The Relationship Between Achievement Goal Orientation, Perceptions of Collaboration, Attitudes towards Group Work and GPA in 3D Educational Software Development Process

3 Boyutlu Eğitim Yazılımı Geliştirme Sürecinde Başarma Amacı Yönelimleri, İşbirliğine Yönelik Algılar, Takım Çalışmasına Karşı Tutumlar ve Not Ortalaması Arasındaki İlişkiler

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Abstract

This study investigates students' achievement goal orientation in relation to their attitudes towards group work and their perceptions of group members' collaborative behaviors in 3D educational software development process. A total of 48 (33 males and 15 females) 4th year Computer Education and Instructional Technology Department students taking Design, Development and Evaluation of Educational Software course at Middle East Technical University in the Spring term of the year 2003 formed the sample of this study. The study lasted 14 weeks. During this period, the students worked in-groups and developed a 3D learning environment by using the rapid prototyping approach and Active World. 3.3·. At the end of the semester, a four-part survey questionnaire was given to students to collect data on background, achievement goal orientations, attitudes toward group work, and the students' perceptions of their group members' collaborative behaviors. The data were analyzed by descriptive and inferential statistics. The correlation analysis showed no significant relationship between attitudes towards group work and achievement goal orientation, however, attitudes toward group work predicts how subjects perceive their team members' collaboration with regard to their contribution to the task, discussing and listening, and team functioning behaviors. Significant correlation was found between collaboration in contribution to the task, discussing and listening, and team functioning behaviors. The results indicated that there was a significant relationship between mastery and ego orientations, and a negative relationship between Grade Point Average (GPA) and work-avoidant orientation. Finally, males were found to be significantly more work-avoidant than females.

Keywords: Project-based learning, Collaboration, Achievement goal orientations.

Öz

Bu araştırmanın amacı 3 boyutlu eğitim yazılımı geliştirme sürecinde öğrencilerin başarma amacı yönelimleri, takım çalışmasına karşı tutumları ile takım akadaşlarının işbirliği davranışlarına yönelik algıları arasındaki ilişkiyi araştırmaktır. Araştırmaya Orta Doğu Teknik Üniversitesi, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'nden 2003 yılı bahar döneminde Eğitim Yazılımı Tasarlama, Geliştirme ve Değerlendirme dersine katılan 33 erkek ve 15 bayan olmak üzere toplam 48 öğrenci katılmıştır. Araştırma 14 hafta sürmüştür. Araştırma süresince öğrenciler takımlar halinde çalışmışlar ve Active World 3.3 yazılımını kullanarak hızlı ilk örnekleme yaklaşımı ile 3 boyutlu öğrenme ortamı geliştirmişlerdir. Çalışmanın sonunda öğrencilerin demografik özellikleri, başarma amacı yönelimleri, takım çalışmasına karşı tutumları ve takım akadaşlarının işbirliği davranışlarına yönelik algıları hakkında bilgi toplamak amacıyla dört bölümden oluşan bir anket uygulanmıştır. Veriler betimleyici ve tahmine yönelik istatistiki yöntemlerle çözümlenmiştir. Bulgular öğrencilerin başarma amacı yönelimleri ve takım çalışmasına karşı tutumları arasında bir ilişki olmadığını, ancak öğrencilerin takım çalışmasına karşı tutumları ile takım arkadaşlarının işbirliği davranışlarına yönelik algıları arasında anlamlı düzeyde bir ilişki olduğunu göstermiştir. Öğrencilerin takım arkadaşlarının işbirliği davranışlarına yönelik algılarından katkıda bulunma, tartışma ve dinleme, ve takım işleyişine yönelik katkıları arasında, tam öğrenme ve benlik yönelimleri arasında anlamlı düzeyde olumlu ilişki bulunurken genel not ortalaması ile çalışmaktan kaçınma yönelimi arasında anlamlı düzeyde negatif bir ilişki olduğu ortaya çıkmıştır. Son olarak erkek öğrencilerin çalışmaktan kaçınma yönelimlerinin kız öğrencilerden anlamlı düzeyde daha fazla olduğu ortaya çıkmıştır.

Anahtar Sözcükler: Proje tabanlı öğrenme, İşbirliği, Başarma amacı yönelimleri.

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Introduction

Certain foundations give shape to the process of designing and developing instructional software. Alessi and Trollip (2001) define these foundations as standards, ongoing evaluation and project management. The third one, project management, should penetrate the entire project with regard to good management of the tasks, resources, money, and time. From the start, it is important that a project is under tight control with regard to the stated issues. To make it possible, an instructional software development project requires "a team of talented individuals to work towards a common goal" (Alessi & Trollip, 2001, p. 530). While working on the project, all students need to be competent in undertaking their own work in relation to other team members, and also in accordance with specified project goals. During this process, the social skills of the team members are important to facilitate cooperation, resolve conflicts, communicate with others, set goals and make plans for the success of the project (Viktorsson & Ritzen, 2005).

Since the instructional software development process in real life requires strict project management and team-work, "instructional software design, development and evaluation" studied at university level can be learned better through a project-based collaborative learning experience. According to Rooney (1996), "project-based means student centered, hands-on, active learning, and retention of knowledge" (p.3). She indicates that in the project-based learning process, students are responsible for the planning and execution of a curriculum-based project. In such an environment, students are provided with opportunities to experience and re-experience course-related concepts in an authentic context, to become actively involved in the learning process, and to enrich their understanding of the materials and ideas (Solomon, 2003). According to Shanley (1999), project-based learning is a tool that "empowers children to understand exactly what it is they are learning" (p. 2). It is a challenging process, but when we think about the outcome, it is worth the effort. She stated that "project-based learning is much more relevant, and helps to build valuable critical thinking and problem-solving skills" (p. 2). Even though a project-based learning context provides opportunities

for effective learning, the individual characteristics of team members such as achievement goal orientation, attitudes toward group work and collaboration affect the project-based learning process and the outcomes of the process.

In reaching instructional goals, students' perceptions of achievement, understanding of learning, study habits, and interactions with others in the teaching and learning environment are some of the determining factors. As Eggen and Kauchak (1999) state, one way of reaching instructional goals is "guiding students in setting their own goals" (p. 417). This goal setting motivates students, and helps them act to reach the place they want to be in their learning processes (Woolfolk, 2004). Current literature indicates two independent types of goal orientation, performance goals and learning goals (i.e., mastery goals) (Breland & Donovan, 2005). While guiding students, the distinction between performance oriented and learning oriented goals is important. Eggen & Kauchak (1999) define the performance goal as a "focus on demonstrating high ability and avoiding failure. In a performance orientation, learning isn't viewed as a goal in itself, but rather as a means to end, such as a high-test score or good grade" (p. 418). Performance-oriented learners are motivated to show their task competency to avoid negative judgments (Breland & Donovan, 2005), and to outperform others (Bong, 2004). Those types of learners tend to be motivated extrinsically most of the time (Woolfolk, 2004). However, some learners are not willing to learn, they avoid work, and without expending much effort, they try to finish the given tasks and activities as fast as possible. Those learners can be categorized as work-avoidant (Wooklfolk, 2004).

Learning goals, on the other hand, focus on the challenge and mastery of a task (Pintrich & Garcia, 1991 & Stipek, 1996, cited in Eggen & Kauchak 1999), and learning goal oriented students learn the subject to improve their competencies (Bong, 2004). "Learning goals lead to task orientation, in which students focus on understanding and don't worry about failure or comparisons with others" (Eggen & Kauchak, 1999, p. 418). Learning goal oriented learners strive to master something new or to improve their competencies in the subject to be learned (Breland & Donovan, 2005). Those

learners tend to look for challenges, and continue even when they are faced with difficulties (Dupeyrat & Marine, 2005; Woolfolk, 2004). Literature indicates a positive relationship between mastery goals and productive performance behaviors (Giota, 2002).

Another issue which should be considered to ensure the success of software development and project-based learning is effective collaboration among the project team members. Communication and collaboration among team members are essential factors in the software development process. (Hazzan & Tomayko, 2005). According to Alessi and Trollip (2001), collaborative learning requires an "environment in which learners work on a shared project or goal" (p. 34). Similarly, Rosca (2005) argues that collaborative learning involves social skills, positive interdependence, group indulgence, individual accountability, and interaction.

In a collaborative process, students work together to achieve goals or to finish a project; they learn from each other; they express their own ideas and understanding to help others understand them; they develop an understanding of other perspectives and views as the main advantages of collaborative learning. "The group process naturally produces a level of cognitive conflict that challenges the personal understanding of group members, and encourages more active self-regulated learning"(Grabe&Grabe, 2001, p.71). Additionally, collaborative learning provides students with an environment similar to work-place (Howard, 2004).

Although they have many strengths, collaborative learning activities are difficult to organize. As Alessi & Trollip (2001) and Grabe & Grabe (2001) state, the main disadvantage of collaborative learning is that some learners may benefit more than others in such an environment. To ensure all the learners benefit from a collaborative learning experience in an optimum way, activities should be planned, and the type of grouping from one subject or task to another should be defined well. In short, a purposeful structure is necessary in making collaboration effective (Grabe & Grabe, 2001).

Learning the content of instructional software design and development requires a project-based collaborative learning setting in which students learn from each other, reflect their own and team members' ideas, to

experience group interdependence as a main ingredient in this process. However, learners' perceptions of achievement goal orientation, and how they see group work and collaboration may affect the success of this process. From this perspective, it is important to investigate the relationship between goal orientation, attitudes toward group work and collaborative behaviors of students in a project-based software development process. Therefore, this study aims to find out if there are relationships between goal orientation profiles, group work attitudes, group members' perceived collaborative behaviors and GPA in an instructional software design and development process.

The specific research questions that guided this study were the following: (1)What are the participants' achievement goal orientations, attitudes toward group work and perception of their group members' performances in terms of effective collaborative behaviors? (2) Is there a significant difference between male and female students' achievement goal orientations, attitudes toward group work and effective collaborative behaviors? (3) Is there a significant relationship between students' achievement goal orientations, attitudes toward group work, perception of their group members' performance in terms of effective collaborative behaviors and GPA?

Investigating the relationship between achievement goal orientations, attitudes toward group work, and students' perceptions of group members' collaborative behaviors is important from several perspectives. First of all, an educational software development process requires effective teamwork and project management. Since each team member might have a different goal orientation, attitude towards group work and contributions to the group tasks, it would be valuable to examine the relationships among them in an educational software development process. The findings of this study may provide valuable information for educational software development practitioners in forming the development team so that they may benefit more from this process. Additionally, this study may offer insights to the instructors in order that they may be able to help students benefit more from a course on instructional software development.

Method

A case study design was used to examine participants' achievement goal orientations, attitudes toward group work, students' perceptions of their group members' collaborative behaviors, and the relationships among these variables. For this purpose, a specific undergraduate course, "Design, Development and Evaluation of Educational Software," was selected, and the students taking the course formed the sample of the study. A survey design was used to collect the related data. Below the detailed description of the study subjects, the procedures, the data collection and analysis are presented.

Subjects of the Study

The fourth year Computer Education and Instructional Technology Department students who took the Design, Development and Evaluation of Educational Software Course at Middle East Technical University in Turkey formed the sample of this study. A total of 56 students were enrolled on the course (sections one 27, and two 29), but a total of 48 (33 males and 15 females) subjects volunteered to participate in the study. 14 project groups were formed based on gender and Cumulative Grade Points Average. Students were assigned to the project groups randomly considering gender and achievement (high, average and low achievers) clusters to make sure that students from both genders and different achievement levels were represented in the project teams. The Design, Development and Evaluation of Educational Software course was regarded as their graduation course, and they were expected to apply what they had learned in previous courses during their undergraduate period to their projects in this course.

Procedures of the Study

The study lasted 14 weeks (the spring term of 2003). During this period, the group members worked together and developed three-dimensional (3D) instructional software by using the rapid prototyping approach. At the beginning of the semester, the students were informed that as the course project they were supposed to develop a 3D learning environment by following the rapid prototyping approach. Two instructors gave the course involving three theoretical and two practice hours in two sections. In both sections the same content was covered and the same instructional materials and methods were used.

The course consisted of two parts. During the theoretical component of the first part (the first six weeks), students were provided with the basics in the educational software development field. In the first six weeks of the course, the students were taught the theoretical basics of the educational software development process on "learning principles and approaches, general features of educational software, games and simulations" (Alessi & Trollip, 2001), the Systems Approach to Instructional Design (ADDIE Model) (Dick & Carey, 1996), and the Rapid Prototyping Model (Tripp & Bichelmeyer, 1990) repetition of developing, testing and correcting process until producing the final product. During this period, an expert from a private educational software development company was also invited, and he explained how educational software development procedures took place in real life settings. During the practice hours of the first part, the students played with three educational games and wrote a reflective journal individually to compare them in terms of their educational aspects. For the remaining time they examined the characteristics of the 3D environment development software (Active World 3.3") which they did not know then and used in their projects. At the same time they, as group members, brainstormed their project ideas, which needed to be in line with the course framework.

In the second part of the course (the remaining eight weeks), the students focused on their projects. They worked on the analysis, design, development, implementation and evaluation phases of the educational software development process, and wrote reports related to each phase. During this period each group was assigned a specific weekly time period for consultation, and the group members consulted their instructors on their projects and reports. At the end of each consultation period, each group received feedback related to their projects (paper-based prototype, computer-based prototype, the actual product and so on) and reports. They then modified their work in relation to the feedback they had received. This procedure was an iterative procedure, and until the final version of the

project, there were revisions. At the end of the semester, the groups presented their projects to their classmates, together with the documentation of their completed 3D learning environment, in order to share what they had done with others.

Data Collection and Analysis

A four-part survey questionnaire, the Achievement Goal Orientation and Collaboration Questionnaire, was developed to collect data on background variables, achievement goal orientation, attitudes toward group work and group members' collaborative behaviors.

The achievement goal orientation part of the questionnaire included statements related to the three orientation subscales, mastery (which indicates learning goals and consists of 13 items), ego-social, and work-avoidant (which indicate performance goals and consist of 13 and 8 items respectively). A five-point Likert-type scale (ranging from 1 as low to 5 as high orientation) was used to differentiate orientations. The statements in this part of the questionnaire were adapted from a questionnaire (The Achievement Goal Orientation Questionnaire) originally developed by Somuncuoğlu & Yıldırım (1999). They carried out a pilot study with a group of 47 students in 1995 and found a .85 alpha score on mastery, a .83 alpha score on ego-social, and a .79 alpha score on work-avoidant scales.

The collaboration part of the questionnaire included two sections. The first section included the items adapted from The Effective Collaboration Rubric originally developed by the International Society for Technology in Education (ISTE). This section consisted of three subsections: contribution to group tasks and completion of personal tasks (5 items), discussion skills and active listening (4 items), and contribution to group evaluation, problem solving and team functioning (3 items). A four-point Likert-scale (ranging from 1 being the lowest level of collaboration to 4 being the highest level of collaboration) was used. The second section aimed to measure attitudes towards group work and consisted of 12 Likert-type items (ranging from 1 indicating the lowest level to 5 indicating the highest level of agreement). The items in this section were also adapted from the Attitudes toward Group Work Questionnaire, developed by the International Society for Technology

in Education (ISTE). In this study, a .80 alpha score for the items on attitudes towards group work, and a .93 alpha score for items on effective collaboration were found.

The data gathered through the questionnaire were analyzed by descriptive and inferential statistics. Firstly, a descriptive analysis of the items in the three scales in terms of means and percentages was carried out. Secondly, sub-scale scores were calculated for each category under the achievement goal orientation and collaboration scales. Then, the relationship between achievement goal orientations, attitudes towards group work, and the effective collaboration rubric scores were analyzed through a correlation coefficient test. Finally, a t-test was performed to find out if there were any significant differences based on gender.

Rapid Prototyping Model

In the 3D learning environment development process, the project groups used the rapid prototyping approach that was adapted to the educational software development field from the software engineering field by Tripp & Bichelmeyer (1990). According to Lantz (cited in Tripp & Bichelmeyer, 1990), prototyping means "system development methodology based on building and using a model of a system for designing, implementing, testing and installing the system" (p. 35). Rapid Prototyping is repetition of the developing, testing and correcting processes until the production of the final product (Wideman, 2003). In this approach, after briefly describing the needs and objectives, research and development processes were conducted parallel to each other to create prototypes of the software. After testing, the developer may come up with the final product or not (Tripp & Bichelmeyer, 1990). During the progress of their group projects, the students wrote analysis, design, development, implementation and evaluation reports in line with the rapid prototyping approach, and received weekly feedback from the course instructors. Parallel to the reports, they developed firstly paper-based, secondly computer-based and thirdly Active World based prototypes. They gathered feedback for their prototypes from the instructors, from their classmates, and from several other people involved in the project (teachers and students) and came up with the final product.

Active World. 3.3

The students in this study used Active World 3.3" to develop a 3D learning environment. Access to the software was provided from Indiana University in Indiana, the United States. The Active World interface consists of six main components: 3D Virtual World, Web, Chat, Tabs, Tool Bar and Menu Bar. The *3D Virtual World* component allows users to travel in virtual space; the *Web* component provides the knowledge base for the subject area and browsing; the *Chat* component helps users converse with others in the system simultaneously; the *Tab* component enables users to move from one virtual world to another one. The *Menu* and *Tool Bars* help users build virtual worlds and change preferences. The students in this study, who were fourth year Computer Education and Instructional Technology Department students at Middle East Technical University, were able to use Active World in the departments' computer laboratories and needed to connect to the Indiana University's server through the Internet.

Limitations of the Study

The small sample size was one of the limitations of the study. The number of the participants was limited to the number of fourth year students in the Computer and Instructional Technology Education Department and to the students who were volunteers for this study. Therefore, the results of the study cannot be generalized directly beyond the case study group. Another limitation arises from the type of software used, and the way in which it was used in the study. As indicated, Active World 3.3" was used in this study. The space of the virtual world provided for each project group by Indiana University was limited, and connecting to Indiana University servers through the Internet was slow. In addition, the students were using 3D development software for the first time. Even though the students overcame the novelty of the development tool, limited virtual space and slow Internet access remained the main limitations of the project groups. Despite these limitations, this study provides a valuable contribution with regard to the relationship between goal orientation profiles, group work attitudes and collaborative behaviors in the 3D instructional software design and development process.

Results

Descriptive Results on Achievement Goal Orientations, Attitudes toward Group Work and Effective Collaboration Behaviors

The descriptive results of the study are presented in Table 1. The results of the study showed that the subjects are very close to mastery goal orientation (M=3.87), then ego-social (M=2.97), and the last work-avoidant (M=2.1) as a whole. The dominant orientation profiles among the students are mastery, and both mastery and ego-social orientations. The findings indicate that majority of the students focus on the challenge and mastery of the task as Eggen and Kauchak (1999) indicated.

Attitudes toward group work scores (M=3.56) showed that the majority of the students agreed with the

Table 1.

Descriptive Results on Achievement Goal Orientations, Attitudes toward Group Work and Collaboration Behaviors

	N	Minimum	Maximum	Mean	Std. Deviation
Mastery Orientation	48	2.75	5.00	3.87	.51
Ego-social (Performance Orientation)	48	1.38	4.15	2.97	.71
Work-avoidant	48	1.00	3.75	2.10	.80
Group Work Attitude	46	2.17	4.67	3.56	.62
Task Collaboration	48	2.40	4.00	3.46	.43
Discussion/Listening Collaboration	48	2.33	4.00	3.46	.43
Team Functioning Collaboration	48	2.00	4.00	3.43	.46

statements. It can be concluded from this result that students have positive attitudes towards group work.

Students had similar scores on contribution to group tasks and completion of personal tasks (M=3.46); discussion skills and active listening (3.46); and contribution to the group evaluation, problem solving and team functioning (3.43) sub-scales of the collaboration rubric indicating that students perceived other group members as effective collaborators (4th level) in this process.

Differences in Achievement Goal Orientations, Attitudes toward Group Work and Collaboration Behaviors by Gender

As presented in Table 2, the t-test results showed no significant differences between males' and females' attitudes toward group work, and perceptions of effective collaboration rubric. In relation to achievement goal orientation profiles, t-test results indicated similarly that there were no significant differences between males and females regarding mastery orientation and ego-social orientation. However, there was a significant difference between males and females in the work-avoidant profile indicating that males (M=2.26) are significantly more work-avoidant than females (M=1.75) (t=2,092, p<.05).

Relationship between Achievement Goal Orientations, Attitudes towards Group Work, and Perceptions of Collaboration Behaviors and GPA

The correlation results are presented in Table 3. Regarding the relationship between attitudes towards group work and achievement goal orientations, the correlation analysis showed no significant relationship. However, the results indicated a significant correlation between attitudes towards group work and how subjects perceive their teammates' collaboration in regard to discussion and active listening behaviors. In addition, the results pointed to a significant negative correlation between work-avoidance orientation and students' GPA (r:-.40; p<.05). When collaboration behaviors were taken into consideration, there was a significant correlation between completion of/contribution to tasks (as a collaborative behavior) and discussion/active listening behaviors (r:.88;p<.05), between completion of/contribution to tasks, collaboration and team functioning (r:.82;p<.05), and between discussion/active listening and team functioning (r:.78;p<.05). In addition, the results showed that there was a significant correlation between mastery goal orientation and ego goal orientation of the students (r:.44;p<.05).

Table 2.
Differences in Achievement Goal Orientations, Attitudes Toward Group Work and Collaboration Behaviors by Gender

	GENDER	N	Mean	Std. Deviation	df	t-value	p-value
Group Work Attitude	male	31	3.55	.60	44	-.080	.937
	female	15	3.57	.67			
Task Collaboration	male	33	3.51	.40	46	1.392	.171
	female	15	3.33	.47			
Discussion/Listening Collaboration	male	33	3.50	.40	46	1.185	.242
	female	15	3.35	.48			
Team Functioning Collaboration	male	33	3.47	.43	46	.856	.396
	female	15	3.35	.50			
Mastery Orientation	male	33	3.82	.51	46	-.982	.331
	female	15	3.98	.50			
Ego-social Orientation	male	33	3.00	.73	46	.487	.624
	female	15	2.90	.66			
Work-avoidance Orientation	male	33	2.26	.80	46	2.092*	.042
	female	15	1.75	.71			

* p<.05

Table 3.
Relationships between achievement Goal Orientations, Attitudes toward Group Work, Effective Collaboration Behaviors and GPAs

		2	3	4	5	6	7	8. Work-avoidance
1. GPA (Grade Point Average	Pearson r.	-.171	-.232	-.278	-.061	.266	-.130	-.403**
	Sig. (2-tailed)	.255	.113	.056	.682	.068	.380	.004
	N	46	48	48	48	48	48	48
2. Group Work Attitude	Pearson r.		.372	.438**	.334	.058	-.037	.009
	Sig. (2-tailed)		.011	.002	.023	.701	.806	.955
	N		46	46	46	46	46	46
3. Task Collaboration	Pearson r.			.883**	.822**	-.140	-.149	.329
	Sig. (2-tailed)			.000	.000	.342	.313	.023
	N			48	48	48	48	48
4. Discussion/ Listening Collaboration	Pearson r.				.783**	-.219	-.101	.305
	Sig. (2-tailed)				.000	.136	.495	.035
	N				48	48	48	48
5. Team Functioning Collaboration	Pearson r.					.000	-.169	.154
	Sig. (2-tailed)					1.000	.250	.295
	N					48	48	48
6. Mastery Orientation	Pearson r.						.437**	-.230
	Sig. (2-tailed)						.002	.116
	N						48	48
7. Ego-social Orientation	Pearson r.							.190
	Sig. (2-tailed)							.196
	N							48

** Correlation is significant at the 0.01 level (2-tailed).

Conclusions and Discussion

The results of the study showed that the majority of participants are close to mastery orientation indicating that rather than thinking about failure or comparing themselves with other students, they focus on mastering the subject in hand (Eggen & Kauchak, 1999). In addition, to a certain extent, the students are ego-social. Woolfolk (2004) stated that learners often possess mastery and performance oriented goals at the same time. According to Bong (2004), a person's interaction with the context plays an important role in determining their goal orientation. In line with Bong's statement, since the students were soon to graduate, they most likely wanted to be ready for the job market, and they might have wanted to develop themselves in the field. They might think that their achievements and high performances should be rewarded and honored, and they probably see grading as a reward for their achievements. At the same time, high grades might be a reference for them to look for a good job in the job market in Turkey.

The majority of the students agreed with the statements in the group work attitude survey. This result is in line with Viktorsson & Ritzen's (2005) studies. They mentioned that in addition to technical competence, there was a need for efficient planning, co-ordination and cooperation in order to design the product. This result was probably due to the fact that they were close to graduation and they realized that they were going to work with someone whom they did not know. Another reason can be the procedures followed in other courses at the department. The majority of the courses in the department include at least one long-term group project. From the first year, they are accustomed to project-based learning. The positive attitude towards group work might be due to their previous experiences of group work. Additionally, the educational software design development and evaluation process requires team-work and collaboration for the success of the software, as Alessi and Trollip (2001) indicated. The

students in this study probably realized that the software development process is a demanding process and it might not be possible to succeed in it through individual work alone. The students might thus have a positive attitude towards group work in this process due to this reason.

The students in the project groups knew each other but they had not worked together on previous projects. Nevertheless, the collaboration results showed that the students in this study were effective collaborators. In their study, Şumuer, Kurşun, and Çağıltay (2006) found out that the most frequent characteristics searched for in the field of Instructional Design and Technology job announcements were "collaboration and working in groups." In this project-based learning process, as Grabe and Grabe (2001) stated, students worked together to achieve the group goals, they contributed to and completed tasks, actively participated in discussions, listened to others, and solved problems to function as a team. It can be said that running an "educational software design, development, and evaluation course" in a project-based learning environment might help students become effective collaborators. This suggests that software developers should be responsible for the progress of the project as a whole (Viktorsson & Ritzen, 2005), and these issues need to considered in designing instruction.

In this study, males were significantly more work-avoidant than the females. However, the literature does not provide clear results with regard to gender differences in goal orientation (Giota, 2002). The majority of the males in this study possessed higher levels of technical knowledge than the females did. In order to improve their abilities and skills before graduation, females might have been trying to benefit from this process as much as possible. It can be concluded from this result that the female students were more committed to the software development project than the males were.. To be able to eliminate work-avoidance, and keep students on track in the course, students can be guided through the goal setting process, and close monitoring by the instructor can be offered.

Correlation analysis indicated that there was a negative relationship between GPA and work-avoidance orientation showing that low achievers do not focus on mastery or learning the subject, but rather prefer to avoid these types of responsibilities. This result is consistent with Woolfolk's (2004) statement indicating that work-avoidant learners are not willing to learn, and that they try to avoid work.

Among achievement orientations, there is a significant correlation between mastery orientation and ego-social orientation. Woolfolk (2004) mentions that learners often hold mastery and performance goals together, and these goals are associated with using active learning strategies and high self efficacy. As is indicated above, as a result of mastery, students might need external rewards as well. They might want praising and recognition for their learning as high grade and social approval as indicators of their achievement. Project-based learning requires effort demanding long term commitment. It would be motivating to promote students' work and effort in this process.

Attitudes towards group work seem to be correlated to participation in discussion, active listening, and involvement in other collaborative behaviors. The more positive the attitude towards group work was, the more involvement with group discussions was observed. In addition, there are positive correlations between the three subcategories of collaborative behaviors. This result indicates that these collaborative behaviors are interrelated, implying that to function efficiently as a group, the members should perform these collaborative behaviors. To be able to facilitate students' collaborative behaviors, clear guidelines about how the group would proceed throughout the project-based learning process may be provided, and effective group work may be facilitated by the instructor. This might help them approach group work more positively, and result in more effective collaboration.

Even though the findings indicated no significant relationship between goal orientation profiles, and attitudes towards group work and collaborative behaviors, appropriate goal setting, positive attitudes towards group work and effective collaborative behaviors are essential for the success of a software development project. In order to have students benefit from such courses, the instructors may guide students or groups to set their goals, to plan their group work.

Wideman (2002) indicated that the personality profiles of team members are important for the success of the software development process. To be able to uncover the contributing factors such as different cognitive styles and learning styles to the collaboration process in project-based learning and to contribute to the field, additional research studies are needed. In further studies, this issue could be examined by using both quantitative and qualitative research methods, and by evaluating group products. Such research studies would provide insight to the software development process, and enable students to gain from this process.

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