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The Effect of Course Design, Learning Activities, and Lecture Quality on Student Course Statisfaction: A Structural Equation Modeling

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ABSTRACT

Student satisfaction with lectures is an important indicator in evaluating the quality of higher education. This study aims to empirically examine the relationships among course design, student learning activities, lecturer quality, and student course satisfaction using Structural Equation Modeling (SEM). The data were obtained from the Turkiye Student Evaluation Dataset and consisted of 582 observations after screening missing and duplicate records. Four latent constructs were analyzed, namely Course Design, Student Learning Activities, Lecturer Quality, and Course Satisfaction. The analysis was conducted using AMOS with Maximum Likelihood estimation. The initial model did not meet adequate model fit because the RMSEA value was above the recommended threshold; therefore, model modification was performed based on theoretically relevant modification indices. The modified model showed improved goodness of fit, with GFI = 0.999, TLI = 0.999, CFI = 0.999, and RMSEA = 0.014. The results indicate that course design and learning activities have positive and significant effects on lecturer quality, while lecturer quality has a strong and significant effect on student course satisfaction. These findings suggest that active

Keywords: *Course Satisfaction, Course Design, Learning Activity, Lecturer Quality, Structural Equation Modeling,*

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1. Introduction

Student satisfaction with lectures is a key component in evaluating the quality of higher education. A high level of satisfaction reflects the effectiveness of the teaching and learning process and also indicates the perceived quality of academic services. Therefore, identifying factors that influence student satisfaction is important for universities in improving retention, learning motivation, and institutional reputation.

Previous studies have shown that student satisfaction may be influenced by lecturer effectiveness, course design, learning facilities, student participation, and assessment systems [1], [8], [10]. Among these factors, the present study focuses on internal learning-process dimensions, namely course design, student learning activities, and lecturer quality. Systematic course design provides clear learning direction and structure, while active learningactivities encourage students to become cognitively and emotionally involved in the classroom [1], [3]. Lecturer quality also has a central role in delivering materials, guiding discussion, and creating a supportive learning environment [2], [5], [6].

The research problem arises from the gap between students' expectations and their perceptions of lecture implementation. A more comprehensive analysis is required to determine which learning-process variables contribute most strongly to student course satisfaction. This study uses Structural Equation Modeling (SEM) because it allows simultaneous testing of causal relationships among latent constructs while accounting for measurement error [9].

This study adopts the Turkiye Student Evaluation Dataset, which contains student responses to various aspects of teaching and learning in higher education [4]. The independent constructs analyzed in this hing performance throughout the lecture process.study are Course Design and Student Learning Activities, while Lecturer Quality is positioned as an endogenous construct that contributes to Course Satisfaction. The expected contribution of this study is both theoretical and practical: theoretically, it provides a path model of relationships among latent variables, and practically, it offers

recommendations for improving learning experiences in higher education.

The hypotheses underlying the model are formulated as follows: course design has a positive effect on lecturer quality; learning activities have a positive effect on lecturer quality; and lecturer quality has a positive effect on student course satisfaction. These hypotheses are evaluated using the estimated path coefficients, critical ratio, and probability values generated by AMOS.

The structural model developed in this study therefore places Course Design and Learning Activities as exogenous latent variables, Lecturer Quality as an endogenous mediating variable, and Student Course Satisfaction as the final endogenous variable. The model does not only examine direct relationships, but also explains how learning-related factors may form satisfaction through lecturer quality. This framework is suitable for Structural Equation Modeling because each variable is represented by several indicators and the relationship among constructs can be tested simultaneously. Based on the conceptual relationship among variables, this study assumes that course design and learning activities contribute to lecturer quality as perceived by students. A clear course design may help lecturers deliver material in a more systematic way, while active learning activities may increase interaction between students and lecturers. These interactions can shape students' evaluation of lecturer quality. Furthermore, lecturer quality is assumed to influence student course satisfaction because students directly experience the lecturer's teaching ability Lecturer quality represents the pedagogical and interpersonal ability of lecturers in managing lectures. This includes the ability to explain material, answer questions, give feedback, respect student opinions, and create a supportive learning atmosphere. Lecturer quality is positioned as a central construct because lecturers act as the direct facilitator of learning. Even when a course has been designed systematically, the success of the lecture process still depends on how the lecturer implements the design in classroom interaction [5], [6].

Learning activities describe the extent to which students are involved in the learning process. Active learning can be reflected through class discussion, completion of assignments, participation in quizzes and projects, and the use of learning resources. Students who are more actively involved generally have more opportunities to build understanding, ask questions, and relate the course material to practical contexts. Therefore, learning activities are expected to strengthen students' perceptions of the learning process and the quality of instruction [10].

Course design refers to the arrangement of learning objectives, course content, teaching methods, assignments, and evaluation systems. A well-designed course provides students with a clear understanding of what must be achieved and how learning activities are connected to the expected competencies. In the perspective of constructive alignment, learning objectives, teaching strategies, and assessment must be consistent with one another so that students can understand the direction of the course and the relevance of each learning activity [2], [3].Student satisfaction in higher education is not only related to the final evaluation score given by students, but also to the learning experience that is formed throughout the course period. In lecture evaluation, students usually assess whether the course is structured clearly, whether learning activities help them understand the material, and whether the lecturer is able to facilitate the learning process effectively. These three aspects are important because satisfaction is formed through continuous interaction between the learning design, student participation, and lecturer performance [1], [10].

2. Research Method

Explaining This study uses a quantitative approach with explanatory research. The purpose of this approach is to test and explain causal relationships among variables based on hypotheses formulated from previous literature. Data analysis was conducted using SEM with the support of AMOS software and the Maximum Likelihood estimation method.

The data used in this study are secondary data obtained from the Turkiye Student Evaluation Dataset available through Kaggle [4]. The dataset contains student evaluations of several lecture aspects, including course design, learning activities, lecturer quality, and student satisfaction. After screening duplicate and incomplete data, the final sample consisted of 582 observations. This sample size is considered adequate for SEM involving four latent constructs. Previous SEM research has shown that latent variables can be evaluated through CFA and structural model assessment to examine relationships among constructs [11]

Four latent constructs were used in the model: Course Design (X_1), Student Learning Activities (X_2), Lecturer Quality (X_3), and Course Satisfaction (Y). Four latent constructs were used in the model: Course Design (X_1), Student Learning Activities (X_2), Lecturer Quality (X_3), and Course Satisfaction (Y). The operational indicators used to measure each construct are presented in Table 1.

Table 1 operational indicators

Construct	Code	Indicators
Cost Design	X_1	Information on course content;learning methods and assessment system delivered at the beginning of the semester; clarity of learning objectives and outcomes; implementation according to the announced syllabus.
Student Learning Activities	X_2	Quality of class discussion; quality of assignments; adequacy and currency of textbooks and

Construct	Code	Indicators
		learning resources; contribution of quizzes, assignments, projects, and examinations to the learning process.
Lecturer Quality	X_3	Quality of class discussion; quality of assignments; adequacy and currency of textbooks and learning resources; contribution of quizzes, assignments, projects, and examinations to the learning process.
Course Statisfaction	Y	Students enjoy the class and are encouraged to participate; initial expectations are fulfilled at the end of the course; the course is relevant and useful for improving student understanding.

The analysis was conducted in several stages. First, data preparation was performed by checking missing values and duplicate observations. Second, the measurement model was evaluated through Confirmatory Factor Analysis to ensure that the indicators represented their respective latent constructs. Third, the overall model fit was assessed using several goodness-of-fit indices, including Chi-square, GFI, AGFI, TLI, CFI, RMSEA, NFI, PCFI, and PNFI. If the model did not satisfy the fit criteria, modification indices were considered, provided that the modifications were theoretically meaningful. Finally, the structural model was interpreted based on path coefficients, standard errors, critical ratios, and probability values.

When the initial model did not fully meet the fit criteria, modification indices were considered. Model modification was not performed solely to improve statistical fit, but also required theoretical justification. Therefore, only modifications that could be explained in relation to the similarity of measurement items or the conceptual relationship among indicators were considered. This approach was used to avoid overfitting and to maintain the interpretability of the final model.

The analysis was performed using AMOS with the Maximum Likelihood estimation method. Model evaluation was conducted by examining several goodness-of-fit indices, including Chi-square, GFI, TLI, CFI, RMSEA, and PCFI. A model is generally considered acceptable when fit indices meet recommended thresholds, such as CFI and TLI close to or above 0.90 and RMSEA below 0.08. However, model fit was not interpreted based on a single index only because each index has different sensitivity to sample size and model complexity. In this study, the SEM formulation is presented to clarify the relationship between the measurement model and the structural model. The CFA measurement model is expressed as:

$$x = \Lambda x\xi + \delta \quad (1)$$

$$y = \Lambda y\eta + \varepsilon \quad (2)$$

Where x and y denote observed indicators, ξ and η denote latent variables, Λx and Λy denote factor loading matrices, while δ and ε denote measurement errors.

The commonly used formulas for convergent validity and construct reliability are:

$$AVE = (\Sigma\lambda i^2) / n \quad (3)$$

$$CR = (\Sigma\lambda i)^2 / [(\Sigma\lambda i)^2 + \Sigma\theta i] \quad (4)$$

Where λi is the standardized loading factor, θi is the measurement error, and n is the number of indicators in a construct. The general structural model and the specific structural equations in this study are written as:

$$\eta = \Gamma\xi + \zeta \quad (5)$$

$$\eta 1 = \gamma 11\xi 1 + \gamma 12\xi 2 + \zeta 1 \quad (6)$$

$$\eta 2 = \beta 21\eta 1 + \zeta 2 \quad (7)$$

In the modified model, η1 represents Lecturer Quality, η2 represents Course Satisfaction, ξ1 represents Course Design, and ξ2 represents Learning Activities.

AMOS estimates the parameters using Maximum Likelihood estimation. In general, the ML fitting function can be expressed as:

$$FML = \ln|\Sigma| + \text{trace}(S\Sigma^{-1}) - \ln|S| - p \quad (8)$$

where S is the sample covariance matrix, Σ is the model-implied covariance matrix, and p is the number of observed variables.

2.1 Method Estimation and Model Evaluation

The structural model explains the causal relationships among latent variables. In this study, Course Design and Learning Activities were specified to influence Lecturer Quality, while Lecturer Quality was specified to influence Student Course Satisfaction. This structure was chosen because lecturer quality is theoretically located closer to students' direct learning experience. Students may perceive a course as satisfying when the lecturer is able to transform course design and learning activities into meaningful instructional practice.

The SEM model consists of a measurement model and a structural model. The measurement model explains the relationship between each latent variable and its observed indicators. Course Design was represented by four indicators related to course content information, learning methods, learning objectives, and syllabus implementation. Learning Activities were represented by four indicators related to class discussion, assignment quality, learning resources, and the contribution of quizzes or projects to learning. Lecturer Quality was represented by three indicators related to teaching ability, feedback, and professional attitude. Student Course Satisfaction was represented by three indicators related to enjoyment, expectation fulfillment, and perceived relevance of the course.

2.2. Model Specification

The variables used in this study were derived from student evaluation items in the dataset. Because the data were already recorded in numerical form, the indicators could be processed directly in AMOS. Nevertheless, the selection of indicators was not conducted randomly. Each indicator was selected based on its conceptual relevance to the latent construct. This step was important to ensure that Course Design, Learning Activities, Lecturer Quality, and Student Course Satisfaction were measured by items that were consistent with the theoretical meaning of each construct.

Data preparation was conducted before estimating the SEM model. The dataset was screened to ensure that the observations used in the analysis were complete and relevant to the research variables. Duplicate observations and records with missing values were removed so that the final dataset consisted of 582 observations. This number was considered adequate for SEM analysis because the model contained four latent constructs and a moderate number of indicators.

Table 2. Initial SEM Parameter Estimates

Relationship	Estimate	S.E.	C.R.	P
Lecturer Quality ← Course Design	0.294	0.028	10.348	<0.001
Lecturer Quality ← Learning Activities	0.621	0.029	21.723	<0.001
Course Satisfaction ← Lecturer Quality	0.900	0.008	107.666	<0.001

3. Results and Discussion

3.1 Measurement Model Evaluation

Before the structural model was tested, the measurement model was evaluated using Confirmatory Factor Analysis. This evaluation was conducted to ensure that the indicators were conceptually aligned with the latent constructs of Course Design, Student Learning Activities, Lecturer Quality, and Course Satisfaction. In this paper, the discussion focuses on overall model feasibility and structural relationships among latent constructs, while measurement evaluation is used as a basis for proceeding to the SEM structural analysis.

3.2 Intial Model Fit

The initial SEM model did not show adequate fit because the RMSEA value was 0.125, which is above the generally accepted threshold of 0.08. However, several other indices, such as TLI = 0.937 and PCFI = 0.762, suggested that part of the model structure was still acceptable. The Chi-square value was 6708.139 and significant, which may occur in models with relatively large samples or complex structures. Therefore, the evaluation was not based solely on Chi-square, but also on other fit indices and theoretically relevant modification indices.

3.3 Evaluation Modified Model and Structural Rekationshil

After model modification, the goodness-of-fit indices improved substantially. The modified model produced GFI = 0.999, TLI = 0.999, CFI = 0.999, and RMSEA = 0.014. These values indicate that the modified model has a very good fit and can be used for hypothesis testing. The probability value was 0.004, which remains below the ideal threshold of 0.05, but the overall model is considered acceptable because most fit indices satisfy the recommended criteria.

Table 3. Modified SEM parameter estimates

Relationship	Estimate	S.E.	C.R.	P
Lecturer Quality ← Course Design	0.158	0.062	2.565	0.010
Lecturer Quality ← Learning Activities	0.752	0.062	12.047	<0.001
Course Satisfaction ← Lecturer Quality	1.012	0.010	99.404	<0.001

Based on Table 3, the structural equation for Lecturer Quality can be written as $\eta1 = 0.158\xi1 + 0.752\xi2 + \zeta1$, while the structural equation for Course Satisfaction can be written as $\eta2 = 1.012\eta1 + \zeta2$. The results indicate that course design has a positive and significant effect on lecturer quality, with an estimate of 0.158 and $p = 0.010$. This finding suggests that a well-designed course still contributes to students' perceptions of lecturer quality, although the effect is relatively smaller than the effect of learning activities.

Student learning activities have a stronger positive and significant effect on lecturer quality, with an estimate of 0.752 and $p < 0.001$. This result indicates that students who are more actively involved in learning tend to perceive lecturer quality more positively. Furthermore, lecturer quality has a very strong and significant effect on course satisfaction, with an estimate of 1.012 and $p < 0.001$. Thus, students' perceptions of lecturer quality become the main determinant in shaping satisfaction with the overall learning experience.

3.4 SEM Model Figures

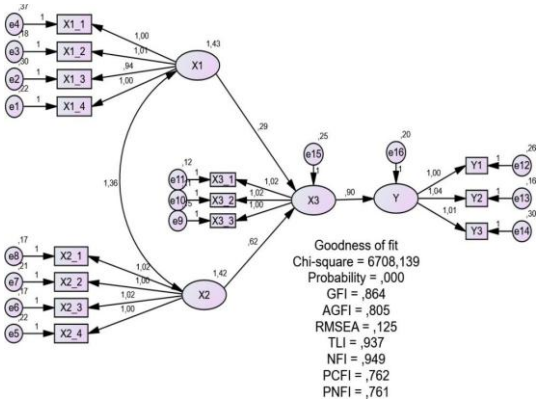

Figure 1. Initial SEM model

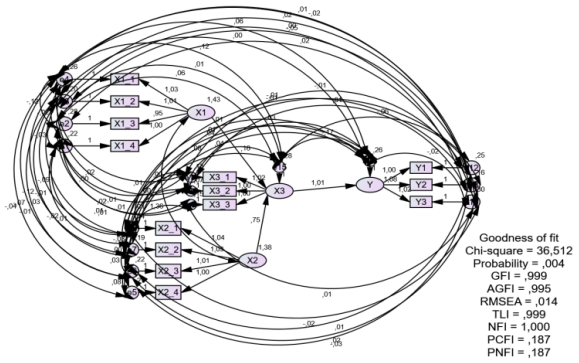

Figure 2. Modified SEM model

Lecturer development programs need to emphasize pedagogical and interpersonal competencies simultaneously. The ability to manage the classroom, explain concepts, answer questions, and provide feedback can directly influence student satisfaction. Therefore, improving lecturer quality can be one of the most effective strategies for increasing students' satisfaction with their courses. Student learning activities need to be designed to encourage active participation. Discussions, assignments, projects, and quizzes should not only be viewed as assessment instruments, but also as learning mechanisms that help students understand the course material. When learning activities are meaningful, students tend to perceive lecturers as competent and supportive figures. The findings of this study have several implications for higher education institutions. Institutions should not only focus on preparing syllabi and formal learning documents but also ensure that lecturers are able to implement those designs effectively in the classroom. Course design will become more meaningful when it is translated into clear explanations, relevant assignments, and constructive interactions during the learning process.

Lecturer Quality has a very strong and significant effect on Student Course Satisfaction. This finding indicates that student satisfaction strongly depends on how students perceive lecturers' teaching performance. Lecturers who can explain the material clearly, respond to questions effectively, provide feedback, and maintain professional interaction are more likely to create a positive learning experience. In this model, lecturer quality serves as the main bridge between the learning process and student satisfaction.

Learning Activities have the strongest effect on Lecturer Quality. This result indicates that student's active involvement in discussions, assignments, quizzes, projects, and the use of learning resources plays a major role in shaping their perceptions of lecturers' performance. When students are active, their interaction with lecturers becomes more intensive, allowing them to directly experience the lecturer's ability to guide, respond, and facilitate learning. Therefore, active learning activities can strengthen the relationship between students and lecturers. The positive effect of Course Design on Lecturer Quality shows that students tend to evaluate lecturers more positively when a course is designed and delivered in a structured manner. A clear syllabus, explicit learning objectives, and consistent implementation of learning activities can help lecturers appear more prepared, organized, and effective in managing the learning process more organized and effective. However, the magnitude of the effect of Course Design is smaller than that of Learning Activities, indicating that the formal structure of a course is not the dominant factor in shaping perceptions of lecturer quality. After model modification, the goodness-of-fit results improved substantially. The RMSEA value decreased to 0.014, while the GFI, TLI, and CFI values reached 0.999. These results indicate that the modified model has a much better ability to reproduce the covariance structure of the data. Although the probability value remains below 0.05, the overall model is considered acceptable because the other fit indices provide very strong support. The initial structural model provides important information regarding the direction of the relationships among variables. Course Design and Learning Activities both show positive relationships with Lecturer Quality, while Lecturer Quality shows a positive relationship with Student Course Satisfaction. However, the initial model still produced an RMSEA value above the generally accepted threshold, indicating that the model required modification before being used as the basis for final interpretation. The evaluation of the measurement model shows that the indicators used in this study are conceptually aligned with their respective latent constructs. Although the loading factor, Construct Reliability, and Average Variance Extracted values are not presented separately in this manuscript, the CFA stage serves as an initial evaluation to ensure that the measurement structure is appropriate for further structural analysis. Therefore, the discussion focuses on the relationships among constructs and the improvement of the overall model fit.

3.5 Interpreation

This study also provides practical contributions by showing that lecturer quality is a strategic point in improving student satisfaction. Course design and learning activities remain important, but their impact becomes stronger when they are implemented through effective lecturer performance. Therefore, higher education institutions can use this model as a reference in efforts to improve teaching quality and students' learning experiences. The role of Lecturer Quality as the strongest predictor of Student Course Satisfaction indicates that the human element remains a central aspect of higher education. Although learning systems, course structure, and assessment design are important, student satisfaction is strongly influenced by the lecturer's ability to make the learning experience clear, meaningful, and supportive. Therefore,

improving student satisfaction cannot be achieved only through curriculum improvement, but must also be accompanied by the continuous development of lecturer quality. Active learning also changes the role of students from passive recipients of information into participants in the learning process. This condition can improve the quality of classroom interaction. Lecturers are not only evaluated based on their ability to deliver course material, but also on their ability to encourage participation, answer questions, manage discussions, and provide meaningful feedback. This explains why the path from Learning Activities to Lecturer Quality is stronger than the path from Course Design to Lecturer Quality. The strong effect of Learning Activities on Lecturer Quality also emphasizes the importance of active learning. Learning activities create opportunities for students to observe the lecturer's ability to facilitate the class. When assignments, discussions, quizzes, and projects are relevant to the course material, students tend to perceive the lecturer as a competent instructor because the lecturer is able to connect learning tasks with learning outcomes. This result is consistent with the logic of student evaluation, in which students tend to assess the learning process based on the direct experiences they encounter. Documents such as syllabi and lesson plans are important at the beginning of the semester, but continuous interaction with lecturers is more dominant in shaping students' perceptions. Therefore, course design can be understood as a supporting factor that helps lecturers conduct teaching more effectively, rather than as the sole determinant of student satisfaction. The finding that Course Design has a significant but relatively smaller effect on Lecturer Quality indicates that formal learning planning is important, but cannot stand alone. Course design provides the structure of learning, but students may not always experience this design directly if it is not implemented clearly and consistently in classroom activities. It is not implemented through lecturers' teaching behavior. In other words, the syllabus, learning objectives, and assessment schedule become meaningful when lecturers are able to communicate and apply them consistently throughout the course.

The modified SEM model shows a very good improvement in model fit compared to the initial model. The values of GFI = 0.999, TLI = 0.999, CFI = 0.999, and RMSEA = 0.014 indicate that the model is highly appropriate for explaining the relationships among latent constructs. Although the probability value remains below the ideal threshold, the overall model can be considered acceptable because most of the goodness-of-fit indices have met the recommended criteria. The results of this study show that Course Design has a positive and significant effect on Lecturer Quality, although its effect is relatively smaller than that of Learning Activities. Student Learning Activities are the strongest predictor of Lecturer Quality, indicating that students' active involvement in the learning process contributes to more positive perceptions of lecturers' teaching quality. Lecturer Quality is also proven to be the main determinant of Student Course Satisfaction. Therefore, higher education institutions need to pay attention not only to the formal design of courses, but also to active learning experiences and lecturer competence as important elements in improving student satisfaction. For future research, the model can be developed by adding other constructs such as learning facilities, academic services, digital learning platforms, or student motivation. Future studies may also compare several student groups using multigroup SEM to determine whether the structural relationships formed are consistent across study programs, gender, or different types of courses. Such development would provide a more comprehensive understanding of student satisfaction in higher education. The findings of this study also show that student satisfaction is formed through a process involving structural and interactional aspects of learning. Course Design provides the formal foundation for the course, Learning Activities create space for student engagement, and Lecturer Quality transforms both aspects into a real learning experience.

4. Conclusion

The modified SEM model shows a very good improvement in model fit compared to the initial model. The values of GFI = 0.999, TLI = 0.999, CFI = 0.999, and RMSEA = 0.014 indicate that the model is highly appropriate for explaining the relationships among latent constructs. Although the probability value remains below the ideal threshold, the overall model can be considered acceptable because most of the goodness-of-fit indices have met the recommended criteria. The results of this study show that Course Design has a positive and significant effect on Lecturer Quality, although its effect is relatively smaller than that of Learning Activities. Student Learning Activities are the strongest predictor of Lecturer Quality, indicating that students' active involvement in the learning process contributes to more positive perceptions of lecturers' teaching quality. Lecturer Quality is also proven to be the main determinant of Student Course Satisfaction. Therefore, higher education institutions need to pay attention not only to the formal design of courses, but also to active learning experiences and lecturer competence as important elements in improving student satisfaction. For future research, the model can be developed by adding other constructs such as learning facilities, academic services, digital learning platforms, or student motivation. Future studies may also compare several student groups using multigroup SEM to determine whether the structural relationships formed are consistent across study programs, gender, or different types of courses. Such development would provide a more comprehensive understanding of student satisfaction in higher education. The findings of this study also show that student satisfaction is formed through a process

involving structural and interactional aspects of learning. Course Design provides the formal foundation for the course, Learning Activities create space for student engagement, and Lecturer Quality transforms both aspects into a real learning experience. Therefore, improving student satisfaction requires an integrated strategy that combines well-structured course design, meaningful learning activities, and continuous improvement of lecturer quality. These three aspects should not be treated separately, because course design will be more effective when supported by active learning activities and implemented by lecturers who are pedagogically and interpersonally competent. Thus, the results of this study emphasize the importance of aligning course planning, student engagement, and lecturer performance in order to create a more satisfying learning experience in higher education.

Limitation

This study is limited to the use of secondary data from the Turkiye Student Evaluation Dataset. Future research may include additional variables, such as learning facilities, institutional support, and student characteristics, to provide a broader explanation of student satisfaction.

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Author Contributions Statement

Author 1: Contributed to the conceptualization, methodology, data analysis, original draft preparation, and final editing of the article.
Author 2: Provided academic guidance, supervision, and input during the preparation of the manuscript.
Author 3: Preparation of the original draft or writing of the review and editing

Conflict of Interest Statement

☒ The authors declare that they have no competing financial interests or known personal relationships that could be considered to influence the work reported in this article.
☐ The authors declare the following financial/personal relationships that may be considered competing interests.

Data Availability

The data supporting the findings of this study are openly available in the Turkiye Student Evaluation Dataset on Kaggle.

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