IMPLEMENTING PROJECT BASED LEARNING IN COMPUTER CLASSROOM

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ABSTRACT
Project-based learning offers the opportunity to apply theoretical and practical knowledge, and to develop the student's group working, and collaboration skills. In this paper we presented a design of effective computer class that implements the well-known and highly accepted project-based learning paradigm. A pre-test/post-test control group design investigation was undertaken with 98 students from 6th grade students (male and female) enrolled in computer class at the elementary school in Koprubasi, Trabzon, Turkey in the 2002-2003 academic year. Students were randomly divided into two treatment groups. One group (50 students) formed the control group. Other 48 students received the project based learning treatment.
The effect of the project based learning on students' computer skill achievement level was assessed using the *Rubric,* an instrument that was developed during the study. *Group and Self evaluation forms* were used to measure the learning outcomes related to the teamwork, communication and social skills. The results have been found to be positive and are discussed.

1. INTRODUCTION

Learning processes have been studied by philosophers for centuries. Socrates, Plato, and Aristotle were all interested in the ways in which people learn. Socrates once said, "I cannot teach anybody anything, I can only make them think." In the 20 th century Piaget's theory showed that children need to construct or reconstruct knowledge in order to learn and that they also need rich opportunities to interact with the physical world and with their peers. Piaget's work on cognitive development provided the foundation for modern-day constructivists (Wadworth, 1979).

Constructivist theory has implications for the ways in which educators view learners. It acknowledges that learners come from various cultural backgrounds, and possess a range of interests and styles of learning. These are respected and form the basis of curriculum planning and practice. Rather than lecture and specific step-by-step presentation, curricula should have based on projects, authentic tasks, real-world contexts

The concept of constructivism emphasizes the student as being the "active learner", playing a central role in mediating and controlling learning and most of the learning environments are technology-based in which learners are engaged in meaningful interactions. Constructivist learning environments also supports project-based curriculum as an alternative to traditional teaching practices (Jonassen, 1999).

Project-based learning (PBL) is an effective educational approach. It focuses on creative thinking, problem-solving, and the interaction of students with their peers to create and use new knowledge. Notably, this is done in a context of active, scientific dialogue with supervisors who are active researchers (Berenfeld, 1996, Marchaim 2001). In project based learning environment the teacher acts as facilitator, designing activities and providing resources and advice to students. The students collect and analyze information, make discoveries, and report their results. Projects are often interdisciplinary. Teams of varying size and in varying locations work on projects. Instruction and facilitation are guided by a broad range of teaching goals. Project-based learning provides an authentic environment in which teachers can help students increase their skills through cooperative learning and collaborative problem solving.

In a case study that focused on three pairs of students working together on an integrated math and science project, Venville, Wallace, Rennie, and Malone (2000) found that students' learning was enhanced as a result of the collaboration and communication between the students of the pairs. Students were able to research relevant science and math concepts that were, at times, beyond the expertise of the teacher. Also, students developed ideas for further research and study as a result of the team project.

PBL can be used apparently in any subject and at most levels. PBL is also a model for computer classroom activities that shifts away from short, isolated, teacher-centered lessons. Instead, it emphasizes learning activities that are long-term, interdisciplinary, student-centered, and integrated with real world issues and practices. PBL, in which students work in teams to explore a question or create a projects, helps maximize the student ability to develop computer skills.

According to Riel and Fulton (2001) it is necessary to create learning communities when given the task of teaching students new technologies. Riel and Fulton defined learning communities as groups of students, teachers, and outside sources that share knowledge, practices and value of the knowledge.
Harrison's research (1999) looked at assumptions made by teachers about what students know and what they want to know. Harrison found that once students were given minimal instructions, they were soon exploring with other students and entering into conversations with each other about how to complete a task on the computer. Harrison also looked at the ways in which teachers create opportunities for students to learn. Students in the study appeared to be pleased to have had the opportunity to explore new things with peers.

Dooling (2000) found that roughly 30% of students in 4th through 7th grades preferred to learn about technology by trial and error on their own. Dooling's study also found that family members and friends were a major source of information about new technologies for middle school students. The majority of the students surveyed felt they learned best by doing, not by listening. The study also found that a great deal of computer learning at school happens during periods of informal time students have to interact, such as lunch, recess and after school. Dooling also found that situations where the students knew more about technology than their teachers were not uncommon. In conclusion, Dooling suggested schools should integrate curriculum to use technology as a tool for teaching and learning, and that students appreciate learning experiences that are authentic and relevant. Additionally, Dooling stated that when students are taught skills on a need-to-know basis, within the context of a content-area assignment, students can apply and reinforce new knowledge immediately. According to Dooling, the role of the teacher is being redefined. The teacher is becoming more of a facilitator and the students are becoming the teachers.

In this study, the effect of PBL on students' computer skill achievement level and group working skills were investigated. This article also describes PBL environment designed for computer classroom and how 6 th grade students acquired computer skills. A review of the literature found little information how 6 th grade students acquired computer skills. Although information was abundantly available on teaching methodologies and learning styles, information concerning specific methodologies and learning styles, directly related to teaching computer skills was not found. In this study students in 6 th grade computer class were examined over the course of eight weeks to better understand by which methods students learn computer skills and which methodology or methodologies are best suited for presenting computer skills to 6 th grade students.

2. METHOD

Participants

The researchers recruited all 6th grade students (male and female) enrolled in computer classes at the elementary school in Koprubasi, Trabzon, Turkey in the 2002-2003 academic year. 98 students participated in this study. 86% of the students were between 12 and 14 years. 54% were female and 46% were male.

With 132 sq km area land and about 17000 populations, Koprubasi is the smallest district in the Trabzon Province. The area of Koprubasi is mountainous and much of its industry is agro-based such as the tea and hazelnut-processing facilities. Koprubasi had lost most of its habitants in 1980's because of the economic and educational concerns. Many people migrated to big cities in order to provide best education opportunities to their children. Now the majority of remain population in Koprubasi has a very low income. Approximately 70% of the students in Koprubasi Primary Education School are being transported from near villages to school by rural school bussing system.

In 1997, the Turkish parliament approved a new Basic Education Law which extended the duration of compulsory schooling from five years to eight years and mandated improvements in the quality and relevance of basic education. To support this initiative the government has requested large scale support from the World Bank.

Koprubasi Primary Education School has been selected as a regional primary school by the implementation of the Basic education law and had its first computer lab and technology classroom within the scope of the 1st Phase of the Basic Education Program loan agreement that was signed between the World Bank and the government of the Turkish Republic.

Although several in-service training courses have been organized by Ministry of National Education to ensure that education technology tools are used effectively in primary schools, computer lab and technology classroom in Koprubasi Primary Education School have remained closed for four years. There was a computer teacher shortage all around the Turkey, especially in the rural areas. For that reason the participants of this study have first meet with computers in 2002-2003 academic years when their first computer teacher was employed.

EVALUATION

The instruments used in this study were: Rubrics, Group Evaluation Form and Self Evaluation Form.

Rubrics: Performance test was given to both control and experimental groups at the beginning of the semester and the same test also was administered at the end of the semester. Two different rubrics were used to score the performance test's sample items. The first rubric was developed to measure student's drawing abilities in MS Paint and the second rubric was developed to measure student's abilities to create computer presentation by using MS Power Point. The scoring rubrics for performance sample items provided researchers the opportunity to see how an individual item is awarded a specific raw score point (see Appendix A). A four point scale and criteria is used to determine the raw score point for each item. Each score point for the item has a description of the criteria that must be met in order to receive it's appropriate score point. Items that are scored on a 0 are identified as an incorrect. Other items have more detailed descriptions for each score points criteria (for example, 2 out of 3 things must be correct, etc.).

Items for two rubrics were generated from the Ministry of National Education Publications for Selective Courses Curriculum.

Group Evaluation Form: The purpose of this form was for each team member to evaluate the performance of the group work. This form included two sections. The first section consisted of 5 statements with scale of 1-3, and the second section consisted of 3 open-ended questions (See Appendix B). This form was given to experimental group at the end of the group project to critique their group experiences in the project. Students used this form to evaluate how well they and their group functioned.

Self Evaluation Form: The purpose of this form was for each team member to evaluate his/her performance in the group. This form included two sections. The first section consisted of 4 statements with scale of 1-3, and the second section consisted of 5 open-ended questions (See Appendix C). This form was given to experimental group at the end of the group project to critique their own experiences in the group project. Students used this self-evaluation form to reflect and respond about participation within their group, the project, and the knowledge they gained.

PROCEDURES

A pre-test/post-test control group design (Campbell and Stanley, 1963) investigation was undertaken with 98 students from 6th grade students (male and female) enrolled in computer class at the elementary school in Koprubasi, Trabzon, Turkey in the 2002-2003 academic years. The research lasted 2 mounts (8 weeks).

Performance test was administered to students at the beginning of the study. During the performance test students were asked to create a one-page draw document, such as a poster or magazine cover and create a slide show, including text, backgrounds, graphics, transitions, & text builds, using the following programs: MS Paint and MS Power Point. Rubrics were used to evaluate each student's competency level.

Students were randomized to four sections because the computer suite could accommodate only 25 students. Two sections formed the control group. Other two sections received the project based instruction. Each class section lasted 90 minutes.

The Monday afternoon classes were used as the control population and were taught (45 minutes) in the traditional style, with information presented in a lecture format and concepts explained by the instructor prior to lab work. In lab work period (45 minutes) students were asked to work on lab activities in small groups of three or four members. During practicing class activities students selected their own group members.

The Wednesday afternoon classes were the experimental population, and project based learning design was implemented. Students over the period of 90 minutes, planned, designed and developed their group projects. Computer lab was available for them during this period.

At the end of the eight week the performance test was administered again to all individual students to assess their competency levels. Students were asked again to create a one-page draw document, such as a poster or magazine cover and create a slide show, including text, backgrounds, graphics, transitions, & text builds, using the MS Paint and MS Power Point programs. Rubrics were used to evaluate each student's competency level. Also group and self evaluation forms were given to experiment groups to assess individual and group performance

DESIGN OF PROJECT BASED LEARNING ENVIRONMENT

Group Selection and Size

Groups can be formed using self- selection, random assignment, or criterion- based selection. This study used self- selection, where students chose their own group members. The choice of group size involves difficult trade-offs. According to Rau and Heyl (1990), smaller groups (of three) contain less diversity; and may lack divergent thinking styles and varied expertise that help to animate collective decision making. Conversely, in larger groups it is difficult to ensure that all members participate. This study used a group size of four. There were 48 students in the project based learning treatment group. Thus, there were 12 groups of four students each. Only two groups included 5 students.

Cross Curriculum Project Planning

Computer course is a subject on its own, the knowledge, understanding and skills taught in computer class are expected to be applied and developed across the curriculum. Implementing cross-curriculum projects in computer class allow students to see how their computer skills are connected in the real world.

In this study the computer teacher played a key role in the success of across-the-curriculum projects. At the beginning of the study computer teacher worked with teachers from several subject areas to identify project topics. Teachers came with different ideas. The possibilities for projects were endless. The key ingredient for any project idea was that it is student driven, challenging, and meaningful. Several questions formed in this stage such as:

_ does the project stem from a problem or question that is meaningful to the student?
_ is the project similar to one undertaken by an adult in the community or workplace?
_ does the project give the student the opportunity to produce something that has value or meaning to the student beyond the school setting?

Outlining Project Goals

The teacher and the students developed an outline that explains the project's essential elements and expectations for each project. The outline contained the following elements:

a) Situation or problem: A sentence or two describing the issue or problem that the project is trying to address. Example: Homes and businesses in Koprubasi affect the lake's phosphorus content, which reduces the lake's water quality. How can businesses and homeowners improve the quality of the lake water?
b) Project description and purpose: A concise explanation of the project's ultimate purpose and how it addresses the situation or problem. Example: Students will research, conduct surveys, and make recommendations on how businesses and homeowners can reduce phosphorus content intakes. Results will be presented in a PowerPoint.
c) Performance specifications: A list of criteria or quality standards the project must meet.
d) Rules: Guidelines for carrying out the project. Include timeline and short-term goals, such as: Have interviews completed by a certain date, have research completed by a certain date.
e) List of project participants with roles assigned: Include project teammates, community members, school staff members, and parents
d) Assessment: How the student's performance will be evaluated.

Identify Learning Goals and Objectives

Before the project is started, teacher identified the specific skills or concepts that the student will learn, formed clear academic goals, and mapped out how the goals tie into school, state, and/or national standards.
Teacher asked following questions when determining learning goals:

1. What important skills do I want my students to develop? (e.g., to use computer to create presentations). Here teacher used national standards as a guide.
2. What social and affective skills do I want my students to develop? (e.g., develop teamwork skills).
3. What metacognitive skills do I want my students to develop? (e.g., reflect on the research process they use, evaluate its effectiveness, and determine methods of improvement).
4. What types of problems do I want my students to be able to solve? (e.g., know how to do research, to use computers effectively, to solve real life problems).

Project Development Process

Students had no a priori knowledge in drawing and presentation tools and, therefore, were given hands on activity books and resources to provide them with basic skills in MS Paint and MS Power Point application programs. The students also had to develop their collaborative working skills. As a group, students had to decide on the concept of the presentation, the design of the presentation interface and navigation, and the appropriate digital multimedia elements and interactive features to use to best convey their topic of interest. They also had to decide on a group leader and assigned various tasks to their members. These included tasks such as "Graphic Designer", "Sound Engineer", "Researcher" and "Producer."

In the project development process the role of the teacher in this class was that of a facilitator and consultant to these students (Katz, L.G. & Chard, S.C. 2000). The teacher and students met twice a week to discuss their group projects and to consult on any issues or concerns that they may have encountered.

In the project development process (Asan, 2002) the students created their applications as follows:

1. *Subject/Topic Selection.* The teams and their group leaders brainstormed ideas with the computer teacher discussed possibilities and options. After discussion period the teams listed the topics that were of interest to them and selected the one that everyone could agree upon to do.
2. *Concept Mapping.* After deciding on their topics of interest, the various teams then developed concept maps to conceptualize their ideas. These concept maps were presented to the lecturer for consultation. From these concept maps the interactive application was developed.
3. *Planning, organizing and information gathering.* The groups then organized their schedules, planned their meetings, discussions and brainstorming sessions, divided the team work and carried out research activities such as interviews and information gathering on their topics from various sources such as printed books and the Internet.
4. *Information processing.* After collecting the necessary data, the groups then discussed and decided on the combination of media elements (text, graphics, sound, and video, animation) to use to best convey their data, and set about creating and finding those elements. After all the elements had been created and the information was successfully digitized, groups referred back to their concept maps and authored their applications accordingly.
5. *Knowledge Presentation.* At the end of the project, each group made an oral presentation of their final product to the teacher and their peers who then made critical comments on their projects. This enabled students to reflect on their overall performances.

SHOWCASE STUDENT PROJECTS

The final presentations that were developed by groups included many topics. One group, for example, developed an interactive presentation on a Turkish traditional wedding (Figure 10). Here students focused on the traditions and culture of Turkish wedding in the Blacksea region. Students created interactive buttons to link the user to the various pages in the application, including "Engagement ceremony," "Khina night", and "Wedding songs". Students created their drawings by using paint program. They copied and then pasted their drawings into Power Point. They also inserted recorded sound into their applications. Another group concentrated on developing their application around the topic of *Healthy Environment* (see Figure 2). They dealt with environmental issues and diseases caused by air pollution. Other groups worked on different topics such as technological developments (see Figure 3), traffic, daily life in the village, football, and animals.

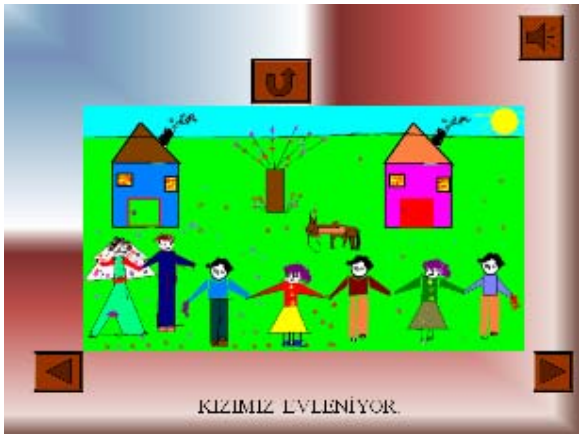

Figure 1. The final page for one group's project on a traditional Turkish wedding.

Figure 2. A menu page for another group's project on healthy environment.

Figure3. A Screen on history of microscope.

3. RESULTS AND DISCUSSION

Pre-test Post-test

A performance test was administered to the both control and experimental group students prior to the computer class. After completing the study, both groups were given the same performance test as a posttest.

Table 1. MS Paint and MS Power Point Competencies for experimental and control groups on pretest

Pretest	**Control Group (n=50)**		**Experimental Group(n=48)**			
	X	**Ss**	**X**	**Ss**	**t**	**p**
MS.Paint	1.1836	14.67	1.1812	15.64	0.02	0.98
MS. Power Point	0.3012	9.70	0.3191	8.87	0.02	0.81

($\infty = 0.05$)

Table 2. MS Paint and MS Power Point Competencies for experimental and control groups on posttest

Posttest	**Control Group (n=50)**		**Experimental Group(n=48)**			
	X	**Ss**	**X**	**Ss**	**t**	**p**
MS.Paint	2.5344	27.45	3.1632	19.88	3.24	0.002
MS. Power Point	2.4008	27.45	3.2560	20.41	4.39	0.000

($\infty = 0.05$)

As it is seen from Table 1, pre test results for students' MS Paint and MS Power Point competencies indicate that there is no statistically significant difference between two groups at alpha level of 0.05. The competency level of both groups was similar at the beginning of the study.

Table 2 illustrates statistical analysis of posttest results for students' MS Paint and MS Power Point competencies. At the end of the study, the two groups performed in a statistically significant manner at alpha level of 0.05. The experimental group achieved a higher mean score in competencies (MS Paint mean = 3.16), (MS Power Point mean = 3.25) compared to the control group (MS Paint mean = 2.53), (MS Power Point mean = 2.40).

The t test results indicate that the improvement in scores from the pretest to the posttest was significant (MS Paint $t = 3.24$, $p<0.05$), (MS Power Point $t = 3.24$, $p<0.05$).

Group Evaluation Form

The purpose of this form was for each team member to evaluate the performance of the group work. This form included two sections. The first section consisted of 5 statements with scale of 1-3, and the second section consisted of 3 open-ended questions (See Appendix B). This form was given to experimental group at the end of the group project to critique their group experiences in the project. Students used this form to evaluate how well they and their group functioned.

Table 3. Students' selected responses in group evaluation form.

ITEMS	**Yes %**	**Sometimes %**	**Not this time %**
We planned all activities together	67	14	19
We searched different sources to get information	42	30	28
We respected each others opinion in group	75	14	11
We worked all very hard	80	9	11

Self Evaluation Form

1) There were problems encountered during our group work, because …….		
CATEGORY	**%**	**SELECTED ANSWERS**
Disagreement within the group	47	My friends were always arguing about everything. Sometimes we were all in discussion and disagreement.
Lack of computer skills	24	Sometimes it was difficult for us to complete the task, because we didn't know how to do it. Scanning pictures, copying and pasting all went wrong at the first.
Group size	7	We were four, and there was only one computer for us. I waited too much for my turn.
2) Our group was perfect, because ……		
CATEGORY	**%**	**SELECTED ANSWERS**
Collaboration	80	We supported and respected each others' opinion. We did everything together and we were successful. There was a good relation in our group work, and nobody got angry.
Computer skills	26	We learned everything, how to draw pictures and how to make presentations. We were perfect on computers.
Research skills	24	We planned our work and we did researches to get information.
3) Our group would have performed better if ……		
CATEGORY	**%**	**SELECTED ANSWERS**
Disagreement	51	We had respected each other. I were happy in my group We had an agreement. Serdar wasn't in our group, because of Serdar it was difficult for all of us to succeed.
Teacher directions	16	We had listened to our teacher. We had followed teacher directions
Time management	11	There was no time, we run out time.
Group size	8	If we were only two student in the group. we couldn't do better because we were four.

The purpose of this form was for each team member to evaluate his/her performance in the group. This form included two sections. The first section consisted of 4 statements with scale of 1-3, and the second section consisted of 5 open-ended questions (See Appendix C). This form was given to experimental group at the end of the group project to critique their own experiences in the group project. Students used this self-evaluation form to reflect and respond about participation within their group, the project, and the knowledge they gained.

Table 4. Students' selected responses in self evaluation form.

ITEMS	**Yes %**	**Sometimes %**	**Not this time %**
I followed the teachers' instructions	86	9	5
I learned computer skills	79	16	7
I respected each others' opinions	79	14	5
I asked when I get confused	72	9	19

1) The most important thing that I have learned from this project ……..…		
CATEGORY	**%**	**SELECTED ANSWERS**
Computer skills	46	I learned everything about computers I learned how to use scanner Now I know how to insert pictures, sound, and video to my presentation I learned making my drawings as a background on my desktop
Collaboration	32	I learned how to respect other's ideas We can't decide by ourselves, we have to take different opinions to make decisions. How to be sensitive to other's feelings I have learned to be more patient to my friends and be responsible for own actions
Research skills	56	Research, take notes, analyze information I learned how to interview people
Interdisciplinary knowledge	39	I learned how important to protect our environment I learned that car egzost has a negative effect on our environment and health. I learned how was microscope at the beginning and how it was developed.
Taking risks	7	At the beginning we were afraid but we knew we had to take risks to be successful We tried everything to get computer work
Working hard and time management	5	If you want to be your work complete you should work very hard To be always on time and meet deadlines
2) Our project was very boring, because ……		
CATEGORY	**%**	**SELECTED ANSWERS**
Deleted files	33	Somebody deliberately deleted our file, so we prepared them again We don't know what happed but we couldn't find our work as we leave it. We had to create it again.
Feeling not respected	31	I tried to say something and do something but they didn't allow me to do so. My friend was always erasing everything that I added to the work.
Lack of skills	15	We didn't know how to use computer very well. Everything was very hard and complicated
Gender issues	2	I don't like to work with boys.
3) I contributed to group progress by doing ……..		
CATEGORY	**%**	**SELECTED ANSWERS**
Taking individual responsibility	90	I helped my friend, I took notes, I visited hospital. I was teaching them what I know about computers

		I shared my ideas with my friends, I collected pictures and I scanned them. I helped them to find information about our topic, I visited and talked to responsible people.
4) I wasn't very good in the project, because ……		
CATEGORY	**%**	**SELECTED ANSWERS**
Lack of computer skills	48	There many things that I don't know very well. I didn't know how to scan pictures I didn't know copying and pasting pictures
Lack of collaboration	35	Meryem and Esma they didn't give me chance to use computer. I waited too long for my turn and I forgot what I know already.
Anxiety	9	I was afraid that my friend will blame me for wrong things I was afraid to push wrong button.
Gender Issues	2	My peer was a girl.
5) I was very good in the project, because ……..		
CATEGORY	**%**	**SELECTED ANSWERS**
Self esteem	38	I am interested student and intelligent. My ideas are always good, I am brilliant. I worked very hard and I did everything correct. I can learn very easily. I am talented student, also my partners were talented.
Pre-entry skills	25	I had experience before. I was using MS Paint before. Also my brother taught me how to animate pictures.
Collaboration	24	My friends were very kind, they let me use computer. My partners helped me, I also helped them to get job done.
Teacher instructions	12	I followed my teachers' instructions and I did everything correct. Our teacher explained and I did well.
Computer access	1	I have computer at home.

Collaborative skills

Project implementation was the result of the efforts of many. Most of the students indicated that they respected each others opinion in the group and they learned to share tasks and take responsibility for accomplishing them. But some responses presented a more complex situation than researchers anticipated. Approximately 50 percent of students indicated that there was a disagreement within the group members. Also some responses emerged to confirm the presence of a strong individualistic culture in the groups. Most students rated their own team work abilities highly. 90 per cent indicated that their success is entirely due to their efforts. In other words, students had confidence in their own skills to effectively complete team projects. Students also believed that their fellow students contributed to the best of their ability to satisfactorily complete the team project. From all of these responses we can conclude that the students felt very positive about their collaboration. The way they talked about arguing seems to suggest that there was a battle of wills over different people's opinions rather than a sharing of ideas. At the end of the project, they seemed to appreciate that the final outcome was a combined effort and they enjoyed working with the other team members, learned about the importance of teamwork and learned to be more patient with others and to be more open-minded.

Few students complained about group size and time management. This is because this class were not used to group work, they wasted a lot of time and worked slowly.

Computer skills

Students were mostly novice computer users. Some had barely touched computer keyboards. Despite their lack of experiences they gained enormous achievements. 79% of students indicated that working on the project helped them improve their technological skills and learn about computers. Students acquired basic knowledge of computers, specific software and the skills to use them effectively as well as for learning purposes. They learned how to use scanner, how to insert pictures, sound and video to create PowerPoint presentation.

Some students complained about their lack of computer skills and knowledge. Most of the discomfort was related to insufficient basic computer skills, such as saving files, copying and pasting procedures. Few students

expressed fear of destroying the machine, fear of wiping out, destroying, or losing files or materials, fear of trying something new, and fear of embarrassment and the discomfort felt when their peers commented their work on.

Research skills
For a project, students searched information from books in library, CD ROMs and the Internet; discussed ideas with teacher and students, and interviewed people. I order to that they learned how to summarize, take notes, use manual or electronic searches, and ask questions in interviews. Several students indicated that working on the project helped them improve their research skills and learn about new topics. The project also gave them the opportunity to meet new people. The students felt that they learned the importance of time management and taking risks. In addition, they enjoyed learning useful skills.

Interdisciplinary knowledge
39% of students' responses confirmed that project based learning engaged them in learning activities that are interdisciplinary, student-centered, and integrated with real world issues and practices. Through the exploration of a theme and essential question that results in a product, students developed a more in-depth, applied understanding of an academic content area, philosophical issue, or social problem.

Teacher direction versus self direction
Most of the students felt the teacher's role in supplying knowledge about new technologies is vital to their acquiring new technology skills. Eighty-eight percent of the students credited listening to and observing a teacher as a primary source of their knowledge and skill in technology. But the responses also confirmed that they used self-selected resources, such as journals, other library resources and textbooks. As they engaged in real life issues and practices they tended to assume increased responsibility for their learning.

Self-esteem and self-motivated attitude
Self-esteem is related to children's feelings of belonging to a group and being able to adequately function in their group. %90 of the responses confirmed that taking pride in accomplishing something that has a value. It is possible that working on projects helped increase the students' feelings of academic competence because they constructed a meaningful project and helped increase their feelings of peer popularity because they successfully collaborated with others in the group to produce a quality project.
Students thought project based learning is an interesting and enjoyable learning method, and that it offers a more flexible and nurturing way to learn. Their attitudes helped students increasingly become more self-motivated and independent learners, which will help students, continue their learning practices once they leave school.

4. CONCLUSION

Project-based learning is an effective educational approach and offers the opportunity to apply theoretical and practical knowledge, and also to develop the student's group working, and collaboration skills. PBL allows the computer teacher the flexibility to present their curriculum in an innovative manner. In the PBL, the teacher becomes a facilitator, a consultant or guide on the side, helping students to access, organize and obtain information.

In this study the effect of PBL on students' computer skill achievement level and group working skills were investigated. Pre and posttest results, student responses and observations conducted during this study suggest that when students work together in teams to create projects, they maximize their computer skills. This study also indicated that PBL improves students' collaboration skills. Harrison (1999) and Dooling (2000) studies support this conclusion as well. The data in this study also supports Venville, Wallace, Rennie, and Malone (2000) observation that students' learning was enhanced as a result of the collaboration and communication between the students of the pair. Additionally, this study supports the findings of Riel and Fulton (2001) on the importance of learning communities. Students need to be given opportunities to work together and develop collaborative skills.

Overall, this paper has shown that PBL can be used as an efficient instructional strategy in creating a constructivist based learning environment in a computer classroom. Today's children need to learn the skills that will help them in today's job market and today's society. They need to learn how to make decisions on their own, work well with others, and sift through vast amounts of information.

PBL accommodates and promotes collaboration among students, between students and the teacher. For PBL to be effective, the school must give students change to involve team projects frequently. Placing students in a group and assigning them a task does not guarantee that the students will engage in effective collaborative

learning behavior. When you put a group of people that have never worked together, personalities might lead to arguments. The traditional lecture-oriented classrooms do not teach students the social skills they need to interact effectively in a team Teachers should give students the skills they need to succeed in groups. Many students might have never worked in collaborative learning groups and may need practice in such skills as active and tolerant listening, helping one another in mastering content, giving and receiving constructive criticism, and managing disagreements. Teachers should discuss these skills with his/her students and model and reinforce them during class.

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APPENDIX A- RUBRICS

MS PAINT RUBRIC

ITEM 1 (type and format text)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.
SCORE POINT 2:
At least two of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Different fonts are used
- Different font styles are used
- Different font sizes are used
- Color of the text is changed

ITEM 2 (create picture)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.
SCORE POINT 2:
At least three of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Freeform line is used

- Straight line is used
- Ellipse shape is used
- Circle shape is used
- Rectangular shape is used
- Square shape is used

ITEM 3 (Working with colors)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.
SCORE POINT 2:
At least three of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Foreground colors are used
- Background colors are used
- Area or object filled with colors
- Brush paint is used
- Airbrush effect is created

ITEM 4 (Work with picture)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.
SCORE POINT 2:
At least three of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Picture is used as a desktop background
- Image file is inserted into current picture
- Picture or object is rotated
- Picture or object is flipped
- Part of the picture copied and pasted

MS POWER POINT RUBRIC

ITEM 1 (Inserting Slides)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.
SCORE POINT 2:
At least two of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Applying a slide layout
- Using normal, slide sorter and slide show view buttons
- Deleting Slide
- Copying and pasting slide
- Changing the slide order
- Changing the slide background
- Applying slide design

ITEM 2 (Working with Slides)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.

SCORE POINT 2:
At least two of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Adding text
- Using text box
- Adding clip art
- Adding picture
- Adding sound, music
- Adding video

ITEM 3 (Presentation Features)
SCORE POINT 0:
None of the tasks are correctly completed.
SCORE POINT 1:
At least one of the tasks is correctly completed.
SCORE POINT 2:
At least three of the tasks are correctly completed.
SCORE POINT 3:
All tasks are correctly completed.

- Creating slide show
- Animating text
- Animating text by letters, word or paragraph
- Animating objects
- Setting timing
- Setting transitions

APPENDIX B- STUDENT GROUP EVALUATION FORM

Group Project_____
Student Name_____

Use this group-evaluation guide to reflect and respond about participation and collaboration within your group, the project, and the experience you gained.

	Yes	**Sometimes**	**Not this time**
We planned all activities together			
We searched different sources to get information			
We respected each others opinion in group			
We worked all very hard			

1) There were problems encountered during our group work, because …….

2) Our group was perfect, because ……

3) Our group would have performed better if ……

APPENDIX C- STUDENT SELF EVALUATION FORM

Group Project_____
Student Name_____

Use this self-evaluation guide to reflect and respond about participation within your group, the project, and the knowledge you gained.

	Yes	**Sometimes**	**Not this time**
I followed the teachers' instructions			
I learned useful skills			
I respected each others' opinions			
I asked when I get confused			

1) The most important thing that I have learned from this project ……..

2) Our project was very boring, because ……

3) I contributed to group progress by doing ……..

4) I wasn't very good in the project, because ……

5) I was very good in the project, because ……..