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Relationships between Learning Approaches of Civil Engineering Undergraduates in Three Turkish Universities and Success in Construction Management Courses*

GÜLDEN GÜMÜSBURUN AYALP
Zirve University, Faculty of Architecture and Design, Department of Architecture, 27260, Kızılhisar-Gaziantep, Turkey.
E-mail: gldngumusburun@hotmail.com

Once student learning approaches have been identified, the instructor can remove or mitigate factors that encourage surface learning and develop their course to encourage deep learning. When instructors organize appropriate learning activities to ensure that students engage in active learning, civil engineering students are more likely to develop a deep approach toward learning. Therefore, identifying civil engineering students' learning approaches is an important factor in their academic success. The present study examined the learning approaches of civil engineering students in three universities in Turkey and the extent to which their learning approaches were related to gender, age, type of university, year of study, and construction management course success. Data were collected from civil engineering students in undergraduate programs at three different universities using the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F). The questionnaire was directly administered to students, and 174 participants responded to the survey. The study findings revealed week correlations of learning approaches with age and year of education, and moderate correlations between learning approaches and construction management success.

Keywords: civil engineering education; learning approaches; construction management; deep approach; surface approach

1. Introduction

Learning is not a simple and straightforward process in which teachers transmit knowledge to students. Students must construct meaning themselves. There are several ways to going about learning, some leading to good, well-structured outcomes, others to low level outcomes. The approach to learning that students typically adopt depends on factors both within the student and in the teaching context. Students interpret their classroom experience in terms of what they see as required, what their own goals are, and what they feel they can cope with. How they learn depends on why they learn [1]. Learning approaches are defined as what students do when they go about learning and why they do it [2]. The term "approach" signifies both the learner's intention and the way in which she/he processes information [3].

In current education regarding construction, advanced technologies require graduates to acquire not only creative thinking skills but also state-of-the-art knowledge [4]. Despite the growing demands for constant curriculum review and revision, students are considered to be less prepared for university study due to the shift from elite to a mass education model [5]. Consequently, professional institutions have regularly performed studies of the undergraduate curricula in construction-related courses by [e.g., 6–10]. In addition, many studies have found that instructors are able to influence the learning environment and suggest that educational outcomes are improved when educators understand student learning approaches [11–17]. However, little research has investigated the learning approaches of engineering students. To apply the most appropriate approaches to teaching civil engineering education professional knowledge and practical skills and to enhance student attitudes toward learning, it is important to assess the learning characteristics of civil engineering students.

To identify the learning approaches of undergraduate civil engineering students, the R-SPQ-2F developed by Biggs et al. [18] was used to examine the relationship between learning approaches and student gender, age, year of study, type of university, and construction management course success. In this research, survey forms were collected from freshman to 4th year students at three different universities throughout Turkey. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc. (SPSS 18 software) was used to analyse the data; in addition to examining cross tabulations, t-tests and one-way ANOVAs were performed.

2. Learning

2.1 Learning process

Learning can be defined as an internal process that differs for each individual. Currently, educational leaders acknowledge that the processes involved in learning are critically important and that the way

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individuals learn is the key to educational improvement [19, 20]. The learning approach of an individual involves the processes of acquiring knowledge and skills through studying, instruction and experience [21].

Knowledge is constituted by the internal relationship between the knower (the subject) and the known (the object) [22]. In civil engineering education, the subject is the civil engineering student and the object is the construction industry. The phenomena to be experienced and understood are those aspects of professional construction knowledge that should be included in the curricula [23]. The literature includes many studies of learning approaches. The four major streams of research into student learning approaches (the Lancaster group led by [24]; the Australian group led by [12] the Swedish group led by [14]; and the Richmond group led by [25]) that have dominated the research agenda throughout the world [26] identify two main approaches to learning: the *deep* approach and the *surface* approach. In contrast, some researchers propose three major approaches toward studying: reproducing, meaning and achieving orientations [16, 24, 27, 28] discuss learning approaches in regard to memorizing intentions and understanding intentions. Although the above perspectives classify different learning approaches in different ways, their aims and approaches are similar. The present study employed Biggs's Revised Two-Factor Version of the Study Process Questionnaire (R-SPQ-2F).

2.2 Learning approaches and the revised two-factor study process questionnaire (R-SPQ-2F)

Learning approach is defined as the student's characteristic methods for learning a particular task [29]. Study Process Questionnaire (SPQ) was developed by [12, 30], 43-item self-report scale involving the three factors of *deep, surface and achieving* learning. Due to criticism that the achieving factor was not sufficiently distinctive, Biggs, Kember and Leung [18] revised the SPQ and produced a two-factor, 20-item version of the SPQ, the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F). The revised questionnaire categorizes students on the basis of deep approach (DA) and surface approach (SA) learning approaches with deep motive (DM), deep strategy (DS), surface motive (SM), and surface strategy (SS) subscales (Table 1). Each subscale includes five items, and each learning approach includes ten items. Each item is ranked along a 5-point Likert scale that ranges from "always or almost always true of me" to "never or only rarely true of me." The questionnaire scoring exhibits the following cyclical order:

1st Question (Q). Deep Motive, 2nd Q. Deep Strategy, 3rd Q. Surface Motive, 4th Q. Surface Strategy
5th Question (Q). Deep Motive, 6th Q. Deep Strategy, 7th Q. Surface Motive, 8th Q. Surface Strategy
9th Question (Q). . . . , etc.

Based on the above order, scoring R-SPQ-2F is given at Equation (1).

Equation (1): *Deep Approach Score*: $\sum$ Deep Motive Scores + Deep Strategy Scores

Surface Approach Score: $\sum$ Surface Motive Scores + Surface Strategy Scores [18]

Surface and deep learning approaches have been found to be significantly correlated with surface and deep motives, respectively [12, 31, 32]. Different learning approaches directly influence study time and academic outcomes. According to [33] students who worked hard might achieve poor results because they inefficiently applied a surface approach to the task of studying, while employing a deep approach has been associated with both effective studying and examination performance [34]. From an educational perspective, surface learning approaches should be discouraged and deep learning approaches encouraged.

Table 1. Traditional learning approaches [adapted from 12]

Learning Approach	Learning Motive	Learning Strategy
Surface Approach (SA)	**Surface motive (SM)** is to meet requirements minimally: a balancing act between failing and working more than necessary.	**Surface strategy (SS)** is rote learning where students focus on what appear to be most important topics or elements and reproduce them but do not see interactions between knowledge.
Deep Approach (DA)	**Deep motive (DM)** is intrinsic interest in what is being learned; to develop competence in particular academic subjects	**Deep strategy (DS)** is to seek meaning and involves processes of high cognitive level, such as searching for analogies relating to previous knowledge. Students love knowledge and play with task and think about it constantly.

Table 2. The learning approach framework [adapted from 1, 12, 30]

Strategy / Motive	Surface Motive (SM)	Deep Motive (DM)
Surface Strategy (SS)	*Surface approach* Respondent is not interested in the subject and so is not willing to spend time on it.	*Discouragement approach* Respondent is interested in subject but his/her interest is discouraged by learning environment, such as overcrowded timetable.
Deep Strategy (DS)	*Encouragement approach* Respondent is not interested in subject but is encouraged by good learning environment.	*Deep approach* Respondent is intrinsically interested in subject so is willing to spend extra time in reading related material.

2.3 The learning approach framework

A framework based on surface and deep LM, and surface and deep LS was devised to account for a wide range of learning occurring from the initial point (motivation) to the action process (strategy; see Table 2). The framework incorporates four student learning approaches: (1) a surface approach, (2) a discouragement approach, (3) an encouragement approach, and (4) a deep learning approach.

Surface approach (SS-SM): This approach relies on memorizing facts or ideas and sees a task as a demand that must be satisfied to achieve some other goal [16]. Although students employing a surface approach might pass their examinations, they are unlikely to retain the knowledge acquired over time [35].

Discouragement approach (SS-DM): Although students adopting the discouragement approach are intrinsically interested in the subject, they are discouraged by an unfavourable learning environment with features such as too many difficult assignments or overly high teacher expectations. Unfavourable learning environments encourage both competent and incompetent students to adopt a surface approach rather than a deep approach to learning [36, 37].

Encouragement approach (DS-SM): Although students employing the encouragement approach adopt a deep learning strategy, they are extrinsically motivated. Students who apply this learning approach are encouraged by teachers or fellow students and would not mind spending extra time on the subjects to gain more knowledge than necessary [23].

Deep approach (DS-DM): The deep approach is fostered by intrinsic motivators such as curiosity and interest that motivate students to learn. Student study behaviour is typically marked by extensive reading [12, 30], discussions with teachers and other classmates, and logical thinking. Students must realistically identify their own cognitive resources in relation to task demands and then plan, monitor, and control those resources in their learning processes. They use optimal strategies to learn that are related to the nature of the task. The goal of their studying for a test or exam is not to avoid failure, but to grasp key concepts, how these concepts are interrelated, and how they apply to a range of circumstances [38]. In brief, this approach focuses on the learning process.

Surface and deep approaches to learning are not unalterable, although they are influenced by personal characteristics such as ability [12]. However, which approach is employed is partially influenced by the learning task itself and the conditions under which the task is performed [12, 35]. Thus, students might use both surface and deep approaches on different occasions. Although students might adopt different approaches in different situations, they exhibit a general tendency to adopt and maintain a particular approach [12, 35, 37].

Learning approaches are important because students who use a deep approach tend to earn higher grades as well as being more likely to retain, integrate and transfer knowledge [24, 35, 39–43]. Deep learning is also associated with an enjoyable learning experience, while surface approach tends to be less satisfying [44].

Because learning is influenced by the learning approach employed by a student [45], the primary goal of the present study was to examine the learning approaches of civil engineering students to identify the relationship between student learning approaches and the factors of student gender, age, year of study, type of university, and construction management course success.

Many studies in other countries have investigated student learning approaches in various disciplines [e.g., 45–56]. However, few studies have investigated this issue for Turkish students [57–59]. Similarly, although many researchers have investigated the effects of learning approaches in other fields, few studies have focused on engineering and construction management students. First, [23] examined the learning approaches of construction students in Hong Kong, and [60] compared the learning approaches of construction engineering students in Hong Kong and mainland China. Finally, [61] investigated the relationship between learning approaches and learning environments for engi-

neering students. Thus, the extant literature indicates that few studies have focused on construction and engineering students. In addition to, no study discusses the learning approaches of civil engineering students and its relationship with gender, age, type of university, year of engineering study and construction management course success.

Based on the above considerations, the present study addressed the following research questions:

1. Is there a significant relationship between civil engineering students' learning approaches and student gender?
2. Is there a significant relationship between civil engineering students' learning approaches and student age?
3. Is there a significant relationship between civil engineering students' learning approaches and the type of university they attend?
4. Is there a significant relationship between civil engineering students' learning approaches and their year of study?
5. Is there a significant relationship between civil engineering students' learning approaches and student construction management course success.

3. Construction management education in civil engineering programs

As the construction industry continues to expand, civil engineers expect to find management positions in a construction companies. According to [62] "an engineer is hired for his or her technical skills, fired for poor people skills, and promoted for leadership and management skills." Because the construction sector operates on a project basis, it requires different skills and qualities in comparison to other sectors [63].

Because construction covers a wide range of technical and theoretical subjects, students must not only acquire basic knowledge in different areas (for example, law and management) but also the required practical skills [64]. Construction education in general, and civil engineering in particular, encompasses a vast amount of knowledge in different applied areas [65, 66], construction methods and techniques [67], construction management [68–71], professional skills and ethics [64, 72], and occupational health and safety [73]. [65, 69] note that the curricula should reflect the dynamic needs of society, the needs of employers and students, and wider economic and political demands [74]. Therefore, civil engineering students must acquire basic skills in areas such as law, management science, planning and coordinating, planning techniques, and teamwork; all of these skills fall within the scope of construction management [75, 76]. The success of the sector is highly dependent on the quality of employee education. Similarly, employees' level of education affects the extent to which they experience success in their careers [77].

The level of knowledge in these areas undoubtedly affects the quality of construction and the costs involved in construction work. Consequently, civil engineers who participate in construction projects must have sufficient grounding in management and management processes such as planning, organization, coordination, direction and control. Therefore, as in other courses, teaching construction management corresponds to civil engineering students' learning styles is important for their future professional careers.

4. Research method

Data on the learning approaches of civil engineering students at three different universities in Turkey were obtained using the R-SPQ-2F developed by [18]. The questionnaire, which consists of 20 items on a 5-point Likert scale, was used to identify the learning approaches of participating civil engineering students and to examine relationships among the study variables. The R-SPQ-2F, which was used as the measurement instrument, has been translated into Turkish and assessed the reliability of the Turkish version by [78]. This study was based on data from 174 surveys. SPSS 18 statistical software was used to analyse the data, calculate percentages and frequency distributions and cross tabulations, perform t-tests, one-way ANOVAs, and Tukey HSD post-hoc tests, and calculate Pearson correlation coefficients.

5. Findings

5.1 Participants

The sample consisted of first, second, third and fourth-year civil engineering students during the 2013–2014 academic year from departments of civil engineering at Zirve University, Gaziantep University, and Çukurova University in Turkey. Zirve University is a private university, and the others are state universities. Biggs [12] notes that learning approaches might be affected by personal characteristics and other contextual factors. Consequently, the questionnaire was administered to all students enrolled in civil engineering programs at the above universities. Study participation was voluntary.

The curricula of the of civil engineering departments at Çukurova University, Gaziantep University, and Zirve University require students to take construction management courses. The curricula

Table 3. Participant characteristics

Variables		Student Number (*N*)	Percentage (%)
Gender	Female	31	17.8
	Male	143	82.2
Age	19–21	27	15.5
	22–24	119	68.4
	25 and older	28	16.1
Year of Civil Engineering Education	1st	13	7.5
	2nd	19	10.9
	3rd	47	27.0
	4th	95	54.6
Type of University	State	127	73.0
	Private	47	27.0
Total		174	100.0

also offer managerial courses in construction such as "Law for Engineers" and "Project Management".

Construction management courses are fundamental for teaching basic management concepts such as cost analysis and pricing methods, the bidding process, construction site organization, scheduling, and occupational health and safety.

The present study examined three different civil engineering departments and three different construction management instructors. This context introduced many variables into the research. Because reducing the number of variables improves the ability to evaluate the data, a common construction management syllabus was prepared for the three civil engineering departments participating in the present research. Each instructor teaching the subject used the same content for each week of the construction management course, and the course teaching methods were identical. Course instructors used classroom-based teaching, and the midterm and final exam questions were identical for all three civil engineering departments. These procedures reduced the number of variables associated with the construction management classes. Consequently, it was possible to identify the learning approaches adopted by the civil engineering students and analyse the relationship between learning approaches and grades in the construction management courses.

The mean age of the 174 participants was 23.13 years, with most (68.4%) ranging in age from 22 to 24 years; 31 (17.8%) were female and 143 (82.2%) were male. Most of the participants (127 or 73.0%) were educated at state universities; 95 students (54.6%) were fourth-year students, 47 (27%) were third-year students, 19 (10.9%) were second-year students, and 13 (7.5%) were first-year students (Table 3).

Table 4 represents the distribution of grades for civil engineering students in the construction management courses. Because the construction management course is usually taken during the third or fourth year in Turkey, data from first- and second-year students were not included in the analysis; the analysis was thus based on surveys from 134 participants. To succeed in the course (i.e., pass the course), students needed to receive a grade of 70 or higher. Students were thus divided into two groups based on their performance in the construction management course. As Table 4 indicates, 67.9% of the participants achieved course grades of 70 or higher.

5.2 Identifying participants learning approaches

Civil engineering students learning approaches were identified using the Revised Two-factor Study Process Questionnaire (Table 5).

Table 5 presents descriptive statistics for the learning approach scales. In the study sample, students exhibited higher scores for deep approaches than for surface approaches.

There were two major scales representing deep and surface learning approaches, and participants obtained scores on both of these scales; individuals thus exhibited a range of scores on these two scales.

Table 4. Distribution of construction management course grades

Grade	Student Number (*N*)	Percentage (%)
Up to 70	43	*32.1*
70 and over	91	*67.9*
Total	134	*100.0*

Table 5. Descriptive statistics for the main learning approach scales

Variable	Mean	Standard Deviation (SD)
Deep approach	32.21	5.40
Surface approach	29.07	6.35

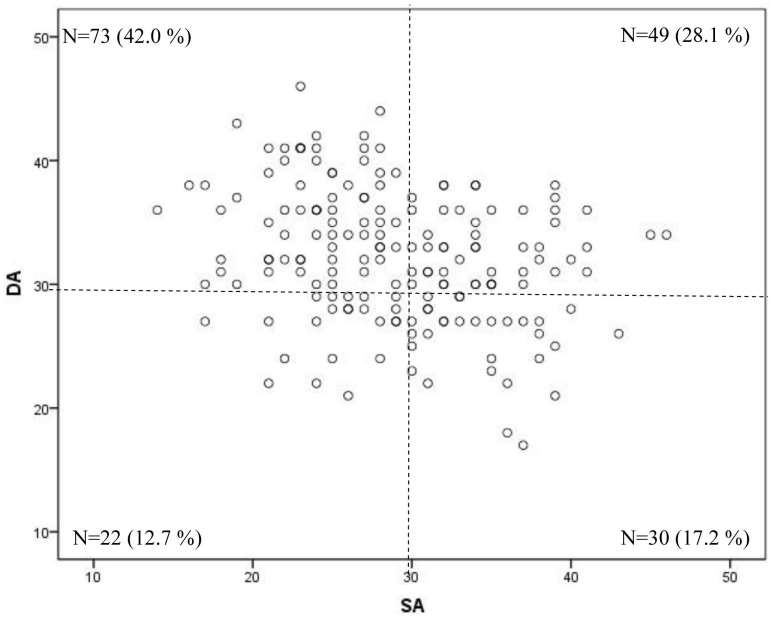

Fig. 1. Distribution of types of learning approaches among participants.

The plot in Fig. 1 and cross tabulation in Table 6 present the information used to identify student learning approaches.

Figure 1 indicates that most students were classified as exhibiting high deep learning approach scores and low to average surface learning approach scores (N = 73, 42.0%). Few students exhibited high scores for both deep and surface learning approaches (N = 49, 28.1%). Similarly, few students exhibited high surface learning approach scores and low deep learning approach scores (N = 30, 17.2%). The data in Table 6, which present the numerical distribution, support these results.

Table 7 presents the mean scores representing learning motives (LM) and learning strategies (LS) in boldface. Although the mean scores for the two learning motives in the sample ranged from 13.96 to 16.95 and were not significantly different, the results suggest that *deep motives* and *deep strategies* were the most popular learning approaches adopted by Turkish civil engineering students. These results suggest that most Turkish civil engineering students are intrinsically motivated to adopt an achieving strategy in their coursework and that they prefer to use a deep strategy not because they are interested in the subject but because this is encouraged by a good learning environment.

5.2.1 Gender difference in learning approaches

T-tests were performed to assess gender differences with respect to the learning approach variables; the results are presented in Table 8. There were no

Table 6. Cross tabulation of deep learning and surface learning approaches

		SA				Total (N)
		10–19 (N)	20–29 (N)	30–39 (N)	40–50 (N)	
DA	10–19	0	0	2	0	2
	20–29	1	21	26	2	50
	30–39	9	49	43	6	107
	40–50	1	14	0	0	15
Total (N)		11	84	71	8	174

DA = deep approach; SA = surface approach.

Table 7. Mean scores for learning motives (LM) and learning strategies (LS)

	Learning Motives		Learning Strategies	
	Surface Motive	**Deep Motive**	**Surface Strategy**	**Deep Strategy**
Civil Engineering Students	13.96	**15.01**	14.87	**16.95**

Table 8. Gender differences with respect to the learning approach variables

	Female		Male			
Variable	**Mean**	**Standard Deviation (SD)**	**Mean**	**Standard Deviation (SD)**	**t-value**	**Significance (Sig.)**
DA	31.48	*4.58*	32.08	*5.58*	–0.758	0,450
DM	14.89	*2.97*	15.05	*3.41*	–0.435	0,463
DS	16.59	*2.25*	17.04	*2.76*	–2.035	0,113
SA	28.37	*6.63*	28.93	*6.38*	–0.210	0,842
SM	13.52	*4.09*	14.07	*3.48*	1.069	0,350
SS	14.85	*3.30*	14.87	*3.62*	–1.608	0,316

$p < 0.05$; DA = deep approach; DM = deep motive; DS = deep strategy; SA = surface approach; SM = surface motive; SS = surface strategy.

Table 9. Age difference in learning approaches variables

	19-21		22-24		25 and older			
Variable	**Mean**	**Standard Deviation (SD)**	**Mean**	**Standard Deviation (SD)**	**Mean**	**Standard Deviation (SD)**	**F-value**	**Sig.**
DA	35.60	*7.30*	31.97	*5.06*	31.17	*6.24*	1.60	0.204
DM	17.00	*3.67*	15.05	*3.16*	14.46	*3.86*	0.32	0.720
DS	18.60	*3.64*	16.92	*2.51*	16.71	*3.11*	0.85	0.428
SA	29.80	*1.78*	29.19	*6.28*	27.00	*7.26*	1.21	0.301
SM	15.20	*1.09*	14.02	*3.62*	13.42	*3.86*	0.82	0.439
SS	14.60	*0.89*	15.17	*3.36*	13.58	*4.40*	4.32	**0.015***

$p < 0.05$; DA = deep approach; DM = deep motive; DS = deep strategy; SA = surface approach; SM = surface motive; SS = surface strategy.

significant differences between female and male civil engineering students.

5.3 Age difference in learning approaches

A one-way ANOVA was performed to examine age differences in learning approaches for three age groups. The results are presented in Table 9 and Equation (2), which reveal statistically significant differences in learning approaches across the age groups.

Equation (2): *Sig.*: $0.015 < 0.05$

Tukey HSD post-hoc tests were performed to determine which groups differed from each other. For surface strategies, the mean differences between the learning approaches of 22 to 24 year-olds and 25 year-olds and between the learning approaches of 22 to 24-year-olds and older students were significant. In addition, correlation coefficients were calculated to assess the strength of the relationships between variables. The Pearson correlation coefficient was – 0.157, indicating the presence of a modest negative correlation between age and learning approach, particularly for the surface learning approach (Table 10).

5.4 Differences in university type and learning approaches variables

The results of t-tests performed to analyse the extent to which different types of university exhibited differences in learning approaches are presented in Table 11. The analyses indicated that there were no significant differences between state and private universities.

5.5 Differences in year of study and learning approaches variables

A one-way ANOVA was performed to examine year of study differences in learning approaches for four years studies. The results are presented in

Table 10. Pearson correlation coefficients between age and learning approaches

Variable	**DA**	**DM**	**DS**	**SA**	**SM**	**SS**	**Age**
Age	–0.064	–0.026	–0.005	–0.157*	0.048	0.139	1

* Correlation is significant at the 0.05 level (2-tailed).

Table 11. Differences in learning approach variables for different types of university

	State		Private			
Variable	Mean	Standard Deviation (SD)	Mean	Standard Deviation (SD)	t-value	Sig.
DA	31.78	*5.54*	33.40	*3.75*	–1.265	0.208
DM	14.90	*3.36*	15.93	*2.63*	1.007	0.316
DS	16.88	*2.74*	17.47	*1.95*	0.487	0.604
SA	28.88	*6.59*	28.33	*4.92*	0.367	0.688
SM	13.87	*3.66*	14.60	*3.18*	0.703	0.423
SS	15.01	*3.60*	13.73	*2.91*	1.335	0.184

$p < 0.05$ DA = deep approach; DM = deep motive; DS = deep strategy; SA = surface approach; SM = surface motive; SS = surface strategy.

Table 12, Equation (3) and Equation (4), which reveal statistically significant difference in deep and surface learning approaches across the year of study.

Equation (3): *Sig.*: $0.019 < 0.05$

Equation (4): *Sig.*: $0.026 < 0.05$

To determine which groups differed from each other, Tukey HSD post-hoc tests were performed. The results indicated that there were significant differences between second-year and fourth-year student learning approaches for the deep learning approach. In addition, there were significant differences between first-year and fourth year student learning approaches for the surface learning approach. To determine the strength of the relationships between these variables, correlation coefficients were calculated. The Pearson correlation coefficient was – 0.197, indicating that there was a modest negative correlation between year of study and learning approach, particularly for the surface learning approach (Table 13).

5.6 Construction management success difference on learning approach variables

The "Construction Management" course is usually offered during the third or fourth year of civil engineering programs in Turkey. Consequently, examining the relationship between construction management course success and student learning approaches involved data from third- and fourth-year students, and data from first- and second-year students was excluded from the analysis, which was based on 134 surveys. T-tests were performed to identify the learning approach variables associated with differences in construction management course success; analysis results are presented in Table 14, Equation (5), (6) and (7). These indicators reveal statistically significant differences in the learning approaches exhibited by civil engineering students

Table 12. Differences in learning approaches variables associated with student year of study

	1st year study		2nd year study		3rd year study		4th year study			
Variable	Mean	Standard Deviation (SD)	Mean	Standard Deviation (SD)	Mean	Standard Deviation (SD)	Mean	Standard Deviation (SD)	F-value	Sig.
DA	30.62	*5.09*	35.16	*4.64*	32.89	*5.03*	31.51	*5.57*	3.394	**0.019***
DM	14.23	*3.16*	17.05	*2.71*	15.40	*3.30*	14.81	*3.39*	0.064	0.979
DS	16.38	*2.63*	18.11	*2.66*	17.49	*2.28*	16.69	*2.78*	0.513	0.674
SA	34.00	*5.11*	28.00	*5.89*	29.66	*6.16*	28.33	*6.43*	3.173	**0.026***
SM	16.92	*3.68*	13.21	*3.82*	14.70	*3.41*	13.48	*3.59*	1.157	0.328
SS	17.08	*2.01*	14.79	*3.02*	14.96	*3.50*	14.84	*3.56*	0.467	0.706

$p < 0.05$; DA = deep approach; DM = deep motive; DS = deep strategy; SA = surface approach; SM = surface motive; SS = surface strategy.

Table 13. Pearson correlation coefficients for year of study and learning approaches

Variable	DA	DM	DS	SA	SM	SS	Year of civil engineering education
Year of civil engineering education	–0.099	–0.023	–0.051	–0.197**	0.057	0.061	1

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

Table 14. Construction management success difference associated with different learning approaches

	Grades that are 70 and more		Grades that are 69 and less			
Variable	**Mean**	**Standard Deviation (SD)**	**Mean**	**Standard Deviation (SD)**	**t-value**	**Sig.**
DA	33.20	*3.56*	31.91	*5.44*	–0.269	0.799
DM	16.00	*2.34*	14.98	*3.35*	3.684	**0.000***
DS	17.20	*2.16*	16.94	*2.69*	–0.107	0.920
SA	28.79	*6.51*	29.60	*2.70*	–0.018	0.986
SM	13.85	*3.61*	16.60	*2.30*	4.505	**0.000***
SS	14.94	*3.57*	13.00	*2.23*	3.755	**0.000***

$p < 0.05$; DA = deep approach; DM = deep motive; DS = deep strategy; SA = surface approach; SM = surface motive; SS = surface strategy.

Table 15. Pearson correlation coefficients for learning approaches and construction management course

Variable	**DA**	**DM**	**DS**	**SA**	**SM**	**SS**	**Construction management success**
Construction management success	0.023	**0.517***	0.051	–0.057	**–0.541****	**–0.461***	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

who passed and failed the construction management course, indicating that the type of learning approach influenced student construction management course success.

Equation (5): *Sig.*: $0.000 < 0.05$

Equation (6): *Sig.*: $0.000 < 0.05$

Equation (7): *Sig.*: $0.000 < 0.05$

The Pearson correlation coefficients revealed a moderate negative correlation between construction management course success and a surface motive and surface strategy learning approach and a moderate positive correlation between construction management course success and a deep motive learning approach (Table 15).

6. Discussion

Although educators do not possess the power to affect social and economic environmental conditions, they are tasked with the responsibility for professional training of civil engineering students for services in the construction industry. The present study employed the Revised Two-Factors Study Process Questionnaire (R-SPQ-2F) to identify the learning approaches of Turkish civil engineering students. One limitation of the present study was in performing the research at only three Turkish universities. Although most of the 193 universities in Turkey have civil engineering undergraduate programs, it was not possible to contact all civil engineering students at these universities. Therefore, the present research was performed at three universities. The results of the present empirical study revealed that deep motives and deep strategies were the most popular learning motive and learning strategies for civil engineering students. Statistical analyses indicated that, in general, Turkish civil engineering students most commonly adopted a deep learning approach, although some students also employed a surface learning approach.

No significant relationships were found between gender and learning approaches. This result is consistent with the findings of other studies [e.g. 57, 59, 79–83]. Both male and female study participants preferred a deep approach to learning, although male students' deep approach scores were higher than female students' deep approach scores.

There was a significant relationship between age and a surface strategy learning approach, with students aged 22 to 24 years old differing from students who were 25 years or older. In addition, students aged 19 to 21 years exhibited the highest deep learning approach scores.

There was no relationship between type of university and learning approach. However, students who were educated at the private university exhibited higher deep approach scores than those who were educated at state universities. Conversely, students educated at state universities exhibited higher surface approach scores compared to other students.

Differences in learning approach were associated with differences in year of study. There was a significant relationship between year of study and deep and surface learning approaches. Second-year and fourth-year students exhibited differences with

respect to the deep learning approach, while. First-year and fourth year students exhibited differences with respect to the surface learning approach. Second-year students' deep approach scores were higher compared to other students. Students' use of a deep approach to learning increased from the first to the second year. This situation might occur because freshman civil engineering students are in transition during their first year and their sense of responsibility increases as they progress to the second year of study. It should be noted that students' use of a deep approach to learning declined from the second year to third year. This result is consistent with the findings of [54, 84]. The use of a deep approach gradually decreased from the third to the fourth year. Heavy workloads might produce the unintended consequence of discouraging positive attitudes towards learning and encouraging surface approaches, which might have produced the decline the use of deep approach in the third and fourth years. Because the goal of teaching and learning is to assist the student to develop a deep approach to learning, it is important to acknowledge that higher education requires high quality teaching as well as high quality learning [50].

Finally, there was a significant relationship between construction management course success and the deep motive, surface motive and surface strategy factors. Successful students who achieved a grade of 70 or higher exhibited the highest deep approach scores. In addition, successful students exhibited higher deep motive and deep strategy scores whereas the unsuccessful students who achieved a grade of 69 or less exhibited higher surface approach scores and higher surface motive and surface strategy scores.

According to [85] many factors influence how students approach learning and studying, which include the assessment of students' learning, the learning environment, curriculum overload, teaching design and teaching methods. Thus, lecturers should organize appropriate learning activities, ensure that students are actively engaged in the learning process and engage in appropriate assessment practices to assist the student to develop a deep approach to learning.

Once student learning approaches have been identified, the instructor can eliminate or mitigate the factors that encourage surface learning and develop the course to encourage deep learning [1]. Leung et. al. [23], proposed that teaching methods conform to learning approaches. They proposed that instructors provide a warm classroom climate and inclusive academic tasks rather than an impersonal classroom climate for *surface approach learners*; sufficient study time rather than time pressures and routine study activities for *discouragement approach learners;* ownership of knowledge rather than surface motives for *encouragement approach learners;* and metacognitive learning study skills to improve *deep approach learners* [23].

7. Conclusion

The present study examined the learning approaches exhibited by civil engineering students at three universities in Turkey. The study analyses indicated that deep motives and deep strategies were the most popular learning motives and learning strategies exhibited by civil engineering students. The statistical analyses indicated that, in general, the deep learning approach was the most common learning approach exhibited by Turkish civil engineering students, although some students also employed the surface learning approach.

There were modest correlations of learning approach with age and year of study, as well as a moderate correlation between learning approach and success in the construction management course.

These findings indicate that civil engineering students in Turkey are required to exhibit mastery of learning skills and advanced study techniques. In addition, both instructors and students must focus on various factors relevant to the learning process to improve the learning approaches of civil engineering students.

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Gülden Gümüsburun Ayalp graduated from Cukurova University, Department of Architecture in 2005 and had an MSc from the same university. She received a PhD degree in 2013 from Cukurova University, Program of Construction Management. She worked as a research assistant from 2006 to 2013 and assistant professor at 2013 at Cukurova University. She has been a lecturer at Zirve University in the Department of Architecture. She is the author of articles, which have published in journals including *Journal of Professional Issues in Engineering Education and Practice* (ASCE), *International Journal of Academic Research*, *E-Journal of New World Sciences Academy-Qualitative Studies and E-Journal of New World Sciences Academy—Engineering Sciences.*