being. Constructivism gained attention for several reasons, such as its learner-centered approach and active participation of students (Frank, Lavy, & Elata, 2003; Richardson, 2003). In classes where constructivist approaches are implemented, students have a chance of learning by doing, enhancing their critical skills, and shaping their learning process by being active participants. Project-based learning is one of the methods grounded in constructivism by supporting student engagement in problem-solving situations (Doppelt, 2003). Students in a project-based learning environment deal with real-life problems, which may result in permanent knowledge. Just as there are different approaches to classroom implementation, there are also alternative approaches for performance assessment. Rubric, self-assessment, and portfolio are some of these alternative assessment methods (Corcoran, Dershimer, & Tichenor, 2004). The question of "Which assessment method suits a more specified teaching method?" is a difficult one to answer, as it depends on such variables as target audience and content. Because effective teaching is sensitive to educational context, both the process and product should be carefully designed and assessed. Thus, this research study is mainly based on a constructivist approach, with project-based learning as the teaching method and e-portfolio assessment as the evaluation strategy.

WHY PROJECT-BASED LEARNING AS A TEACHING METHOD?

Project-based learning can be defined briefly as "a model that organizes learning around projects" (Thomas, 2000, p. 1). Even though assigning projects to students in traditional classrooms is not a new phenomenon, project-based learning is quite different from the usual application. Thomas listed five major criteria for a method of learning to be called project-based learning:

- project-based learning projects are central, not peripheral to the curriculum,
- project-based learning projects are focused on questions or problems that "drive" students to encounter the central concepts and principles of a discipline,
- projects involve students in a constructive investigation,
- projects are student-driven to some significant degree, and
- projects are realistic, not school-like. (p. 4)

The project-based learning movement has spread quickly and has had many practitioners adopt it. However, Barron et al. (1998) urged that following a project-based learning approach for instruction rather necessitates an immediate change in not only the curriculum, but also in the instruction and assessment parts for instructors and students. The new role of the instructor in a project-based learning implementation is defined by Frank, Lavy, and Elata (2003) as when "… lecturing to passive students is replaced by encouraging motivation, tutoring, providing resources, and helping learners to construct their own knowledge" (p. 280).

Thomas (2000) defined the issues about the positive side effects of project-based learning for students as the development of positive attitudes toward their learning process, work routines, abilities on problem-solving, and self-esteem. Similarly, Green (1998) emphasized that participants in project-based learning learn better and are more actively acting in their learning. On the other hand, the instructors work backstage as students work on their projects. This turns participants into active problem solvers on the projects, rather than passive receivers of knowledge. Preuss (2002) noted that as students complete their projects, they think reflectively on their experiences about project-based learning processes individually. Besides, students realize similarities between what they are learning and what is going on outside the school walls.

Even though students get disturbed in the early stages of the implementation of project-based learning into their courses, most students feel more motivated as time elapses in a project-based learning course. Because project-based learning provides students with opportunities to implement their freedom in their learning environment, they give up their habit of waiting for step-by-step instructor-based commands (Lenschow, 1998).

Lenschow (1998) suggested applying a trial-and-error approach before moving to a large-scale project-based learning project. A small scale project-based learning trial including five to fifteen participants would be a satisfactory attempt to see its effect on students and related issues with its implementation. This small-scale attempt will help instructors realize the challenges of project-based learning. For example, Frank and Barzilai (2004) provided a long list of possible challenges of using project-based learning:

> Teachers' content knowledge, students' lack of experience in this new approach and their preference for traditional-structured approach; their preference for learning environment which require less effort on their part; and problems arising from time stress. Students struggling with ambiguity, complexity, and unpredictability and are liable to sense frustration in an environment of uncertainty, where they have no notion of how to begin or in which manner to proceed. (p. 43)

Heckendorn (2002) explained that projects in project-based learning require much longer time to complete, are complex in nature, and situated in real life. Additionally, project-based learning concentrates both on the end-product and the experience of the process. Due to the emphasis on the project, its choice is a major concern for instructors. Projects have the responsibility of training students to take complex real-life concerns and dividing them into more specific and smaller steps (Solomon, 2003). For that purpose, Özdener and Özçoban (2004) pointed out that projects might be applied in personal or group levels in which students utilize their thinking, problem solving, and creativity skills.

As Lenschow (1998) proposed, a project is to be as close as possible to reality. To close the gap between real-life and school environments, Heckendorn (2002) urged that deadlines should be emphasized in a project-based learning environment as in a real-life situation. Moreover, both theory and its applications should be regulated under the light of students' competence level. Additionally, the amount of project time should be adjusted so that students can concentrate on the parts of a project.

WHY USE E-PORTFOLIOS AS AN ASSESSMENT IN PROJECT-BASED LEARNING?

Because assessment is an integral part of the learning cycle, it is maintained both during and at the end of project-based learning (Solomon, 2003). Frank and Barzilai (2004) suggested that traditional assessment strategies will not be appropriate for gauging the goals of a project-based learning course. As an alternative assessment type, the portfolio method is widely used for project-based learning because its components are the reflections of students for different periods, improvement in their progress, and prospective goals.

According to Barrett (2001), a portfolio can be defined as collected works and reflections of students that demonstrate their growth along the process. Similarly, an electronic portfolio is defined as the compilation of portfolio items stored in electronic formats such as audio-visual, graphical, or text (Barrett, 2001). The main idea of using an e-portfolio "…is to keep students focused on learning rather than on individual projects or products—e-portfolios are part of the learning process, not a result of it" (Garthwait & Verrill, 2003, p. 23). Constructivism, being learner-centered and authentic, can be associated with performance evaluation with e-portfolio assessment strategies (Read & Cafolla, 1999). By the use of e-portfolios, students have the chance to reflect upon their learning and teachers have the opportunity to provide detailed

feedback on students' work (Ahn, 2004). Among many features of e-portfolio assessment, "the demonstration of critical thinking through reflective writing about artifact construction, selection, and revision" is the most important aspect (Lynch & Purnawarman, 2004, p. 51).

Due to the novelty of project-based learning and e-portfolio assessment in Turkey, the education field suffers from lack of information concerning which activities are the most productive, the relative effectiveness with respect to other teaching and assessment methods in the Turkish education system, practical recommendations on the planning and evaluation, and on the application of project-based learning, e-portfolio, and so forth.

WHY THE DESIGN, DEVELOPMENT, AND EVALUATION OF EDUCATIONAL SOFTWARE COURSE?

The Design, Development, and Evaluation of Educational Software course is required for senior students of the Department of Computer Education and Instructional Technology, which is part of the Faculty of Education. The course has a special significance in the entire curriculum because it is the last course before graduation as teachers, and aims to provide students with the skills of software production and evaluation. The instructor, with the help of the teaching assistant, designed the course in such a way that students would construct their own knowledge and skills by experiencing real-life situations. Project-based learning approach and e-portfolio assessment were thought to be the underlying frameworks that would suit the course best. It was a three-credit course, which lasted 14 weeks. The weekly schedule is presented in Table 1.

When defining the goals of the course, the instructor emphasized her desire to modify the students' concepts of educational software development, instead of teaching specific knowledge. Within the first two weeks of the course, students were introduced to the key concepts and the term-project. The instructor and the teaching assistant along with the students decided to develop software for the content of another undergraduate course. The selected course, Instructional Technology and Material Preparation, is also a required course for all the Departments of the Faculty of Education. This course is also a three-credit 14-week-long course, taken by third-year university students. Because participants had already attended this course in their previous years, and the selected course had been delivered by the instructor and the teaching assistant many times, the content seemed to be appropriate for the projects. From the content of the Instructional Technology and Material Preparation course, each student selected one topic and studied this same topic throughout the semester. Subsequent to the topic selection, needs, content, and media analyses were conducted. In order to perform these analyses, a how-to guideline, prepared by the instructor and the teaching assistant, was distributed to students. For the needs analysis, students were asked to conduct interviews with at least five students and two instructors who had already taken/given the Instructional Technology and Material Preparation course. These structured interviews addressed issues such as learning or teaching difficulties,

Table 1: Weekly Course Schedule

Weeks	Topics/Tasks	Laboratory Assignments
1	Basic Concepts on Educational Software	Content Selection and Analysis
2	Brief Discussion on the project	Searching for the Content from Different Resources
3	Needs, Task, Technology, and Media Analysis	Writing Analysis Reports
4	Presentation and Evaluation of Analysis Results	Development of Flowcharts
5	Presentation and Evaluation of Flowcharts	Development of Storyboards
6	Presentation and Evaluation of Storyboards	Designing User Interface
7	Presentation and Selection of Common User Interface for the Project	Revising and Exploring the User Interface
8	Educational Software Development	Content Development and Media Production
9	Educational Software Development	Software Integration of the Developed Content and Media
10	Presentation of Educational Software	Finalizing the Software
11	Pilot Implementation of Educational Software	Real-Life Implementation and Data Gathering
12	Discussion of Experiences from Pilot Study	Creating Evaluation Report Based on the Data Gathered from Participants
13	Presentation of Evaluation Report	Revision of the Educational Software According to Evaluation Results
14	Presentation of Final Version of Educational Software Discussion about the Overall Course	Submissions of E-Portfolios

misconceptions, adaptation to real-life situations, and additions to professional development. For content analysis, students searched the available resources (Internet, library, course book, instructors) related to their topics, and arranged headings and related activities. Finally, the media analysis was performed to depict the appropriate software and hardware. After the presentation of each analysis results and discussions of the findings, the students created flowcharts and storyboards.

The selected project topics were aimed to be gathered and to yield multimedia-based software for the third-year undergraduate course. Thus the instructor, the teaching assistant, and the students decided to use a common user interface. Following a democratic selection process, a common interface was selected from among the ones prepared by each student, and revised according to the feedback of the students, the instructor, and the teaching assistant. After the agreement on a common interface, the software development process began for the students. Moreover, they were asked to try out their software on at least ten students of various departments from the Faculty of Education.

The software tryout was also maintained with the administration of a Multimedia-based Software Evaluation Questionnaire (MSEQ, see Appendix, page 325). MSEQ was originally developed by the instructor and the teaching assistant, because the development of such an instrument was not an objective of the course and students did not possess necessary skills or experience for such an instrument. MSEQ aims to gather data about participants' perceptions on the software, to guide the students in collecting data about their software products, and to write their final reports and is revised each term to meet the specific needs of the course and students. MSEQ was composed of four parts: addressing instructional adequacy (26 questions), curriculum adequacy (12 questions), visual adequacy (9 questions), and technical adequacy (19 questions). The students conducted a descriptive analysis to analyze the collected data and prepared a final report, which included the findings of the study and their own perceptions on both the process they experienced during the try-out and experiences they had throughout the semester. Finally, after revising the software in accordance with the findings, students submitted their e-portfolios.

It is worth noting that throughout the semester, students sent all the reports on their deadlines by e-mail to the instructor. Furthermore, all the presentations, except for the software itself, were prepared using presentation software. Thus, the e-portfolio included written reports, multimedia presentations, statistical analyses, and two versions of software. The entire course was graded according to the criteria presented in Table 2.

Table 2: Criteria for Assessing Project-Based Learning

Criteria	%
Presentation of Analysis Report	20
Presentation of Flowcharts	7.5
Presentation of Storyboards	7.5
Presentation of User Interfaces	5
Presentation of Educational Software	10
Real-Life Implementation	20
Presentation of Evaluation Report	20
Presentation of Revised Educational Software	10

METHOD

Research Design

The main objective of the course is to contribute to the software production skills of students to create and try out effective educational software for their future classrooms. The course instructor and the teaching assistant carried out the research study. Thus, the purpose of this study was to explore the analysis, planning, design, development, implementation and evaluation issues, and processes that preservice teachers encounter in a project-based learning environment. The research questions for this study were as follows:

1. What do preservice teachers encounter in a project-based learning environment in terms of each step of educational software development?
2. What are the preservice teachers' perceived advantages and disadvantages of implementing a project-based learning approach for the course?
3. What was the overall satisfaction about the course and the instructor?

This was a case study, as it needed an in-depth and longitudinal exploration of one particular case for the purpose of gaining a depth of understanding into the issues being investigated (Yıldırım & Şimşek, 1999). Therefore, although findings can raise awareness on the investigated issues, the general aim is not to generalize the findings to other cases (Miles & Huberman, 1994; Yıldırım & Şimşek, 1999). The qualitative approach was perceived as suitable for this study, because it focused on the students' thoughts, behavior, and difficulties. Qualitative and quantitative tools for collecting data included analysis of assignments, reports and products, structured formal and informal interviews with students, and a course evaluation form. Data were collected at different times and stages throughout the course.

For the qualitative analysis, students' interviews and final reports were analyzed and emerging categories were found. Finally, conclusions were drawn from these categories (Miles & Huberman, 1994; Yıldırım & Şimşek, 1999). For the quantitative analysis, descriptive statistics were calculated.

The Participants

The participants of the study were senior year preservice teachers in the Department of Computer Education and Instructional Technology in the Faculty of Education, at a private university in Turkey. The number of students was eight (five females and three males).

Instruments

For gathering students' perceptions about the project-based learning approach, semi-structured interviews were conducted with each student. The questions addressed the difficulties of each step in educational software design, issues of project-based learning in terms of advantages and disadvantages, and future recommendations.

Data regarding the overall satisfaction of the course and the instructor were taken through a questionnaire named Instructor and Course Evaluation Questionnaire, which is formally administered to all students in all classes at the end of each semester at the university. The questionnaire consisted of 16 questions

in addition to demographic information and asking the degree of agreement level on the given sentences, using a Likert scale of one to five, in which one represented strong disagreement and five represented strong agreement.

RESULTS AND DISCUSSION

Preservice Teachers' Experiences in a Project-Based Learning Environment in Terms of Each Step of Educational Software Development

The course started with the analysis phase. The content of the project and the development tool were determined together with the students, the teaching assistant, and the instructor. The topics were selected from among the fundamental knowledge of the Instructional Technology & Material Development course for ensuring the validity of content, and the students were asked to choose any topic they desired to work on. It is essential for project-based learning that students should work on whichever project they want (Frank, Lavy & Elata, 2003; Thomas, 2000). As the development tool, immersive animation software was selected for several reasons, specifically: (a) the software was flexible and accessible, (b) students had already experienced that software, c) the software was free from different platforms, and (d) an available technical infrastructure.

For the needs assessment phase, students were asked to interview both the instructors and the students who had previously attended the course. The interview results were conflicting because the comments of the instructors and the comments of students differed at some points. For example, the topics mentioned by instructors on which they have difficulties teaching differed from the topics mentioned by the students on which they have difficulties in learning. This resembles the same situation in real life as the project-based learning emphasized (Lenschow, 1998; Thomas, 2000). Needless to say, the roles of instructors and learners are different in the same learning environment; therefore, their points of view with respect to the same course might differ. Moreover, the interview participants were from different subject areas such as mathematics education, early childhood education, primary school teacher education, and so forth.

Within the design phase, along with the development of flowcharts and storyboards, the instructor and the teaching assistant observed that even though several examples were provided for students, they couldn't produce creative scenarios and had difficulties shaping the assessment part of the selected content. Hence, the flowcharts as well as storyboards required redesigning and further assistance by the course instructor and the teaching assistant. As real life has a complex structure, students cannot adapt themselves to that reality (Frank & Barzilai, 2004). The flowcharts demonstrated that the linear reasoning of students and scenarios veered away from the constructivist approach.

As the next step, before preparing user interfaces, all the possible interface elements' functions, styles, and navigation were discussed. At the end, the group came to a common agreement about minimum interface elements. Due to this agreement, all the students believed that these elements would work for the sake of the software and the students' success. After a group discussion, it was decided to use a common interface rather than independent user interfaces. In reality, software developers work in different teams and then combine the parts

having the same interfaces to produce material. Interfaces, prepared by each student and including these minimum elements, were presented and evaluated with respect to the following criteria: color harmony, graphical design, graphical resolution, visual adequacy, button behaviors, interactivity, navigation, content organization, usability, and creativity.

The development phase was the longest and the most painful process in the project. Even though they decided to use a common interface, students criticized the difficulties while using the common interface developed by the animation software. Moreover, students complained about finding content in Turkish, audio-visual editing, applying predefined scenarios, and preparing questions or activities for evaluation. All these items served the same purpose of demonstrating to the students how difficult a process it was to develop the educational software.

Because project-based learning emphasizes real-life applications, the implementation phase was the most important part of the project. Students had opportunities to see what arrangements were necessary, what points needed special consideration throughout implementation, and how implementation was conducted. Students' challenges are listed as follows:

- Time scheduling
- Supplementation of necessary equipment, such as earphones
- Installation of the software
- Participants' bias towards the implementer
- Laboratory management
- Collecting software evaluation data

As the final phase, students evaluated and presented the data. The quantitative evaluation was based on the MSEQ and the qualitative evaluation was based on the observation of the implementer. In light of the findings, the class discussed what they experienced during the implementation process and the possible causes of these findings. Moreover, alternative solutions were identified for the inadequacies. At the end of the course, students submitted their revised projects and e-portfolios.

Preservice Teachers' Perceived Advantages and Disadvantages of Implementing a Project-Based Learning Approach for the Course

Even though students had prepared projects before this course, this was the first time they experienced project-based learning and e-portfolio assessment. Hence, they had the opportunity to state the possible advantages and challenges of project-based learning. The perceived advantages are:

- Eliminating written examination
- Learning by doing
- Eliminating direct instruction
- Having classroom democracy
- Active participation

Throughout the course, students had control over their own learning as well as over the classroom activities. The course contributed to students' self-esteem by giving them responsibility and valuing their ideas. E-portfolio assessment

decreased students' stress and increased their self-confidence. This finding shares the same point of view with Solomon (2003) and Frank and Barzilai (2004).

On the other hand, students also expressed their ideas on the challenges of project-based learning:

- Deadlines
- Loss of self-motivation
- Individual work

Because this was the first time students were participating in such a course, they had difficulties making their own time schedules. They stated that they could not maintain their self-motivation level throughout the project development. Furthermore, having carried out these projects individually they were required to expend significant effort and were overloaded.

Overall Satisfaction about the Course and the Instructor

Unless the instructor understands and acts as a facilitator in a project-based learning environment, overall success cannot be determined. For this purpose, Instructor and Course Evaluation Questionnaire results are presented in Table

Table 3: Overall Satisfaction About the Course and the Instructor

Question	*M*
1. Course goals are briefly explained at the beginning of the semester.	4.43
2. Sufficient information is supplied about main and accommodating resources.	4.29
3. The instructor is well-prepared for the lessons.	4.57
4. The instructor has come to lessons on time.	4.57
5. The instructor was accessible at office-hours.	4.43
6. The course was conducted according to the explained plan.	4.29
7. Students are encouraged to use supportive resources.	4.57
8. Students are offered with individual opportunities (project, presentation, discussion, etc.) for participation in the course.	4.14
9. The language used for delivering instruction is clear.	4.43
10. The instructor has communicated effectively with the students.	4.43
11. The course hours was used effectively.	4.14
12. The instructor tried to use various tools, methods and techniques whenever necessary throughout the course.	4.29
13. The instructor has shared innovations about the course content with students.	4.29
14. The instructor has given value to the ideas of students on teaching and learning.	4.29
15. Assessment questions are prepared in parallel with the course content.	4.29
16. Students are given feedback on the course activities such as project, presentation, and midterm exam.	4.43

3. The mean value for this questionnaire was found to be 4.37, showing a high level of students' satisfaction.

The range (.43) among items is extremely close, showing that all students were satisfied with the course and the instructor. Moreover, the mean scores are between "strongly agree" (5) and "agree" (4). Students agreed that project-based learning produced successful results for their own learning.

CONCLUSION

One vital point observed by the researchers was the students' inability to create scenarios for the educational software. This may be due to the lack of courses emphasizing thinking skills such as creativity and problem solving. Additionally, just one instructional design course exists in the departments' curriculum, and this single course is not sufficient for these students to create alternative designs. Therefore, the curriculum of the Department of Computer Education and Instructional Technology should be evaluated and enhanced with courses emphasizing creativity and problem solving. This curriculum analysis will yield better results for project-based courses (Barron et al., 1998).

At the beginning of the semester, students together with the instructor and the teaching assistant decided to use animation software for several reasons. At the end of the semester students pointed out that they enhanced their knowledge of that software, but complained about using a common interface because they had problems understanding the dynamics of a user interface.

Students also complained about the overloading during the semester. The main reason for having such a workload was a result of the class size. Even though Özdener and Özçoban (2004) proposed that project-based learning might be applied for both individual and group levels, forming groups of two or three people for carrying out such a project would be more suitable. Eight students were compulsorily given individual projects, and expected to finish a complete module by the end of the semester. If the same project were carried out by eight groups consisting of two or three students, they would not have been overloaded. Thus, this result showed the importance of class size when implementing such an approach.

This study was a small scale project-based learning implementation, as it was the first trial of the instructor (Lenschow, 1998). Satisfactory results encouraged both the instructor and the teaching assistant to apply project-based learning to larger groups. Because the students were about to graduate, their teaching methodology repertoire was enhanced, thus giving the opportunity of applying project based-learning in their future careers.

As for the assessment, e-portfolio method was favored by all students. Getting weekly feedback about the assignments and having the opportunity to redesign the assignments before final submission were evaluated by the students as a great chance for self-improvement. In addition, use of e-portfolios demonstrated a learning-centered model for teacher candidates. Students also stated that they gained more knowledge about the software development process and learned more from their class as they started to create their e-portfolios (Hewett, 2004). Moreover, students associated their existing knowledge with real-life

context that enhanced their skills and abilities in the field through the use of e-portfolios (Mason, Pegler, & Weller, 2004). Simultaneously, students engaged in enriched learning experiences both individually and technologically (Woodward & Nanlohy, 2004).

Although the results of this study were satisfactory, they could not be generalized due to several limitations. First of all, the number of participants was low. Second, the study was conducted in a private university, which in Turkey means that more technical facilities are readily available. Third, the study contained just one compulsory course and one subject area. Finally, the researchers were also the instructors of the course.

RECOMMENDATIONS

The following suggestions are derived from the study: (a) larger classes should be formed for effective group study, (b) animation software should be evaluated with respect to the course content beforehand, and (c) e-portfolios with timely feedback should be used for project-based learning.

Based on the limitations mentioned in the previous section, further studies should be conducted to reveal the importance of project-based learning and relevance of using e-portfolios. This research study should be repeated with a different course content and target audience. Furthermore, experimental studies may be conducted to reveal the dynamics of project-based learning to compare individual work with group work. Alternatively, the software might be changed to determine ways in which it affects the process, if any.

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APPENDIX: EVALUATION OF EDUCATIONAL SOFTWARE

General Features of Educational Software	Average Point
Instructional Adequacy	
Curriculum Adequacy	
Technical Adequacy	
Visual Adequacy	
Total	

Comments:

INSTRUCTIONAL ADEQUACY	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Instructional content is well designed.						
Information is consistent throughout the software.						
Software makes users motivated.						
Software makes users active learners.						
The scope of the content is sufficient.						
Information is presented as summary.						
Content is suitable with cultural values.						
Content is free from spelling, punctuation, and grammar errors.						

Information is presented in a clear and logical way.						
Content is suitable for target audience.						
Software includes instructional objectives.						
Software considers users' prior knowledge.						
Explanations in software are sufficient.						
Each topic is supported by examples throughout the software.						
Drill and practice is provided to accomplish objectives.						
Software consists of timely feedbacks.						
Feedbacks are relevant to target audience.						
Information is up-to-date.						
Software can be easily modified.						
Software addresses individual differences.						
Assessment part includes various question types.						
Software included various teaching strategies.						
Software includes accurate directions for ease of use.						
Duration of animations is convenient.						
Software provides facilitation to users.						
Each module provides a summary at the end.						

CURRICULUM ADEQUACY	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Software includes various materials to support teaching.						
Software is appropriate for different learning styles.						
Software is appropriate for different teaching styles.						

Software encourages students to be more creative.						
Software can be used individually.						
Software can be used in group activities.						
Software enhances student achievement.						
Software has a flexible structure.						
Software provides extra-curricular activities.						
Software considers different learning styles equally.						
Software can be related with different subject field.						
Software provides information about duration of study.						

VISUAL ADEQUACY	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Colors in screen design are harmonious.						
Screen is designed according to visual design principles.						
There is no illegibility throughout the software.						
Software is appealing.						
Users can control the interface effectively.						
Screen is designed in a simple manner.						
Simulations are consistent with real-life.						
Screens are not crowded.						
Software is consistent among screen displays.						

TECHNICAL ADEQUACY	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Software can easily be modified.						
Software can be installed easily.						
Software can be installed quickly.						
Software runs correctly.						
Software permits users to correct their errors.						
Software provides users with easy navigation to any topic or task.						
Software runs without spooling the user.						
Software is compatible with different platforms.						
Software is compatible with different software.						
Technical features can be changed according to user request.						
Software has complete user guide.						
User guide is a complete and clear.						
Software has an effective knowledge management.						
Text and audio are in harmony throughout the software.						
Graphics, text, audio and video components are convenient with the content.						
Software values user privacy and security.						
Software provides a simple and clear "help" option.						
Software provides a friendly-print option.						
Interaction level in software is sufficient.						

Any Comments:
Instructional Adequacy:
Curriculum Adequacy:
Technical Adequacy:
Visual Adequacy:
Other: