Relationship between Achievement Goal Orientation and Collaboration in Project-Based Learning Process

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Abstract

This study investigates students' achievement goal orientation in relation to their attitudes toward group work and perceptions of group members' collaboration behaviors. A total of 48 (33 males and 15 females) 4th year Instructional Technology Department students were 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 3D learning environments by using 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 perceptions of their group members' performances in terms of effective collaborative rubric. The data were analyzed by descriptive and inferential statistics. The correlation analysis showed no significant relationship between attitudes toward group work and profiles of achievement goal orientations. However there is a correlation between attitudes toward group work and how subjects perceive their team members' collaboration in regard to contribution to task, discussing and listening, and team functioning behaviors. Significant correlations were found between collaboration on contribution to task, discussing and listening, and team functioning behaviors. The results indicated that there was a significant relationship between mastery and ego orientations, negative relationship between GPA and work avoidant orientation. Finally males were significantly more work-avoidant than females.

Introduction

In the process of designing and developing instructional software, certain foundations are considered. Alessi and Trollip (2001) defined these foundations as standards, ongoing evaluation and project management. The third one, project management, should penetrate the entire project in regard to good management of the tasks, resources, money, and time. From the starting point, it is important that the project is under tight control in regard to the stated issues. To make it possible, instructional software development project requires "a team of talented individuals to work toward common goal" (Alessi and Trollip, 2001, p.530). Team members should communicate and collaborate well for the success of the project.

Instructional software design and development subject can be learned better through a project-based collaborative learning experience since in real settings this process requires a strict teamwork. According to Shanley, (1999), a technology coordinator Lynne Sueoke views project-based learning as a tool that "empowers children to understand exactly what is they are learning" (p.2). It is a challenging process but when think about the gains and outcomes, it is worth to effort. They stated that "project-based learning is much more relevant, and helps to build valuable critical thinking and problem-solving skills" (p.2). However, individual

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

In reaching instructional goals, students' perceptions of achievement, understanding of learning, studying habits, and interactions with others in the teaching and learning environment are some of the determining factors. As Eggen and Kauchak (1999) stated, one way of reaching these goals is "guiding students in setting their own goals" (p.417). While guiding students, the distinction between performance oriented and learning oriented goals are important.

Eggen and Kauchak (1999) defined performance goal as "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). Learning goals, on the other side, focus on the challenge and mastery of a task (Pintrich & Garcia, 1991; Stipek, 1996, cited in Eggen and Kauchak 1999). "Learning goals lead to task orientation, in which students focus on understanding and don't worry about failure or comparisons with others" (Eggen and Kauchak 1999, p. 418).

To be able succeed in project-based learning, collaboration among the project team members should be emphasized. According to Alessi and Trollip (2001) collaborative learning is "… suggesting environment in which learners work on a shared project or goal"(p.34). Grabe and Grabe (2001) indicated that "collaboration have been purposefully structured according to specific and clearly identified principles" (p. 70). In this process they work together to achieve the goals or to finish the project, they learn from each other, they express their own ideas and understanding to help others understand them, they develop 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 and Grabe, 2001, p.71). However collaborative learning activities are difficult to organize. As Alessi and Trollip (2001) and Grabe and Grabe (2001) stated, the main disadvantage of collaborative learning is that some learners may benefit more than the others in such environment. To have all learners benefit from this experience in an optimum way, activities should be planned, and type of grouping from one subject matter to another should be defined well.

Learning instructional software design and development subject 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 which as a main ingredient in this process. However, learners' perceptions of achievement goal orientation, and how they see group work may affect the success of this process.

Although there are many research studies that investigate goal orientation, collaboration, attitudes toward group work, and instructional software development process separately in the literature, there are not many studies that examine the relations among these themes. Therefore, this study tries to find out if there is a correlation between goal orientation profiles, group work attitudes and group members' perceived collaboration behaviors in instructional

software design and development process, and difference between male and female students. The specific research questions that guide this study are 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 collaboration behaviors?
(3) Is there a significant relationship between students' achievement goal orientations, attitudes toward group work, effective collaboration behaviors and GPAs?

Method

A case study design was used to examine the participants' achievement goal orientations, attitudes toward group work, effective collaboration behaviors, and the relationships among these variables in a project-based learning process. The study included fourth-year Computer Education and Instructional Technology students at Middle East Technical University in Ankara, Turkey. For this purpose a specific course "Educational Software Design, Development and Evaluation" was selected, and the students taking the course formed the sample of the study. A survey technique was used to collect the related data. Below, the detailed description of the study, subjects, development of data collection instruments, procedures are presented.

Subjects of The Study

In order to investigate students' achievement goal orientation, attitudes toward group work and perceptions of group member' collaboration behaviors, a specific undergraduate course "Design, Development and Evaluation of Educational Software Course" (at Computer Education and Instructional Technology Department at Middle East Technical University in Turkey) which was taken by the 4th year Instructional Technology students was selected. The course, involving three theoretical hours and 2 practice hours was offered in the Spring term of 2003 in two sections by two instructors. In both sections the same content was covered and the same instructional materials and methods were used. The 4th year students taking that course formed the sample of this study. A total of 56 students were enrolled in 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. Design, Development and Evaluation of Educational Software course was regarded as their graduation course, and they were expected to implement what they had learned during previous undergraduate years to their projects in this course. After graduation most students either work as computer teachers at primary education level or work in private sector on educational software development.

Procedures of the Study

The study lasted 14 weeks. During this period the group members worked together and developed instructional software by using rapid prototyping approach. In the beginning of the semester the students were informed that as the course project they were supposed develop a three-dimensional (3D) game like learning environment by following rapid prototyping approach. The course consisted of two parts. The first part (six weeks) involved providing bases for students in the educational software development field, the second part (remaining eight weeks) focused on software development process.

In the first six weeks of the course the students were taught theoretical bases of educational software development process on "Learning Principles and Approaches, General Features of Educational Software, Games and Simulations" (Alessi and Trollip, 2001), ADDIE and Rapid Prototyping Models. During this period an expert from a private educational software development company came and explained how educational software development procedures took place in real life settings.

During the practice hours of the first part of the course, 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 on their projects ideas,, which needed to be in line with the course framework.

In the second part of the course, the students focused on their projects. They had to perform analysis, design, development and implementation/evaluation phases of educational software development process, and had to write reports related with each phase. During this period each group was assigned a specific weekly time period for consultation, and the group members were consulting their instructors on their projects and reports. At the end of the each consultation period, each group received feedback related with their projects (paper-based prototype, computer-based prototype, the actual product and so on) and reports. In regard to feedback, they modified their prototypes. This procedure was an iterative procedure, and until the end of the project there were revisions. At the end of the semester the groups together with the documentation parts finished their 3D game like learning environments. After that to share what they had done, they presented their projects to their classmates.

Instruments

A four-part survey questionnaire was developed to collect data on background variables, students' achievement goal orientation, students' attitudes toward group work and their perceptions of their group members' performances in terms of effective collaborative rubric.

The Achievement Goal Orientation Questionnaire included statements related to the three orientation subscales, mastery (indicates a learning goal and consists of 13 items), ego-social, and work avoidant (indicate performance goal and consists of 13 and 8 items respectively). A five point Likert-type scale was used to differentiate orientations from 1 as low and 5 as high orientation, and Achievement Goal Orientation Questionnaire was developed originally by Somuncuoğlu and Yildirim (1998) and was adapted for this study.

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 Effective Collaborative Rubric Survey consisted of three sections: contribution of group's tasks and completion of personal tasks (5 items), discussion skills and active listening (4 items), and contribution to group's evaluation, problem solving and team functioning (3 items). It was a four-point scale instrument (1 being the lowest level collaboration, 4 being the highest level collaboration).

Attitudes toward group work questionnaire consisted of 12 Likert-type items where 1 indicating the lowest level and 5 indicating the highest level agreements with the statements.

Both attitudes toward group work questionnaire and the effective collaborative rubric questionnaire were adapted from Information Society for Technology in Education Web site. For this study, a .80 alpha score for attitudes toward group work questionnaire, and a .93 alpha score for effective collaboration rubric were found.

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

Rapid Prototyping Model

In game like learning environment development process, the project groups used rapid prototyping approach that was adapted to educational software development field from software engineering field by Tripp and Bichelmeyer. (Tripp and Bichelmeyer, 1990). According to Lantz (cited in Trip and 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). In this approach, after describing the needs and objectives briefly, 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 and Bichelmeyer , 1990)

During the progress of their group projects, the students wrote analysis, design, development, and implementation / evaluation reports inline with rapid prototyping approach and received weekly feedback from the course instructor. Parallel to the reports they developed first paper-based, second computer-based and third Active World based prototypes. They gathered feedbacks for their prototypes from the instructors, from their classmates, and from several related people (teachers, or 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 game like learning environment. The access to the software was provided over Indiana University in Indiana, United States. Active World interface consists of six main components: 3D virtual world, Web, chat, tabs, toolbar and menu bar. 3D virtual world part allows users to travel in the virtual space; Web component provides the knowledge base for the subject area and browsing; chat component helps users converse with others in the system simultaneously; tab parts provides moving from one virtual world to the another one. Menu and tool bars help users build virtual worlds and change preferences. The students in the study were able to use Active World at the departments' computer laboratories and needed to connect Indiana University's server trough Internet.

Limitations of the Study

Small sample size is one limitation of the study. The number of the participants in the study was limited to the number of fourth year students in Instructional Technology 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 and way of software 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 too slow. In addition the students were using 3D development software for the first time. Even though the students overcome the novelty of the development tool, limited virtual space and slow Internet access remained as the main limitations of the project groups. Despite these limitations, this study provides valuable contribution with regard to relationship between goal orientation profiles, group work attitudes and collaboration behaviors in instructional software design and development process.

Results

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

Descriptive results of the study are presented in Table 1 below. The results of the study showed that 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 majority of the students agreed with the statements. It can be concluded from this result that students have positive attitude toward group work.

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

Table 1. Descriptive Results on Achievement Goal Orientations, Attitudes Toward Group Work and Effective Collaboration Behaviors

	N	Minimum	Maximum	Mean	Std. Deviation
Mastery	48	2.75	5.00	3.87	.51
Ego	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 collaboration	48	2.33	4.00	3.46	.43
Team functioning collaboration	48	2.00	4.00	3.43	.46

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

As it is presented in Table 2, t-test results showed no significant difference between males and females' attitude 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 on mastery orientation and ego-social orientation. However there was a significant difference between males and females in work avoidant profile indicating that males (M=2.25) are significantly more work-avoidant than females (M=1.75).

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

	GENDER	N	Mean	Std.Deviation
Group work attitude	male	33	3.55	.60
	female	15	3.57	.67
Task collaboration	male	31	3.51	.40
	female	15	3.33	.47
Discussion collaboration	male	31	3.50	.40
	female	15	3.35	.48
Team functioning collaboration	male	31	3.47	.43
	female	15	3.35	.50
Mastery	male	31	3.82	.51
	female	15	3.98	.50
Ego	male	31	3.00	.73
	female	15	2.90	.66
Work Avoidant *	male	33	2.26	.80
	female	15	1.75	.71

*** t(46)= 2.092, p=.042**

Relationship between Achievement Goal Orientations, Attitudes toward Group Work, and Perceptions of Effective Collaboration Behaviors and GPAs

Correlation results are presented in Table 3. Regarding the relationship between attitudes toward group work and achievement goal orientations, the correlation analysis showed no significant relationship. However, there is correlation between attitudes toward group work and how subjects perceive their teammates' collaborations in regard to discussion and active listening behaviors. The results indicated significant negative correlation between work avoidant orientation and students' GPAs (–403). In collaboration behaviors, there is a significant correlation between completion of/contribution to tasks collaboration behaviors and discussion/active listening behaviors (.883), between completions of/contribution to tasks collaboration behaviors and team functioning behaviors (.822), and between discussion/active listening behaviors and team functioning behaviors (.783). In addition, the results showed that there is a significant correlation between mastery goal orientation and ego goal orientation profiles of the students (.437).

Table 3 Relationship between Achievement Goal Orientations, Attitudes toward Group Work, Effective Collaboration Behaviors and GPAs

		1	2	3	4	5	6	Work Avoidant
GPA	P. Correlation	-.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
1. Group work attitude	P. Correlation		.372	.438**	.334	.058	-.037	.009
	Sig. (2-tailed)		.011	.002	.023	.701	.806	.955
	N		46	46	46	46	46	46
2. Task collaboration	P. Correlation			.883**	.822**	-.140	-.149	.329
	Sig. (2-tailed)			.000	.000	.342	.313	.023
	N			48	48	48	48	48
3. Discussion collaboration	P. Correlation				.783**	-.219	-.101	.305
	Sig. (2-tailed)				.000	.136	.495	.035
	N				48	48	48	48
4. Team functioning collaboration	P. Correlation					.000	-.169	.154
	Sig. (2-tailed)					1.000	.250	.295
	N					48	48	48
5. Mastery	P. Correlation						.437**	-.230
	Sig. (2-tailed)						.002	.116
	N						48	48
6. Ego	P. Correlation							.190
	Sig. (2-tailed)							.196
	N							48

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

Conclusion

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 learning the subject (Eggen and Kauchak, 1999). Since they were to be graduated, they wanted to be ready for the job market and they might want to develop themselves in the field. In addition, up to some extend the students are ego social. They might think that their achievement and high performance should be rewarded and honored, and they probably see grading as reward for their achievement. At the same time, high grades will be reference for them to look for a good job in the market in Turkey. In

addition to mastery of the tasks other important thing for them can be grade since it is important to pass and after graduation.

Majority of the students agreed with the statements in the group work attitude survey showing that they had positive attitudes toward group work. 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 who they did not know. Another reason can be the procedures followed in other courses at the department. Majority of the courses in the department have at least one long-term group project. From the first year, they are used to project based learning. The positive attitude toward group work might be due to the previous experiences about the group work.

The students in the project groups had known each other but they did not work together in the previous projects. Even they did not work together as group before, collaboration results showed that students in this study were effective collaborators according to their teammates. It can be said that in this project-based learning process as Grabe and Grabe (2001) indicated they worked together to achieve the group goals, they contributed to and completed tasks, actively participated to discussions, and listened to others, solved problems to function as a team. This might be due to their experiences in the department and the nature of the project that they cannot handle the project alone.

In this study males are significantly more work avoidant than the females. We can conclude from this result that female students are more involved with the software development project. Correlation analysis indicated that there is negative relationship between GPA and work avoidant orientation showing that low achievers do not focus on mastery of or learning the subject and they avoid these issues.

Attitude toward group work seems to be correlated to participation to discussion and listening to others collaboration behaviors. The more positive the attitude toward group work, the more involvement with group discussion. In addition, there are positive correlations between the three sub categories of collaboration behaviors. This result specifies that these collaboration behaviors are interrelated and to function efficiently as a group, the members should have these collaborative behaviors. Among achievement orientations, there is a significant correlation between mastery orientation and ego social orientation. As it is indicated above as a result of mastery students needed some kind of promotion or reward. They might want justification and recognition for their learning as grades and social approvals, and as reference for their achievements.

Investigating the relationship between achievement goal orientations, attitudes toward group work and students' perceptions of group members' collaboration behaviors is important from several perspectives. First of all to be successful, educational software development process requires effective teamwork and project management. For that reason, each team member's goal orientation, their attitudes toward group work and their contributions to collaboration process are important for the outcome of educational software development process. Since each individual has different goal orientation and attitude toward group work, it would be valuable to examine which type of goal orientation is effective in different stages of software development process. The results of this study offer some explanation in terms of

influence of goal orientations on attitudes toward group work and collaboration in educational software development process. In addition, the findings of this study will provide valuable information for educational software development practitioners in forming the development team to benefit more from this process. Finally, to have students benefit more from "design, development and evaluation of educational software development course," this study provides insights for the instructors of this course in forming the project groups.

References

Alessi, S., M., Trollip, S., R. (2001). Multimedia for learning: Methods & Development (3rd ed.). Allyn & Bacon. Needham Heights: Massachusetts.

Eggen, P. & Kauchak, D. (1999). Educational psychology (4th ed.) Prentice Hall, Upper Saddle River, NJ.

Grabe, M., & Grabe, C. (2001). Integrating technology for meaningful learning (3rd ed.). Houghton Mifflin Company: Boston:MA.

Shanley, M.K. (1999). Projects unlock students' potential. Curriculum Administrator, 35(10). (EBSCOHOST Research Databases).

Somuncuoğlu, Y. & Yıldırım, A. (1999). Relationships between achievement goal orientations and use of learning strategies. Journal of Educational Research, 92(5), 267-278.

Tripp, S. D., & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. Educational Technology Research and Development, 38(1), 31-44.