JOURNAL OF DESIGN FOR RESILIENCE
IN ARCHITECTURE & PLANNING

Research Article
Online: www.drarch.org
Volume 6, Issue 2 (441-457), 2025
DOI: 10.47818/DRArch.2025.v6i2176

Multidimensional analysis of teaching techniques used in higher education: The case of a landscape architecture department

Ahmet Akay*

Abstract

This study provides a multidimensional analysis of teaching techniques in a landscape architecture department. The study aims to identify the most effective among different learning methods and analyze the effectiveness of the training offered by lecturers through student feedback and lecture notes. It is imperative to acknowledge the significance of student feedback as a crucial source of data for the evaluation of teaching methodologies and curriculum design. The study indicates that, beyond the extent of student learning of the course material, it is also imperative for teaching methodologies to align with the students' perceptions and personalities. To this end, a questionnaire was administered to students enrolled in four distinct courses (Computer Aided Design, Planting Design, Landscape Engineering, and Project-I) at the beginning and end of the semester. The objective of the questionnaires is to assess the students' level of knowledge regarding the topics included in the curriculum of the relevant courses. The study used a quantitative research method, a 5-point Likert-type scale, and a one-group pretest-posttest design. The data obtained were analyzed using reliability, frequency, independent, and dependent sample t-tests. In addition, the consistency between student feedback and end-of-semester course scores was also examined. The results of the study show that, in general, there is a statistically significant increase in the knowledge level of students in all courses toward the end of the semester. However, the effectiveness levels of the teaching techniques vary by course and subject. For instance, it was determined that teaching techniques were more successful in the Computer-Aided Design course (89.2% effective), while this rate was lower in the Project-I course (66.6% effective). In addition, students' perceptions of their knowledge levels (post-test results) were found to be higher than their end-of-semester scores. In the student feedback, issues such as insufficient class hours, lack of visual examples, and the importance of practical applications were also mentioned. In conclusion, the study shows that the evaluation of the questionnaire data and student scores together can be an effective tool in determining the level of teaching effectiveness and identifying issues that require revision in the curriculum.

Keywords: educational effectiveness, higher education, landscape architecture, student feedback, university

1. Introduction

In modern societies, which have a remarkable variety of opportunities to access information, the need to find the most effective techniques among different learning methods is becoming more and more prominent. In this regard, the effectiveness of the education provided by individuals in the position of instructors needs to be well analyzed. Education is a process that supports individuals' social, cultural, and intellectual development. Education in schools, on the other hand, focuses more on the transfer of course content to students. Although the level of effectiveness of the education provided in educational institutions is questioned through assessment/evaluation methods such as homework and exams, additional assessment/analysis methods need to be developed and implemented. At this point, feedback from students in the learner position is of great importance. Because, unlike teaching, learning is a non-explicit (hidden) activity. In this context, the two most important factors are the content of the curriculum and the teaching

*(Corresponding author), Assist. Prof. Dr., Selcuk University, Türkiye ahmetakay@selcuk.edu.tr
Article history: Received 19 April 2025, Accepted 11 June 2025, Published 30 August 2025

methods applied by the course instructors. Therefore, further evaluation and analysis of the collection of student feedback should focus on these two factors. An examination of the relevant literature reveals that there are various studies on this subject. Mortimore (1993) suggested that in addition to focusing on presentation skills, it is crucial to understand how students learn and how subject knowledge can be transformed to be appropriate for students of different ages. Feng (2007) noted that in order to develop effective strategies, it is necessary to have a full understanding of the students' situation based on the information obtained from the results of psychological tests, questionnaires, and surveys. Scheerens et al. (2013), concluded that among the indicators examined in their study on the effectiveness of schools, curriculum-related factors showed the greatest effects. In order to identify students' learning styles and match teaching patterns to them, Khaleghimoghaddam (2023) proposed to test students' learning styles in the early stages of studies to find appropriate solutions. As Erdoğan et al. (2021) have noted, the necessity of updating the education process and curriculum is a matter of discussion. Law (2022) noted that an effective curriculum has become a critical component of higher education due to changes in the techno-socio-economic environment and digital revolutions in Industry 4.0. Similar studies in literature have addressed the complexity of curriculum effectiveness and emphasized the need for a multidimensional approach to curriculum evaluation and improvement. Cheong Cheng (1994) emphasized the importance of coherence between curriculum change and teacher development and the need for a comprehensive framework to manage these processes. Vasilev et al. (2024), found that teaching methods are the most significant subgroup of factors affecting the quality and effectiveness of the educational process. In the point of selection of the right teaching methods, it should not be forgotten that the most important data source in meeting this need is the feedback received from students. As stated by Artkan and Kaya (2021), the necessity of developing teaching methods that align with students' perceptions and personalities, contingent on their developmental stage, becomes evident. Schweinberger et al. (2017) stated that effective feedback is crucial for knowledge acquisition and subsequent school improvement activities. In a study conducted by Shafique et al. (2018), students recognized the importance of feedback for academic performance, highlighting the need for structured feedback mechanisms and improved faculty engagement. Student questionnaires can help instructors create effective teaching programs (Fuchs et al., 1990). A review of the literature shows that many studies emphasize the value of student questionnaires in the assessment of curriculum effectiveness and the need for continuous improvement. Marsh and Roche (1997) stated that under appropriate conditions, students' evaluations of teaching are multidimensional, reliable, and stable. Amua-Sekyi (2016) noted that assessment by students has an impact on how teachers teach and therefore on how students learn. Lanning et al. (2012) emphasized the importance of continuous evaluation and adaptation of the curriculum based on student feedback. Tagulwa et al. (2023) concluded that curriculum assessment has a strong, positive and significant impact on students' employability. Stobaugh et al. (2020) stated that student opinions are a valid source of data for measuring teacher effectiveness. It should not be ignored that these data have the potential to be useful not only in measuring teacher effectiveness but also in various aspects. Heritage and Heritage (2013) stated that the data obtained as a result of the feedback received is an important resource in revealing the current learning status of students and making decisions about the next steps in education. The questionnaire results in Mart (2017)'s study also show that student evaluations are useful and have an impact on the quality of teaching methods of instructors. In addition, it was concluded that student participation is essential in the evaluation of teaching methods in higher education institutions. Kuhn and Rundle-Thiele (2009) also reported that students' perceptions of measures of learning success are relevant for educators in higher education. Through self-initiated feedback generation, students not only gain a deeper understanding of their strengths and areas for improvement but also develop essential metacognitive skills that support lifelong learning and academic success (Lipnevich & Smith, 2022; Nicol & Kushwah, 2024).

The needs of all stakeholders need to be considered to create an effective curriculum and consequently improve the quality of education. Accordingly, systematic evaluations of curriculum and teaching techniques in educational institutions are essential to ensure sustainability in effective education. In this context, to determine the quality of education, students at Selçuk University Department of Landscape Architecture were asked to fill out questionnaire forms at the beginning and end of the semester in four different courses (two for each course). By analyzing the data obtained from the questionnaires, findings related to the effectiveness of the education provided in these courses and the opinions/expectations of the students about the curriculum were discussed. In the light of the findings, the techniques used in instructing the relevant courses were evaluated and outputs were obtained for the revisions needed in the curriculum. Although there are many studies in the related literature that have conducted questionnaires about the curriculum, most of them have only used student feedback as a data set and determined the study outputs accordingly. This study differs from other studies in that it uses not only student feedback but also students' course scores at the end of the semester as the two main factors of the data set. The study outputs were prepared by questioning whether there is consistency between these factors. In this framework, answers to the following questions were sought within the scope of this research:

- How is the level of effectiveness of the education provided to the students?
- Is there consistency between student feedback and students' performance levels (course scores)?
- Is it possible to obtain data to guide the instructor as a result of the questionnaires conducted to determine the students' level of knowledge about the curriculum?

It is expected that the multidimensional evaluation process carried out within the scope of this study and the findings obtained would contribute to the increase in the level of effectiveness in education in other higher education institutions.

2. Methods and Materials

The flow chart summarizing the process carried out within the scope of the study is given in Figure 1. In the first stage, the literature review on the subject was completed and the questions to be answered were determined. The next step was to decide on which courses the study would be conducted on. Following the determination of the courses, the design of the questionnaires to be applied was completed and the questionnaires were finalized by finalizing the revisions needed as a result of the preliminary questionnaire studies.

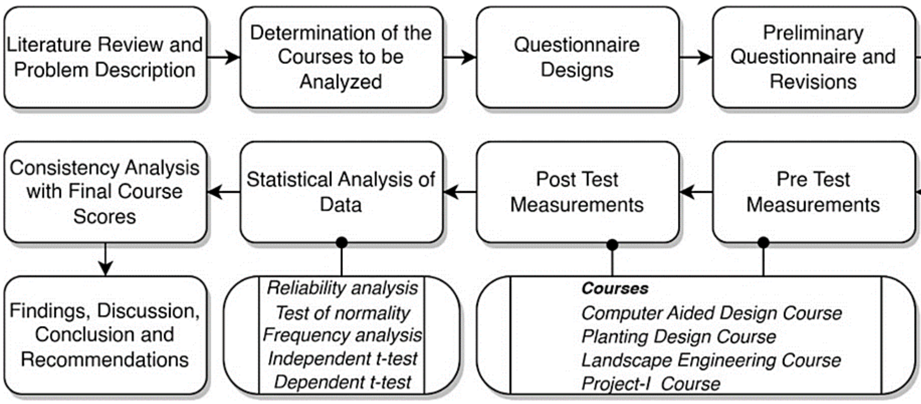

Figure 1 Flow chart of the study

In the next stage, pre-test measurements were performed at the beginning of the academic year for the students taking the determined courses. At the end of the semester, post-test measurements were performed on the same participants after the completion of the education provided within the scope of the curriculum. The data obtained from the pre, and post-test measurements were digitized. Following this stage, various statistical analyses were performed on the data obtained and research findings were prepared. The findings of the study were evaluated, the conclusions and recommendations section were prepared, and the process was completed.

2.1. Questionnaire Designs and Samplings

The method to be used in the study is based on questionnaire measurements. In the determination of the courses to be questioned, it was ensured that there was categorical diversity in the course subjects, and the information obtained in face-to-face interviews with the students was taken into consideration. In this respect, the courses to be questioned through questionnaire measurements are Computer Aided Design, Planting Design, Landscape Engineering, and Project-I courses. The questionnaire designs were based on the relevant course curriculum. The aim was to determine the level of knowledge of the students about the subjects in the curriculum before and after taking the course. The content of the questionnaire consists of statements that measure students' level of knowledge about the subjects in the curriculum of the relevant courses. The questionnaire prepared for the Computer Aided Design course consists of 5 sub-sections. These sections consist of statements that measure the level of knowledge about 5 software (Autodesk AutoCAD, Adobe Photoshop, Trimble Sketch Up, Act-3D Lumion, and Adobe Illustrator) taught in the course. Similarly, the Planting Design course questionnaires consist of 5 sub-sections. These sections consist of statements that measure the level of knowledge of the students about planting design elements, planting design principles, functions of plants, dendrological characteristics of plants, and planting types. The design of the questionnaire for the Landscape Engineering course, which consists of three sub-sections, was based on the topics of land forming, circulation (transportation) systems/parking lots, and irrigation/drainage. The questionnaire form prepared for the Project-I course consists of three sub-sections based on the three basic stages of the landscape design process: research/analysis, design, and development. The questionnaire forms were designed to be conducted both at the beginning and at the end of the semester. The sample of the study consists of the students (4 courses, 51+37+46+47 students) of the Department of Landscape Architecture at Selçuk University who will take the courses in the relevant academic year.

2.2. Measurement Methods and Data Collection

In this study, a 5-point Likert-type scale model was applied as one of the quantitative measurement methods. Single Group Pre-Test - Post-Test Design was applied. A single-group pretest-posttest procedure (Figure 2) refers to a design used to evaluate the effect of an intervention on a group of participants. In this type of design, participants are initially given a pre-test, followed by the intervention, and then a post-test to assess changes. The pretest and posttest are the same tests conducted at different times.

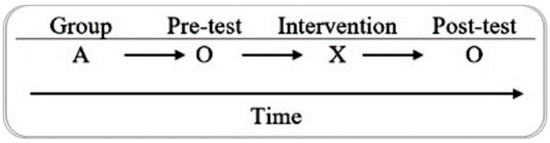

Figure 2 Single group pre-test - post-test design

The questionnaire forms were conducted face-to-face with the students twice, once at the beginning and once at the end of the semester, and the effectiveness level of the education provided was questioned. A data set was prepared as a result of digitizing the data obtained from the questionnaire forms.

2.3. Data Analysis

The data obtained as a result of the questionnaire process was subjected to statistical analysis with IBM SPSS 27.0 software. The statistical analysis methods applied were reliability, frequency, t-test for independent groups, and dependent sample t-test to find out whether there was a statistically significant difference between the results of the questionnaire at the beginning and end of the semester. The dependent sample t-test is used to assess the difference between two measurements in the same group. Subsequently, the data were analyzed comparatively to investigate whether there was consistency between the student feedback obtained from the questionnaires and the final exam scores. This analysis is an appropriate method to assess whether there is a consistent relationship between students' post-test feedback and exam scores. Finally, the data obtained from the pre-test and post-test were analyzed on the basis of each statement (curriculum topics) in the questionnaires.

3. Results and Discussion

3.1. Findings Related to the Analysis of Pre-Test Data

Reliability analysis, test of normality, frequency analysis, and independent sample t-test analyses were applied to the data sets obtained from the questionnaires conducted at the beginning of the semester for each course. The results of the analysis are given below.

3.1.1. Reliability Analysis Results

As a result of the reliability analysis applied to the pre-test data of the Computer Aided Design, Planting Design, Landscape Engineering, and Project-I course questionnaires, Cronbach's Alpha values were found to be ,913-,925-,691-,868 respectively (Table 1) and it was confirmed that the statements in the questionnaires were reliable.

Table 1 Reliability Analysis Results for Pre-Test Data

Course	Cronbach's Alpha	Evaluation
Computer Aided Design	,913	Strong
Planting Design	,925	Strong
Landscape Engineering	,691	Reasonable
Project-I	,868	Reliable

After testing the reliability of the data, the next stage is to analyze whether the data is normally distributed. As a result of this analysis, it is decided whether the statistical analysis to be performed will be parametric or non-parametric tests.

3.1.2. Test of Normality Results

Skewness and Kurtosis values were analyzed for the test of normality to determine whether the groups were normally distributed or not. It was observed that the Skewness value ranged between ,313 and 1,273 and the Kurtosis value ranged between -,803 and 1,127 (Table 2). A normal distribution is accepted when Kurtosis and Skewness values are between -1,5 and +1,5 (Tabachnick et al., 2013). As a result of the tests of normality, it was determined that the groups were normally distributed for all courses, and it was determined that it was appropriate to use parametric tests in the analysis of the data.

Table 2 Test of Normality Results for Pre-Test Data

	Skewness		Kurtosis		Shapiro-Wilk	
Course Data Set	Statistic	Std. Error	Statistic	Std. Error	df	Sig.
Computer Aided Design	1,273	,333	1,127	,656	51	,000
Planting Design	,313	,388	-,803	,759	37	,266
Landscape Engineering	,892	,350	,117	,688	46	,001
Project-I	,880	,347	,539	,681	47	,007

3.1.3. Frequency Analysis Results

It was found that most of the students who participated in the questionnaires (between 90.2% and 100%) took the relevant course for the first time and the majority of them (between 78.7% and 97.8%) had never attended any training apart from the relevant course (Table 3).

Table 3 Students' Course-Taking Status and Level of Off-Course Education

Course	Taking for the First Time	No off-course Education
Computer Aided Design	90,20%	88,20%
Planting Design	97,30%	97,30%
Landscape Engineering	100,00%	97,80%
Project-I	100,00%	78,70%

Frequency analyses were performed to determine the distribution rates of the groups and the knowledge levels of the students according to the courses and subjects. The data obtained as a result of the analysis were shown in Figure 3.

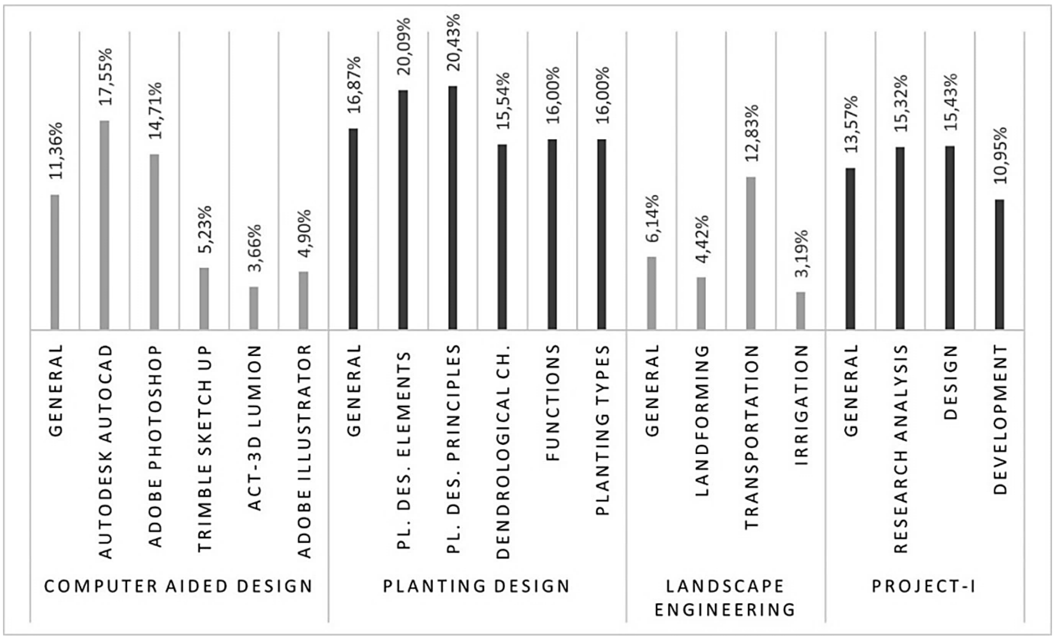

Figure 3 The knowledge levels of the students based on the courses and subjects at the beginning of the semester

An analysis of the students' level of knowledge about the curriculum before taking the course shows that the highest level of knowledge (16,87%) was in the Planting Design course and the lowest level of knowledge (6,14%) was in the Landscape Engineering course. It was determined that the highest level of knowledge (17,55%) was in "Autodesk AutoCAD" software and the lowest level of knowledge (3,66%) was in "Act-3D Lumion" software. It was found that the level of knowledge about "planting design elements" and "planting design principles", which are among the topics of the Planting Design course, was above 20%. Examining the data of the Landscape Engineering course, where the lowest level of knowledge is determined, it is seen that only "transportation systems/parking lot" is above 10% and "irrigation and drainage" is at the level of 3,19%. In the Project-I course, it is observed that the level of knowledge about all sub-sections is above 10%.

3.1.4. Independent t-Test Results

Based on the results of the independent t-test applied at 95% confidence interval (Table 4), it was seen that the level of knowledge about the curriculum of the Computer Aided Design course differed significantly between those who took the course for the first time and those who had taken the course before (p=,011), while it did not differ according to gender (p=,272). As seen in the table, the mean knowledge level of the students who took the Computer Aided Design course for the first time ($\bar{X}$ =18,83, ss=18,48) is significantly lower (t(-2,630)=49, p<0,05) than the mean knowledge level of the students who took the course before ($\bar{X}$=41,2, ss=12,58). It was found that the level of knowledge about the curriculum of the Planting Design course did not differ significantly between those who took the course for the first time and those who had taken the course before (p=,280), while it differed significantly according to gender (p=,028). The mean knowledge level of female students taking the Planting Design course ($\bar{X}$=31,89, ss=17,79) is significantly higher (t(2,292)=35, p<0,05) than the mean knowledge level of male students taking the course ($\bar{X}$=18,27, ss=12,74).

Table 4 Independent t-Test Results for Pre-Test Data

Variable	Sub-Group	N	$\bar{X}$ (ss)	t	df	p	Course
Gender	Female	37	18,73 (15,78)	-1,136	16,85	,272	Computer Aided Design
	Male	14	27,07 (25,69)				
Course Taking Status	First time	46	18,83 (18,48)	-2,630	49	,011*	
	Taken before	5	41,2 (12,58)				
Gender	Female	26	31,89 (17,79)	2,292	35	,028*	Planting Design
	Male	11	18,27 (12,74)				
Course Taking Status	First time	36	28,36 (17,41)	1,097	35	,280	
	Taken before	1	9,00				
Gender	Female	29	4,45 (4,16)	-,979	44	,333	Lands. Eng.
	Male	17	5,71 (4,28)				
Gender	Female	30	13,43 (9,42)	1,230	45	,225	Project-I
	Male	17	10,06 (8,30)				

** p<,05 statistically significant*

Considering the course-taking status in Landscape Engineering and Project-I courses, it was noted that all of the students participating in the questionnaire took the relevant courses for the first time. For this reason, an independent t-test was applied only for gender status for these courses. For both courses, it was determined that the level of knowledge about the curriculum did not differ according to gender (p=,333; p=,225).

3.2. Findings Related to the Analysis of Post-Test Data

Reliability analysis, test of normality, frequency analysis, and independent sample t-test analyses were applied to the data sets obtained from the questionnaires conducted to the students at the end of the semester for each course. The results of the analysis are given below.

3.2.1. Independent t-Test Results

As a result of the reliability analysis applied to the pre-test data of the Computer Aided Design, Planting Design, Landscape Engineering, and Project-I course questionnaires, Cronbach's Alpha values were found to be ,932-,956-,891-,924 respectively (Table 5) and it was confirmed that the statements in the questionnaires were reliable.

Table 5 Reliability Analysis Results for Post-Test Data

Course	Cronbach's Alpha	Evaluation
Computer Aided Design	,932	Strong
Planting Design	,956	Strong
Landscape Engineering	,891	Reasonable
Project-I	,924	Reliable

3.2.2. Independent t-Test Results

Skewness and Kurtosis values were analyzed for the test of normality to determine whether the groups were normally distributed or not. It was observed that the Skewness value ranged between -,686 and ,388 and the Kurtosis value ranged between -,876 and ,759 (Table 6). As a result of the tests of normality, it was determined that the groups were normally distributed for all courses, and it was determined that it was appropriate to use parametric tests in the analysis of the data.

Table 6 Test of Normality Results for Post-Test Data

	Skewness		Kurtosis		Shapiro-Wilk	
Course Data Set	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**	**df**	**Sig.**
Computer Aided Design	-425	,333	-,876	,656	51	,018
Planting Design	-,686	,388	-,435	,759	37	,010
Landscape Engineering	-,145	,350	-,288	,688	46	,604
Project-I	-,036	,347	-,554	,681	47	,350

3.2.3. Frequency Analysis Results

Frequency analyses were performed to determine the distribution rates of the groups and the knowledge levels of the students according to the courses and subjects. The data obtained as a result of the analysis were shown in Figure 4.

Analyzing the students' level of knowledge about the curriculum after taking the course, it is seen that the highest level of knowledge (85,74%) is in the Computer Aided Design course and the lowest level of knowledge (75,87%) is in the Landscape Engineering course. It was determined that the highest level of knowledge (90,78%) was in 'Autodesk AutoCAD' software and the lowest level of knowledge (78,37%) was in 'Adobe Illustrator' software. It was found that the level of knowledge was above 84% in all subjects except the subject of 'functions of plants' among the subjects of the Planting Design course. Examining the data of the Landscape Engineering course, which is determined to have the lowest level of knowledge in general, it is seen that the level of knowledge is above 80% in the subjects of 'land forming' and 'transportation systems/parking', while other subjects are below this value. In the Project-I course, the highest value (82,13%) was in the 'design phase' and the lowest value (75,74%) was in the 'development phase'.

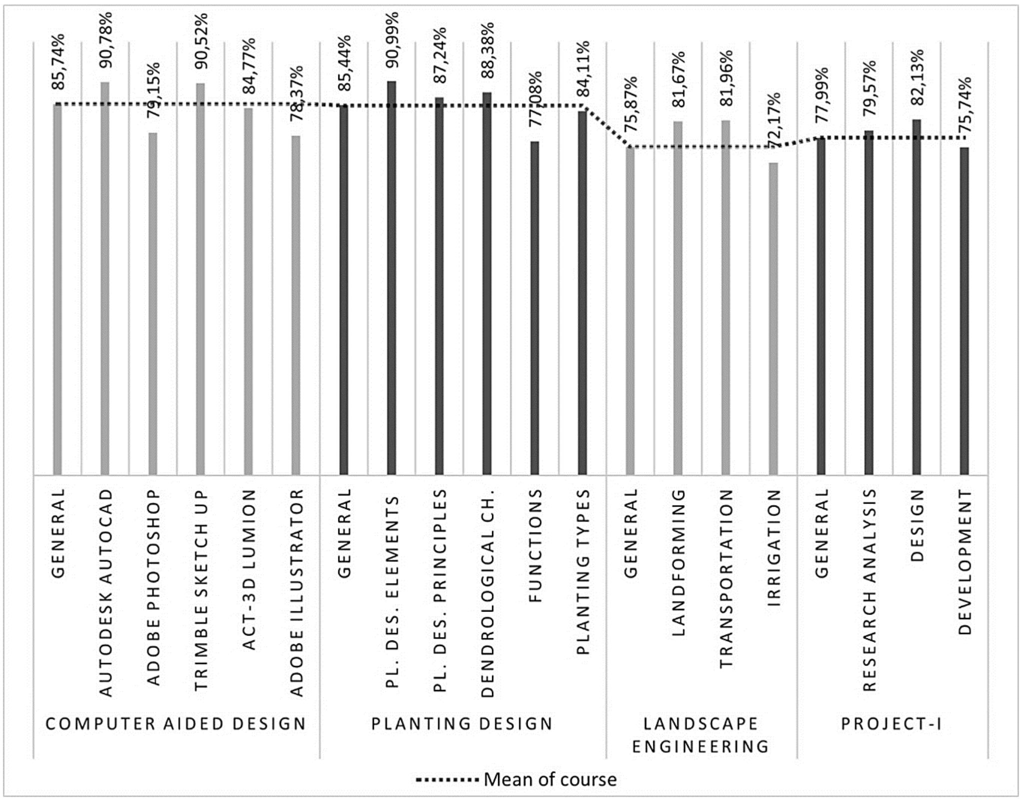

Figure 4 The knowledge levels according to the courses and subjects at the end of the semester (post-tests)

3.2.4. Independent t-Test Results

According to the results of the independent t-test applied at 95% confidence interval (Table 7), it was determined that the level of knowledge about the curriculum of Computer Aided Design and

Planting Design courses did not show a significant difference between those who took the course for the first time and those who had taken the course before. Examining whether there is a difference according to gender, it is observed that only the level of knowledge for the Planting Design course differs significantly between male and female students (p=,012). The mean knowledge level of female students taking the Planting Design course ($\bar{X}$=145,65, ss=16,23) is significantly higher (t(2,292)=35, p=,028) than the mean knowledge level of male students taking the course ($\bar{X}$=129,91, ss=17,07).

Table 7 Independent t-Test Results for Post-Test Data

Variable	Sub-Group	N	$\bar{X}$ (ss)	t	df	p	Course
Gender	Female	37	158,14 (16,40)	-,339	49	,736	Computer Aided Design
	Male	14	159,93 (18,07)				
Course Taking Status	First time	46	158,46 (17,08)	-,219	49	,827	
	Taken before	5	160,2 (14,24)				
Gender	Female	26	145,65 (16,23)	2,657	35	,012*	Planting Design
	Male	11	129,91 (17,07)				
Course Taking Status	First time	36	140,86 (18,05)	-,226	35	,822	
	Taken before	1	145,00				
Gender	Female	29	62,41 (7,42)	1,747	44	,080	Lands. Eng.
	Male	17	57,77 (10,60)				
Gender	Female	30	73,07 (9,85)	2,762	45	,080	Project-I

** p<,05 statistically significant*

3.3. Findings Related to the Dependent Sample t-Test

A dependent sample t-test was applied to the data sets obtained as a result of the pre-test and post-tests conducted to determine the effectiveness level of the education provided for the courses during the semester (Table 8). Regarding the effectiveness level of the education provided, it was detected that there was a statistically significant difference between the mean knowledge level before and the mean knowledge level after all courses (p=,000). Computer Aided Design course mean increased from 21,02 to 158,63; the Planting Design course mean increased from 27,84 to 140,97; the Landscape Engineering course mean increased from 4,91 to 60,7 and the Project-I course means increased from 12,21 to 70,19.

As expected, a significant increase was observed in the general averages of students' knowledge levels before and after taking the course for all courses. The main purpose here is to observe this change specifically for sub-topics rather than the general average increase. At this point, it is possible to understand which subjects have been learned more effectively, or which ones have deficiencies by looking at the t values. It can be understood that the larger the t value, the greater the increase in the student's knowledge level.

In order to analyze the statements given in the course questionnaires according to the sub-sections, a dependent sample t-test was applied to the data related to these statements. Based on the results of the test applied to the data, it was determined that there was a statistically significant difference between the means of before and after knowledge level for all of the subjects taught within the scope of the relevant curriculum in all courses. It was found that post-test means were higher than pre-test means in all courses. This can be interpreted as a statistically significant effect of the education provided on a subject basis.

Table 8 Dependent Sample t-Test Results for Pre-Test and Post-Test Data

Course	Subject		N	$\overline{X}$ (ss)	t	df	p
Computer Aided Design	General	Pre-Test	51	21,02 (19,11)	-43,468	50	,000
		Post-Test	51	158,63 (16,71)			
	Autodesk AutoCAD	Pre-Test	51	10,53 (10,85)	-27,892	50	,000
		Post-Test	51	54,47 (4,57)			
	Adobe Photoshop	Pre-Test	51	4,41 (6,47)	-16,228	50	,000
		Post-Test	51	23,75 (5,42)			
	Trimble Sketch Up	Pre-Test	51	1,57 (2,5)	-49,539	50	,000
		Post-Test	51	27,16 (3,16)			
	Act-3d Lumion	Pre-Test	51	1,1 (1,92)	-41,675	50	,000
		Post-Test	51	25,43 (3,81)			
	Adobe Illustrator	Pre-Test	51	1,47 (4,06)	-25,360	50	,000
		Post-Test	51	23,51 (5,2)			
Planting Design	General	Pre-Test	37	27,84 (17,46)	-28,071	36	,000
		Post-Test	37	140,97 (17,81)			
	Planting Design Elements	Pre-Test	37	6,03 (5,14)	-22,323	36	,000
		Post-Test	37	27,3 (3,44)			
	Planting Design Principles	Pre-Test	37	10,22 (8,57)	-19,870	36	,000
		Post-Test	37	43,62 (5,34)			
	Dendrological Character	Pre-Test	37	3,11 (3,42)	-20,647	36	,000
		Post-Test	37	17,68 (2,45)			
	Functions of the Plants	Pre-Test	37	4 (3,35)	-19,447	36	,000
		Post-Test	37	19,27 (3,51)			
	Planting Type	Pre-Test	37	4 (3,65)	-19,564	36	,000
		Post-Test	37	21,03 (4,62)			
Landscape Engineering	General	Pre-Test	46	4,91 (4,20)	-36,602	45	,000
		Post-Test	46	60,7 (8,91)			
	Land forming	Pre-Test	46	1,33 (1,93)	-36,716	45	,000
		Post-Test	46	24,5 (3,69)			
	Transportation/Parking	Pre-Test	46	1,28 (1,39)	-21,932	45	,000
		Post-Test	46	8,2 (1,38)			
	Irrigation/Drainage	Pre-Test	46	0,48 (1,07)	-32,927	45	,000
		Post-Test	46	10,83 (1,97)			
Project-I	General	Pre-Test	47	12,21 (9,09)	-26,381	46	,000
		Post-Test	47	70,19 (10,14)			
	Research/Analysis	Pre-Test	47	1,53 (1,76)	-18,000	46	,000
		Post-Test	47	7,96 (1,52)			
	Design	Pre-Test	47	3,09 (2,69)	-23,402	46	,000
		Post-Test	47	16,43 (2,38)			
	Development	Pre-Test	47	6,02 (5,27)	-26,383	46	,000
		Post-Test	47	41,66 (6,53)			

3.4. Findings Related to the Comparison of Test Results with End-of-Semester Course Scores

The data obtained from the pre-test and post-test were analyzed in order to determine the effectiveness level of the training and the change between these tests, in other words, the amount of increase in students' knowledge level was calculated on the basis of course subjects (Figure 5). The highest increase (85.29%) among the five software programs taught in the curriculum for the Computer Aided Design course was in the "Trimble Sketch Up" software, while the lowest increase (64.44%) was in the "Adobe Photoshop" software. It is seen that the highest increase (72,84%) is in "Dendrological Characteristics of Plants" and the lowest increase (61,08%) is in "Functions of Plants" in the Planting Design course. Of the courses whose curriculum consists of 3 basic subjects each, the highest increase (77.25%) in the Landscape Engineering course was in the subject of "Land Forming", and the highest increase (66.70%) in the Project-I course was in the subject of "Design Phase".

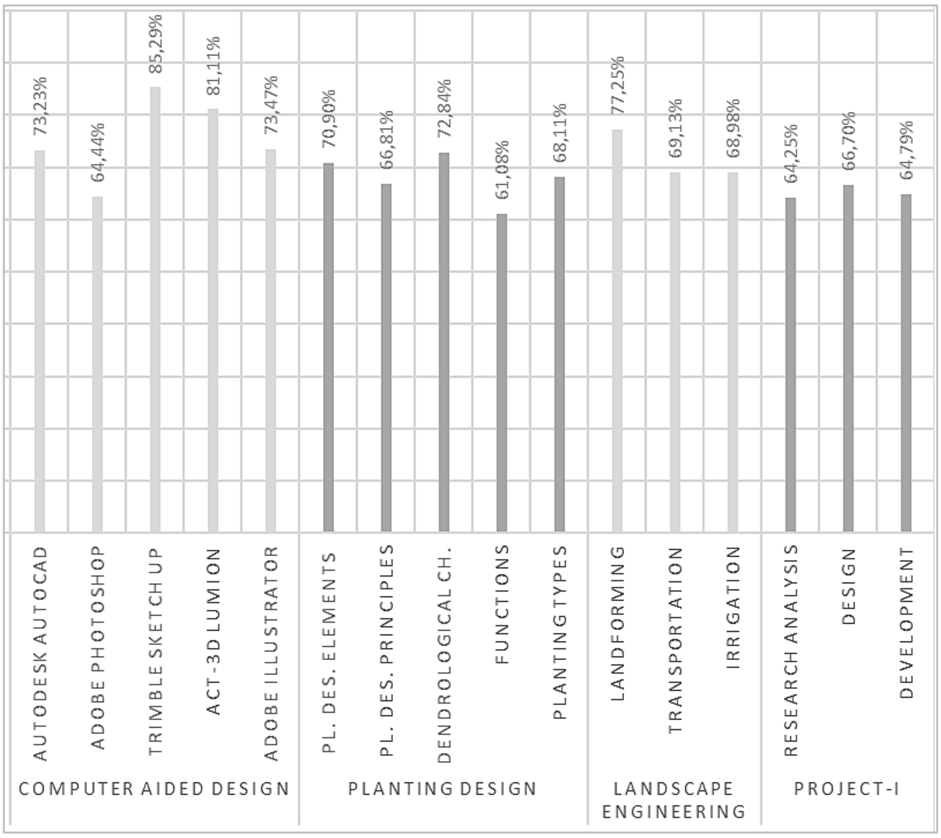

Figure 5 Differences between means according to subjects in pre-tests and post-tests (%)

The differences between the post-test and end-of-semester course scores were analyzed to determine the consistency between the students' responses to the post-tests conducted at the end of the semester and their end-of-semester scores in the courses (Figure 6).

A comparison of the pre-test averages shows that the lowest level of knowledge (6.1%) was in the Landscape Engineering course and the highest level of knowledge (16.9%) was in the Planting Design course. Analyzing the data on post-test and end-of-semester course score means, it is recognized that the end-of-semester course score means for all courses are lower than the post-test mean scores. It is clear that the post-test mean (85.7%) in the Computer Aided Design course was higher than the final score means (70.7%) of the related course. It was understood from the related graph that the same situation was also valid for other courses. This means that the level of knowledge that students think they have is higher than the level of knowledge they actually have. Consequently, checking the consistency of the post-test survey data with the end-of-semester course scores is very important in terms of the validity of the findings.

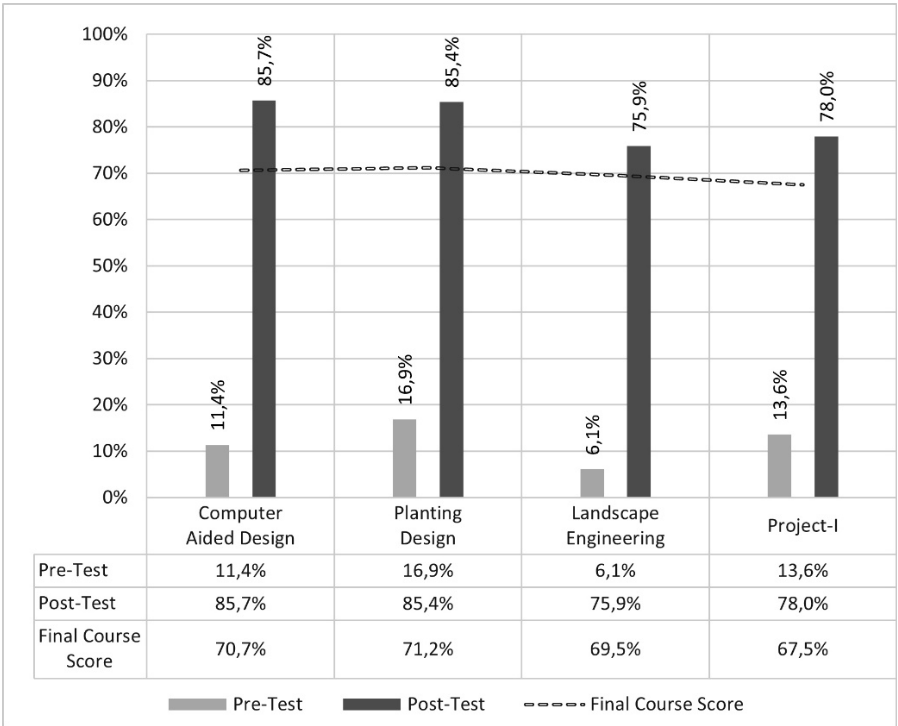

Figure 6 Pre-test, post-test, and end-of-semester course score means

3.5. Findings Related to the Comparison of Test Results with End-of-Semester Course Scores

The situation has been examined until this stage of the study, both in terms of the relevant courses and the sub-sections that constitute the curriculum. It is possible to determine which of the sub-sections in the curriculum are in the category of "open to improvement" in terms of teaching techniques as a result of these analyses, but it is foreseen that it would be useful to go into more detail about the statements that constitute the sub-sections in order to reach more precise results. In this context, a situation analysis was conducted separately for each of the statements in the questionnaires. The analyses were performed by calculating the differences between the students' knowledge levels at the beginning and end of the semester about a subject. The difference, which explains the level of development in the student, indicates the level of effectiveness of the education provided. The higher the difference, the higher the effectiveness of the teaching methods. While the level of effectiveness of the education provided was categorized according to the subjects in the curriculum if the difference between the student's level of knowledge on a subject at the beginning and end of the semester was in the range of;

0%-20%, it was evaluated as '*very low*',

20,1%-40%, it was evaluated as *'low',*

40,1%-60%, it was evaluated as *'medium',*

60,1%-80%, it was evaluated as *'high'*,

80,1%-100%, it was evaluated as *'very high'.*

The data obtained as a result of these analyses are given in Figure 7 (the graphs show the range between 40% and 100% as no development below 40% was calculated).

Based on the data of the 37-statement Computer Aided Design course questionnaire, it is understood that the teaching techniques of the subjects in the statements numbered 1,2,3, and 14 need revision. A development in the range of 40%-60% was found between the knowledge levels of the students at the beginning and end of the semester on the subjects in question. In this context, the level of effectiveness of the education provided on the relevant subjects was evaluated in the ‘medium’ category. It was reported that the effectiveness levels of education in the remaining 33 subjects were in the ‘high’ and ‘very high’ categories. As a result, it can be stated that the education provided in this course, in which 33 out of 37 statements were in the ‘high’ and ‘very high’ categories, was 89.2% (33/37) effective.

As per the 33-statement Plant Design course questionnaire data, the level of effectiveness of the education provided for statements 1, 14, 21, 22, and 23 is in the ‘medium’ category. The education provided for statement number 32 is in the ‘very high’ category, while for the remaining 27 statements is in the ‘high’ category. It can be concluded that 84.9% (28/33) effective training was provided for this course in which 28 of the 33 statements were in the ‘high’ and ‘very high’ categories.

As a result of the analyses performed to determine the level of effectiveness of the education provided in the Landscape Engineering course curriculum consisting of 16 statements, it is recognized that statements numbered 7 and 8 are in the ‘very high’ category, statements numbered 15 and 16 are in the ‘medium’ category, and all of the remaining 12 statements are in the ‘high’ category. It is possible to state that 75% (12/16) effective education was provided in this course, in which the effectiveness level of the education given for 12 of the 16 statements was in the ‘high’ and ‘very high’ categories.

Regarding the data of the Project-I course consisting of 18 statements, it is demonstrated that the effectiveness level of the education provided for the statements numbered 1, 6, 15, 16, 17, and 18 is in the ‘medium’ category, whereas the remaining 12 statements are in the ‘high’ category. Within the scope of this course, it was determined that the level of effectiveness of the education provided for any statement was not in the ‘very high’ category. In this course, where 12 out of 18 statements were in the ‘high’ category, it can be concluded that a 66.6% (12/18) level of effectiveness was achieved.

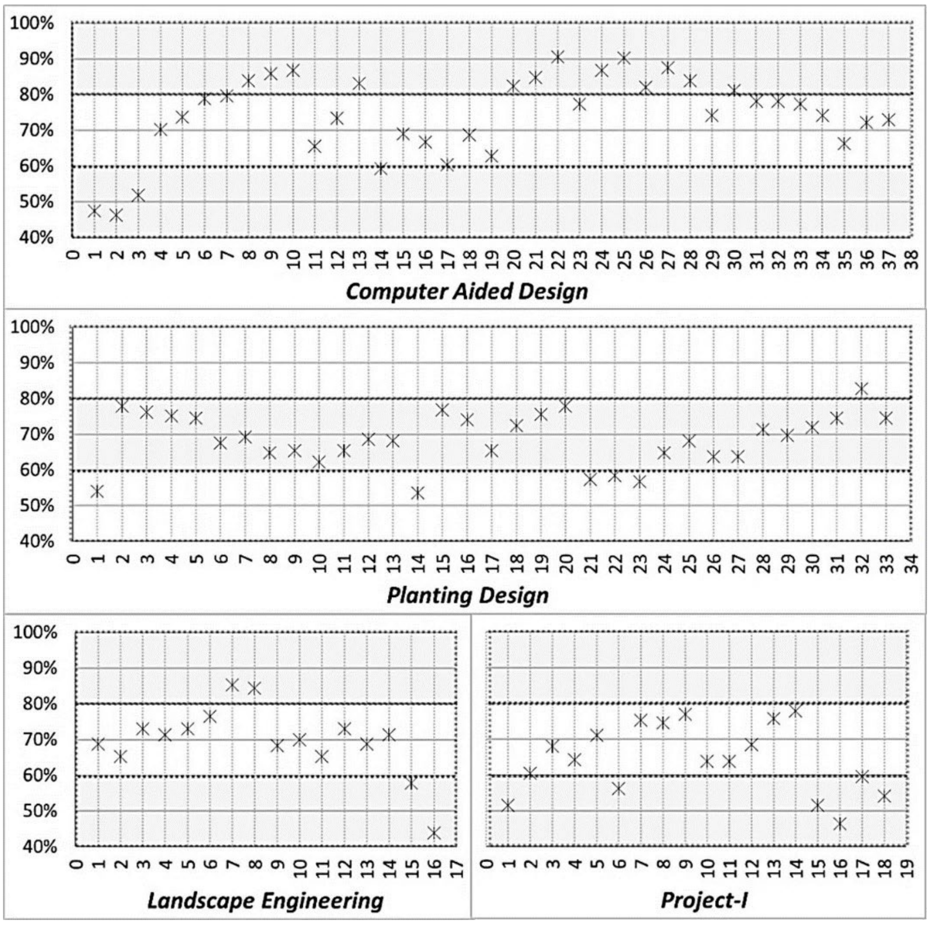

Figure 7 Rates of development in knowledge levels according to subjects

As a result of all analyses, it was determined that the most successful course in terms of the effectiveness level of the education provided was Computer Aided Design (89.2%), followed by Planting Design (84.9%), Landscape Engineering (75%) and Project-I (66.6%). In light of these data, it can be concluded that the teaching techniques applied in the Project-I course should be re-evaluated and the required revisions should be performed.

4. Conclusion and Recommendations

In this study, in order to determine the level of effectiveness of the education provided to higher education students, a questionnaire was conducted twice, once at the beginning and once at the end of the semester for various courses. The data obtained by questionnaires and the end-of-semester course scores of the students were analyzed by various methods and the strong and weak aspects of the education provided were identified. A detailed current situation analysis of the course curriculum was carried out with the method used in the study. The level of effectiveness of the education provided on all the subjects taught during the semester was clearly determined. As a result of the findings, it was determined which subjects needed revision in order to provide a more effective education to the students. In addition, other opinions and demands of the students were obtained with the open-ended questions in the last section of the questionnaire forms. As a result of analyzing the negative responses received in this section, other issues that need to be improved for each course were identified in line with the students' opinions. For the Computer Aided Design course, which is carried out for a total of 4 hours per week, 2 theoretical and 2 practical, the comments were noted that the course hours were insufficient and should be increased. In addition to the fact that the sourcebook used in the course for the Planting Design Course was found insufficient in terms of visual examples, it was reported that it would be more beneficial to practice on-site rather than the education given in the classroom. Regarding the Landscape Engineering course, it was reported that the practice hours were too long and strenuous; more concentration should be given to the presentation of the subject and more sample questions should be solved. Especially the subject of irrigation was reported to be inadequately explained in the sourcebook used and there were complaints that more time should be planned for this subject. For this course, similar to the comments for Computer Aided Design, participants also stated that the course hours should be increased and that the curriculum subjects could not be taught in a single course. Furthermore, similar to the comments made for the Planting Design course, it was also stated that some of the topics for this course could be better learned through on-site practices. Concerning the Project-I course, the disadvantages of online education provided during the Covid-19 pandemic were mentioned intensively. Students reported that they had difficulties in the course because they did not have sufficient proficiency in the computer software they needed to use within the scope of this course. It was also stated that more sample projects should be shown in the course. On the other hand, positive feedback was received from students regarding the questionnaires conducted for all courses. It was stated that the questionnaires were very useful, that it was very valuable to pay attention to the opinions of the students about the courses, and that this practice should be done for other courses in the department. Similarly, the main findings in Steadman's (1998) study were that both instructors and students had positive attitudes towards Classroom Assessment techniques, instructors used it to improve teaching and help students learn, and students found it a valuable learning tool. Charalambous et al. (2021) also stated that better linking teaching quality to student learning processes can create effective changes in education. Student interactions are critical in this context.

The process conducted in the study demonstrated that it can be an important tool not only for increasing the effectiveness of the education provided but also for the self-improvement of the instructors. Various studies in relevant literature emphasize the importance of this issue. Fauth et al. (2019) found that there is a strong relationship between teacher efficacy and student achievement. In another study conducted with 924 students, it was determined that teacher behaviors affected students' cognitive and metacognitive skills (Kyriakides et al., 2020). The methodology used in the study provided the instructors with the opportunity to learn which subjects were successfully taught and which subjects were deficient in the curriculum of the course. This situation shows the issues that need to be revised in the teaching techniques used by the instructors. Therefore, it should not be neglected that the process conducted within the scope of the study has the potential to be very useful not only for the students but also for the instructors.

As mentioned in the introduction section of the study, this research differs from other studies in that it uses not only student feedback but also students' course scores at the end of the semester as the two main factors of the data set.

As a result of the evaluation of the research questions, in this study,

the effectiveness levels of the education provided in the related courses were identified,

it was stated that whether there is consistency between student feedback and students' achievement levels (course scores),

and as a result of the data obtained, it has been proved that outputs that will guide the instructors can be gathered.

As a result, it is foreseen that the implementation of the process carried out within the scope of this study in other higher education institutions will contribute to increasing the level of effectiveness in education and the development of academic staff.

References

Amua-Sekyi, E. T. (2016). Assessment, student learning and classroom practice: A review. *Journal of Education and Practice, 7*(21), 1-6.

Artkan, M., & Kaya M. (2021). Mimarlık eğitimini Z kuşağı ile yeniden düşünmek: Bir görsel öğrenme biçimi olarak “Bricolage”. *IDA: International Design and Art Journal, 3*(1), 54-69.

Charalambous, C. Y., Praetorius, A. K., Sammons, P., Walkowiak, T., Jentsch, A., & Kyriakides, L. (2021). Working more collaboratively to better understand teaching and its quality: Challenges faced and possible solutions. *Studies in Educational Evaluation*, *71*, 101092. https://doi.org/10.1016/j.stueduc.2021.101092

Cheong Cheng, Y. (1994). Effectiveness of curriculum change in school: An organizational perspective. *International Journal of Educational Management, 8*(3), 26-34. https://doi.org/10.1108/09513549410062416

Erdoğan, N. Ş., Özdoğan, M., & Korkmaz, S. Z. (2021). Review of architectural education processes applied by Turkey and member countries of the European Unions. *IDA: International Design and Art Journal, 3*(1), 101-116.

Fauth, B., Decristan, J., Decker, A. T., Büttner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. *Teaching and Teacher Education*, *86*, 102882. https://doi.org/10.1016/j.tate.2019.102882

Feng, D. (2007). School effectiveness and improvement in mainland China. In *International Handbook of School Effectiveness and Improvement* (pp. 287-306): Springer. https://doi.org/10.1007/978-1-4020-5747-2_15

Fuchs, L. S., Fuchs, D., & Hamlett, C. L. (1990). Curriculum-based measurement: A standardized, long-term goal approach to monitoring student progress. *Academic Therapy, 25*(5), 615-631. https://doi.org/10.1177/105345129002500508

Heritage, M., & Heritage, J. (2013). Teacher questioning: The epicenter of instruction and assessment. *Applied Measurement in Education, 26*(3), 176-190. https://doi.org/10.1080/08957347.2013.793190

Khaleghimoghaddam, N. (2023). Investigating students’ challenges in learning architectural design process. *IDA: International Design and Art Journal, 5*(1), 87-98.

Kuhn, K.-A., & Rundle-Thiele, S. (2009). Curriculum alignment: Student perception of learning achievement measures. *International Journal of Teaching and Learning in Higher Education, 21*(3), 351-361.

Kyriakides, L., Anthimou, M., & Panayiotou, A. (2020). Searching for the impact of teacher behavior on promoting students’ cognitive and metacognitive skills. *Studies in Educational Evaluation*, *64*, 100810. https://doi.org/10.1016/j.stueduc.2019.100810

Lanning, S. K., Wetzel, A. P., Baines, M. B., & Ellen Byrne, B. (2012). Evaluation of a revised curriculum: A four-year qualitative study of student perceptions. *Journal of Dental Education, 76*(10), 1323-1333. https://doi.org/10.1002/j.0022-0337.2012.76.10.tb05387.x

Law, M. Y. (2022). A Review of curriculum change and innovation for higher education. *Journal of Education and Training Studies, 10*(2), 16. https://doi.org/10.11114/jets.v10i2.5448

Lipnevich, A. A., & Smith, J. K. (2022). Student-feedback interaction model: Revised. *Studies in Educational Evaluation, 75*, Article 101208. https://doi.org/10.1016/j.stueduc.2022.101208

Marsh, H. W., & Roche, L. A. (1997). Making students' evaluations of teaching effectiveness effective: The critical issues of validity, bias, and utility. *American Psychologist, 52*(11), 1187. https://psycnet.apa.org/doi/10.1037/0003-066X.52.11.1187

Mart, C. T. (2017). Student evaluations of teaching effectiveness in higher education. *International Journal of Academic Research in Business and Social Sciences, 7*(10), 57-61. http://dx.doi.org/10.6007/IJARBSS/v7-i10/3358

Mortimore, P. (1993). School effectiveness and the management of effective learning and teaching. *School Effectiveness and School Improvement, 4*(4), 290-310. https://doi.org/10.1080/0924345930040404

Nicol, D., & Kushwah, L. (2024). Shifting feedback agency to students by having them write their own feedback comments. *Assessment and Evaluation in Higher Education*, *49*(3), 419-439. https://doi.org/10.1080/02602938.2023.2265080

Scheerens, J., Witziers, B., & Steen, R. (2013). A meta-analysis of school effectiveness studies. *Revista de Educacion*. (361), 619-645. https://doi.org/10.4438/1988-592X-RE-2013-361-235

Schweinberger, K., Quesel, C., Mahler, S., & Höchli, A. (2017). Effects of feedback on process features of school quality: A longitudinal study on teachers' reception of school inspection of Swiss compulsory schools. *Studies in Educational Evaluation*, *55*, 75-82. https://doi.org/10.1016/j.stueduc.2017.07.004

Shafique, F., Akram, U., & Ul Ehsan, Muhammad Kashif. (2018). Feedback mechanism role to reduce frustration for betterment of educational effectiveness: A cross-sectional research. *Indo American Journal of Pharmaceutical Sciences*, *5*(7), 6712-6720.

Steadman, M. (1998). Using classroom assessment to change both teaching and learning. *New Directions for Teaching and Learning*, (75), 23-35.

Stobaugh, R., Mittelberg, J., & Huang, X. (2020). Examining K–12 students' perceptions of student teacher effectiveness. *Teacher Development, 24*(2), 274-292. https://doi.org/10.1080/13664530.2020.1739740

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2013). *Using multivariate statistics* (Vol. *6*, pp. 497-516). Boston, MA: Pearson.

Tagulwa, E. A., Owino, P., Muwonge, F., & Kaahwa, M. G. (2023). The effectiveness of curriculum review in improving quality, relevance, and students' employability in university education in Uganda. *International Journal of Multidisciplinary: Applied Business and Education Research, 4*(6), 1932-1942. https://doi.org/10.11594/ijmaber.04.06.19

Vasilev, Y., Vasileva, P., Batova, O., & Tsvetkova, A. (2024). Assessment of factors influencing educational effectiveness in higher educational institutions. *Sustainability*, *16*(12), 4886. https://doi.org/10.3390/su16124886

CRediT Authorship Contribution Statement

All contributions to this article, including conceptualization, methodology, data collection, analysis, writing, visualization, and review, were performed solely by the author, Ahmet Akay.

Declaration of Competing Interest

The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The author would like to express his gratitude to the anonymous reviewers who contributed to the development of this study, and to all the members of the editorial board who contributed to the publication process.

Data Availability

Data will be made available on request.

Ethics Committee Approval

This research was approved by the decision of Selçuk University Faculty of Architecture and Design Scientific Ethics Committee dated 15/10/2021 and numbered 06.

Resume

Ahmet Akay is currently employed at the Department of Landscape Architecture at Selçuk University. His research focuses on landscape design, walkability, urban studies, and, notably, the enhancement of visual quality in urban areas. Akay integrates innovative approaches at the intersection of urban design and environmental acoustics, aiming to elevate both the aesthetic and functional values of urban landscapes. His recent publication, "An Acoustical Landscaping Study: The Impact of Distance Between the Sound Source and Landscape Plants on Traffic Noise Reduction," examines the role of landscape configurations in mitigating urban traffic noise. Moreover, his most cited work, "Relationships between the Visual Preferences of Urban Recreation Area Users and Various Landscape Design Elements," provides a detailed analysis of the nexus between visual quality and user preferences in urban recreational spaces.