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THE RELATIONSHIP BETWEEN ATTENDANCE AND ACADEMIC ACHIEVEMENT IN MATHEMATICS: A QUANTITATIVE CASE STUDY OF SDU UNIVERSITY, KAZAKHSTAN

Abstract. Previous research on the link between class attendance and students' academic performance has reported inconsistent results: while some studies have shown a positive correlation, others have failed to find such a relationship. This calls for further investigation to better understand the relationship between these two variables. However, in the Kazakhstani context, there is a dearth of research investigating this phenomenon. Therefore, the present quantitative study examined the relationship between class attendance and academic achievement in four mathematics courses by analyzing data from two separate anonymous online survey instruments administered to 60 fourth-year students at SDU University in southern Kazakhstan. Data were analyzed using both descriptive and inferential statistics. The perception questionnaire results indicated that students generally agreed that regular class attendance is associated with academic achievement ($M = 4.07$, $SD = 0.93$). Correlation and regression analyses revealed a significant positive association between class attendance and academic achievement in three courses, while one course showed a very weak and non-significant relationship. However, attendance explained only a relatively small proportion of the variance in students' academic performance across the courses. The findings also suggest that students perceived classmates' support, quality of teaching, self-study, and teachers' support as relevant to academic success in mathematics. Therefore, this study concludes that students' academic achievement is associated with multiple factors beyond class attendance.

Keywords: class attendance, mathematics, academic performance, grade point average (GPA), higher education

Introduction

It is widely acknowledged that class attendance has a tremendous impact on academic outcomes in higher education. Regular class attendance may increase students' engagement and participation, leading to a better understanding and application of complex concepts in class (Hemers, 2010). Conversely, a high rate of absenteeism may create gaps in knowledge acquisition, adversely impacting students' academic success.

A substantial body of research has found a strong relationship between academic achievement and class attendance among higher education students. For instance, in a study conducted by Akpur (2021), attendance showed a strong impact on academic success. The study reported a positive correlation between Course Participation Grades (CPG) and English language achievement. In another study, Mia et al. (2025) concluded that higher Semester Cumulative Grade Point Average (SCGPA) scores are influenced by participation in extracurricular activities and class attendance among undergraduate students. Also, a strong correlational relationship ($r = .65$) was found by Vaidya and Mishra (2023), linking attendance rates and GPA among management students, suggesting that students with a high rate of attendance receive better final grades. Moreover, Zeqiri and Sadiku (2023) investigated the relationship between English exam grades of architecture students in Kosovo and the absenteeism level of students. They found a clear, statistically significant gap: every 1.8 absences directly pulled down a student's final exam grade. Specifically, the linear regression analysis showed an unstandardized coefficient of $B = -1.834$ ($t = -8.141$, $p < .001$). This means that for roughly every two classes missed, a student's final score dropped by one full grade point on the institutional ten-

point scale, proving that academic performance decreases step-by-step with each accumulated absence. Closely related, a study conducted in Nigeria by Auru and Gidado (2022) indicated that success in a business education course is strongly associated with student attendance. It was found that there is a significant relationship between lecture attendance and academic performance. The authors discussed that there is a greater chance of better performance for students who regularly attend than for students with a high percentage of absences.

With regard to investigations in mathematics, studies have also revealed a positive correlation between classroom attendance and academic outcomes. It is well documented in the literature that regular attendance in mathematics classes improves students' learning outcomes, participation in learning activities, and, most importantly, material comprehension. For example, Foldnes (2017) found a strong relationship between academic outcome and both scholars' lecture attendance and their attitudes toward the mathematics course. Critically, even with all lecture content freely accessible via online videos, digital materials could not substitute for structured, peer-based sessions; a one-standard-deviation increase in attendance yielded a 0.28 standard deviation increase in exam performance, even after controlling for baseline skills and attitudes. Consequently, students who frequently miss classes may face considerable challenges later in their education. Schmidt and Raines (2019) also examined the relationship between class attendance and academic performance in prescribed mathematics courses. The study found a profound impact of class attendance on students' final grades in these courses. The authors concluded that students with a high percentage of absenteeism during the semester are most likely to achieve lower final grades. Overall, results from these studies indicate that class attendance could be a strong determinant of academic success among students in higher education.

In contrast, differing results have been reported in some studies. Some studies reported not only a weak relationship, but also a negative relationship between attendance and performance. For instance, a weak correlation between academic achievement and attendance was found in the research conducted by He (2024) about the Java programming classroom. In the study, the researcher argued that class attendance alone may not be adequate, especially in difficult subjects, such as computer science. Veerasamy et al. (2016) found a negative correlation between lecture attendance and final exam performance in an introductory programming course, suggesting that the availability of online learning materials may have reduced students' dependence on formal lectures. In addition, De Clercq et al. (2021) used multilevel analyses to compare different programs and lessons. It was found that lessons among different faculties yielded different results despite similar average participation rates. For instance, in the Law course, students could get high achievement with less participation. So, students can achieve good academic performance regardless of class attendance. These variables (self-efficacy, motivation, engagement, and use of technology in classrooms) can influence student learning success (Ardill, 2024; He, 2024; Thatcher et al., 2007).

Despite the controversies, it is important to highlight that an investigation into the relationship between classroom attendance and academic results in higher education is crucial because mathematics is one of the subjects that needs constant effort and cumulative understanding (Mayfield & Chase, 2002). However, compared with other disciplines, research on the impact of class attendance on students' academic outcomes in higher education mathematics courses has not been extensively investigated in the literature. Studies investigating this phenomenon predominantly address primary or secondary levels of education (Byiringiro, 2023; Oribhabor & Adesanya, 2024; Yilmaz, 2022).

Moreover, there are limited studies that directly examine the relationship between attendance and academic performance at universities in Kazakhstan. In one study that directly examines this topic, Moldabayev et al. (2013) found a very strong positive correlation between attendance and semester grade point average among engineering students at Nazarbayev University. However, as revealed in the study, the correlation varied throughout various years of the study and the subjects. Although previous research has reported strong evidence on the relationship between attendance and academic performance in disciplines such as physics and engineering within the Kazakhstani context, university-level mathematics remains underexplored in this regard. In particular, there is a lack of

course-specific quantitative evidence examining whether the relationship between attendance and academic achievement is consistent across different mathematics subjects within the same academic program. To address this gap, the present study aims to provide a course-level analysis of four mathematics subjects within the Mathematics Pedagogy program at SDU University. By examining both academic indicators and students' perceptions of factors influencing achievement, the study contributes empirical evidence from a context that has received little attention in the literature. The findings are expected to contribute to the ongoing debate on attendance and academic performance in higher education and to provide practical insights for university administrators and mathematics departments when considering attendance policies.

Hypothesis

The following hypothesis guided this study: class attendance significantly predicts students' final grade in mathematics at the university level.

Methods and materials

Methods

This quantitative study investigated the relationship between class attendance and academic achievement in mathematics courses without manipulating instructional variables. A quantitative approach allowed the objective measurement of the strength and direction of this relationship. The sample size was relatively small ($N = 60$), since all participants were drawn from a single academic program at one university. These factors may limit the generalizability of the results beyond this specific context.

Participants

This small-scale quantitative study consisted of fourth-year students who were conveniently sampled from the Mathematics Pedagogy program at SDU University in Kaskelen, Kazakhstan. All participants were enrolled in four mathematics courses: Ordinary Differential Equations, Number Theory, Applied Statistics, and Calculation Methods in the academic year 2024-2025.

Data Collection

Data collection was conducted in two sequential phases. The two-phase design was intentional: Phase 1 objective data allowed statistical testing of the attendance–achievement relationship, while Phase 2 perception data provided complementary insight into how students themselves understand the factors influencing their academic performance. Together, the two phases enabled both a quantitative examination of actual behavior and an exploratory understanding of student perspectives.

Both surveys were distributed via the private group communication channel of the fourth-year Mathematics Pedagogy cohort at SDU University. Phase 1 involved an online JotForm survey (Appendix A) in which students self-reported their attendance and final grades for the four mathematics courses. To improve data accuracy, participants were optionally asked to provide a screenshot of their official university grade records as supporting evidence. A total of 60 students (34 females, 26 males) completed Phase 1. Phase 2 was administered one month later. This deliberate interval served two purposes: it allowed the academic term to conclude, minimizing potential interference between data collection phases, and it provided time to carefully design Phase 2 instruments to complement Phase 1 findings. Consequently, an anonymous Likert-scale questionnaire (Appendix B) was deployed to collect students' perceptions from 59 cohort members (36 females, 23 males) regarding these missing explanatory factors, such as individual self-study habits and teaching quality.

To preserve anonymity, no personal identifiers were collected. Consequently, responses from the two phases could not be individually linked. Instead, data were analyzed at the population level: Phase 1 data were used for correlation and regression analyses, while Phase 2 data were analyzed independently for descriptive purposes. Both datasets represent the same student cohort. The slight variation in sample size (60 vs. 59) and demographic composition across phases is typical of voluntary

survey participation and does not indicate different populations, as both surveys were distributed exclusively to the same fourth-year Mathematics Pedagogy cohort.

It should be noted that self-reported data on academic performance may affect accuracy and should be carefully considered: reporting one's own behavior may have a bias effect. Moreover, at SDU University, attendance is factored into final grades for some courses: if students have 30% or more in unexcused absences, they automatically fail the course, and some courses deduct points from the final grades of students with frequent absence. Consequently, attendance may not strictly be an independent variable for final course grades, as it can influence final grades in some courses. This overlap should be considered when interpreting the findings.

Table 1 presents the participant demographics for Phase 1. Additionally, gender data were collected during Phase 2 to verify sample consistency across both time points. The number of responses varied slightly across courses due to missing data.

Table 1
Profile of Participants.

Characteristics of the sample	Category	Frequency
Gender of respondents	Male	26
	Female	34
Courses	ODE	60
	Number Theory	58
	Applied Statistics	58
	Calculation Methods	56

Note. ODE = Ordinary Differential Equations

Results and Discussion

Descriptive Statistics

Table 2
Final Average Class Attendance and Exam Scores in Undergraduate Mathematics Courses

Course	Mean Attendance (%)	SD (Attendance)	Mean Exam Score (%)	SD (Exam Score)
ODE	84.5	8.4	77.9	11.1
Number Theory	89	8	73.8	13.9
Applied Statistics	91.4	7.7	70.4	18.9
Calculation Methods	91.5	8.8	66.7	17.6

Note. ODE = Ordinary Differential Equations

Overall, attendance in the four courses was relatively high, as shown in Table 2. The course with the highest attendance was Calculation Methods which shows an average of 91.5 with the average final grade being 66.7, which deviates 17.6 from its average, followed by Applied Statistics with average class attendance of 91.4 with the average final grade being 70.4 which deviates 18.9 from its average, while Number Theory had an average attendance of 89, with an average final grade being 73.8, which deviates 13.9 from its average. As revealed, Ordinary Differential Equations had the lowest average attendance of 84.5 with an average final grade of 77.9, which deviates 11.1 from its average. The high percentage of attendance found across all four courses is not surprising, as the university has a mandatory attendance policy that compels teachers to record students' attendance in every lesson. The attendance policy explicitly states that students with 30% or more absenteeism in a course will automatically be assigned a failing grade. Moreover, most of these courses award points

for regular class attendance. However, the relatively high attendance rates and limited variability across courses may have influenced the strength of the observed relationships.

Table 3

Perceived Factors Influencing Academic Performance in Undergraduate Mathematics Courses

Statement	Mean	SD
Regular attendance in mathematics classes positively influences my academic performance.	4.07	0.926
The quality of teaching influences my academic performance more than my level of attendance.	4.24	0.751
My academic performance in mathematics depends more on self-study than on class attendance.	4.27	0.827
Teachers' support during class sessions contributes to my academic performance	3.75	0.902
Support from classmates positively affects my performance in mathematics more than class attendance.	3.93	1.08

Note. Responses were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The findings in Table 3 suggested that participants agreed that each of these five factors is related to their mathematical achievement. The mean values ranged from 3.75 to 4.27 out of 5. The mean for self-study ($M = 4.27$, $SD = 0.83$) was the highest, followed by the quality of teaching ($M = 4.24$, $SD = 0.75$) and regular attendance ($M = 4.07$, $SD = 0.93$). The statements on students' support ($M = 3.93$, $SD = 1.08$) and lecturers' support during class ($M = 3.75$, $SD = 0.90$) were rated moderately. However, the SD values indicate some variation in responses, suggesting that students' opinions were not consistent. The descriptive Likert items were not based on a validated scale; thus, the responses reflect participants' viewpoints and cannot be generalized as demonstrating underlying factors shaping students' academic achievement. Collectively, these results indicate that the respondents considered regular attendance, self-study, quality of teaching, teacher support, and support from classmates as important to their academic achievement in mathematics. These results are consistent with an existing study that suggests teacher-student relationships, peer interactions, and feeling connected or belonging to the classroom are related to student performance (Shieh et al., 2022).

Inferential Statistics

Correlation and Regression Analysis

Table 4

Association Between Class Attendance and Academic Performance in Undergraduate Mathematics: A Correlation Analysis

Item	Pearson Correlation	
Course	r	p
Ordinary Differential Equations	.021	.873
Number Theory	.452	< .001
Applied Statistics	.479	< .001
Calculation Methods	.519	< .001

As illustrated in Table 4, there was a moderate positive and significant correlation between class attendance and final grades in three courses: Calculation Methods ($r = .519$, $p < .001$), Applied

Statistics ($r = .479$, $p < .001$), and Number Theory ($r = .452$, $p < .001$). Although simple linear regression models were calculated to test the formal predictive hypothesis, the resulting Coefficients of Determination (R^2) do not offer separate multivariate insights beyond the initial correlation analysis, because each course model relies on a single predictor where R^2 is mathematically identical to the square of the Pearson correlation coefficient (r^2). To maintain reporting conciseness, the regression statistics are presented narratively rather than in tabular form. Specifically, variance percentages show that attendance accounts for 27% of the variance in Calculation Methods, 23% in Applied Statistics, and 20% in Number Theory. Conversely, it shows an absolute lack of explanatory power in the Ordinary Differential Equations course ($R^2 < .001$). Our findings are in line with those of Finlay et al. (2022), who found a moderate positive correlation ($rs = .43$), and Pudaruth et al. (2013), who also reported a moderate association between attendance and academic performance across various courses.

In general, the findings suggest a statistically significant moderate association between attendance and academic performance in three of the four courses. However, attendance accounted for a relatively small proportion of the variance in students' academic performance. This suggests that other variables also contribute to students' academic performance. This finding supports participants' opinions earlier that factors such as self-study and the quality of teaching could play a significant role in students' academic performance. Thus, the hypothesis was partially supported.

Among the four courses, ODE specifically warrants deeper discussion. Despite having the lowest mean attendance (84.5%), students achieved the highest mean exam score (77.9%), suggesting that attendance alone did not determine performance in this course. This pattern suggests that factors other than attendance played a larger role in students' performance, potentially including prior mathematical knowledge or self-directed learning strategies. Several course-specific factors likely explain this result. First, ODE is a theoretically intensive course that builds on strong prior mathematical foundations. Consequently, students may be less dependent on lecture attendance to achieve high grades. Second, differential equations is a subject with abundant online resources and textbooks, which reduces students' reliance on in-class instruction as the primary learning channel. Third, SDU University's grading policy incorporates attendance into final grades for some courses. It is possible that the weight assigned to attendance varied across the four courses examined. If so, this structural difference may have influenced the observed statistical relationships. However, course-level grading policy data were not collected in this study, and this explanation remains speculative. Because the present study did not directly measure self-study behaviour, resource use, or prior achievement either, all three explanations should be interpreted with caution and examined in future research. This finding aligns with Veerasamy et al. (2016), who found a negative correlation between attendance and performance in a technically demanding course, and with He (2024), who demonstrated that formal attendance is insufficient for success in complex subjects where self-directed learning dominates. Therefore, the ODE result represents the most theoretically significant finding of this study, suggesting that the attendance-performance relationship is not uniform across mathematics courses and may be influenced by factors such as course complexity, student autonomy, and the availability of supplementary learning materials.

The two phases were administered sequentially, with Phase 2 deployed one month after Phase 1 upon conclusion of the academic term. The study's two-phase approach proved particularly valuable in understanding the complexity of the attendance-achievement relationship. Phase 1 revealed that while attendance was statistically significant in three courses, it accounted for only a modest proportion of grade variance ($r^2 = 0.20\text{--}0.27$), suggesting that unmeasured factors substantially influenced academic outcomes. This quantitative finding retrospectively validated the strategic decision to deploy Phase 2, which targeted these gaps by collecting student perspectives on variables such as self-study habits, teaching quality, and peer support. The sequential design thus enabled both statistical rigor and exploratory depth, integrating objective behavioral data with subjective understanding to provide a more complete picture of the attendance-achievement relationship.

These results align with previous studies by Schmidt and Raines (2019), who noted that other factors besides attendance that play a role in academic performance, including motivation, stress, and student autonomy.

The strength of these relationships needs to be interpreted in the context of the particular institution and student body.

Conclusion

The current study examined the relationship between class attendance and academic achievement in four mathematics courses. The perception questionnaire data indicated that students tended to agree that attendance is associated with academic achievement. Also, among the mathematics courses selected for this study, both correlation and regression analysis revealed a significant positive association between class attendance and final grades in Calculation Methods, Applied Statistics, and Number Theory, while a very weak and non-significant relationship was found in Ordinary Differential Equations. Therefore, the hypothesis was only partially supported. While the relationship between class attendance and final grades was statistically significant in three courses, the proportion of variance in final grades explained by attendance was relatively low; thus, attendance should not be regarded as a strong independent predictor of students' academic success. Accordingly, the study also showed that classmates' support, quality of classroom teaching, self-study, and teachers' support were perceived by students as relevant factors associated with academic performance.

Based on the current findings, this study suggests that teachers adopt active learning strategies that promote student-student interaction in the classroom, such as collaborative activities, as peer learning fosters deeper conceptual understanding. Also, teachers should provide continuous support both in and outside the classroom to reinforce students' understanding of the concepts they teach. Moreover, students are encouraged to practice effective time management, take responsibility for their own learning by continually revising concepts learned in the classroom, and seek support, when necessary, from both teachers and classmates.

It is important to highlight that the current study is not without limitations. The participants in this study were fourth-year mathematics students in a private institution in southern Kazakhstan. The number of participants in this study was approximately 60, which may not be adequate for quantitative research. Moreover, while participants in Phase 1 were asked to show screenshots, the final grades and attendance were self-reported, which potentially affects the reliability and introduces response bias. Further, in some courses, attendance at SDU University directly influences final course grades, based on mandatory attendance and attendance points (points from attendance count); thus, attendance should not be considered an independent variable. As such, the results should be considered an indication and not a definitive conclusion regarding the relationship between these variables. Also, the results should be considered course-specific and contextualized to one university and sample, and cannot be applied to all mathematics students in Kazakhstan. Additionally, students' academic performance is a multifaceted construct that can be explained by classroom and non-classroom factors. But not all these variables were included in the current study. Multivariate models of academic success tests, including control for self-study, motivation, and teaching quality, should be examined in future studies to better establish the independent effect of attendance on academic success. This would yield a stronger test of the relationship between attendance and achievement and would help disentangle the effect of various factors. Thus, additional research is required to provide a better understanding of academic success among students.

In conclusion, the current study adds valuable information to the current literature on the relationship between class attendance and academic success in university-level mathematics courses. The findings suggest that class attendance is one of several factors associated with academic achievement and should not be considered the primary determinant. Hence, both factors within and beyond the classroom need to be considered in any attempt to resolve issues with students' academic achievement.

Ethical Consideration

Ethical approval was obtained from the Faculty-level Research Ethics Committee at SDU University. This study was conducted by adhering to the ethical standards set by the institution regarding research with human participants.

The participation was voluntary, and electronic informed consent was obtained from all participants before completing the online questionnaire. This was done by requiring participants to tick a box indicating their agreement with the information statement before proceeding to answer the questionnaire.

The current study was conducted anonymously, without collecting any personal information. Although participants provided information about their performance and attendance, such information was not linked to any individual students.

Confidentiality was ensured with all the data obtained.

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САБАҚҚА ҚАТЫСУ МЕН МАТЕМАТИКАДАН ҮЛГЕРІМ АРАСЫНДАҒЫ БАЙЛАНЫС: ҚАЗАҚСТАНДАҒЫ SDU UNIVERSITY НЕГІЗІНДЕГІ САНДЫҚ ЖАҒДАЯТТЫҚ ЗЕРТТЕУ (CASE STUDY)

Андатпа. Ғылыми әдебиеттерде сабаққа қатысу мен академиялық үлгерім арасындағы байланысқа қатысты әртүрлі тұжырымдар бар: кейбір зерттеулер оң корреляцияны растаса, басқалары мұндай тәуелділікті жоққа шығарады. Қазақстандық білім беру контекстінде аталған құбылыстың жеткілікті деңгейде зерттелмеуі осы мәселені тереңірек зерделеудің өзектілігін айқындайды. Осыған байланысты, бұл зерттеу жұмысында математикалық төрт пән мысалында студенттердің сабаққа қатысуы мен үлгерімі арасындағы байланыс қарастырылды. Зерттеуге SDU University-де 4-курс оқитын 60 студент қатысып, деректер екі бөлек анонимді онлайн-сауалнама құралдары арқылы жиналды. Жиналған мәліметтер дескриптивті және инференциалды статистика әдістерімен талданды. Нәтижесінде, студенттердің сабаққа жүйелі қатысуы академиялық үлгеріммен байланысты деген пікірмен жалпы алғанда келісетінін көрсетті ($M = 4.07$, $SD = 0.93$). Сонымен бірге, корреляциялық және регрессиялық талдаулар үш курс бойынша сабаққа қатысу мен академиялық үлгерім арасындағы маңызды оң байланысты анықтады, ал бір курста бұл байланыс өте әлсіз және статистикалық тұрғыдан маңызды емес болып шықты. Дегенмен, барлық курстар бойынша сабаққа қатысу көрсеткіші студенттердің академиялық үлгеріміндегі дисперсияның (ауытқудың) тек аз ғана бөлігін түсіндіреді. Сондай-ақ, зерттеу нәтижелері студенттердің

математикадағы жетістікке жетуінде курстастардың қолдауы, оқыту сапасы, өз бетінше дайындалу және оқытушының қолдауы маңызды рөл атқарады деп санайтынын көрсетті. Осылайша, зерттеу студенттердің академиялық жетістіктері сабаққа қатысудан басқа да көптеген факторлармен байланысты деген қорытындыға келеді.

Түйін сөздер: сабаққа қатысу, математика, академиялық үлгерім, орташа үлгерім балы (GPA), жоғары білім беру

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ВЗАИМОСВЯЗЬ МЕЖДУ ПОСЕЩАЕМОСТЬЮ И УСПЕВАЕМОСТЬЮ ПО МАТЕМАТИКЕ: КОЛИЧЕСТВЕННОЕ ИССЛЕДОВАНИЕ (CASE STUDY) НА ПРИМЕРЕ SDU UNIVERSITY, КАЗАХСТАН

Аннотация. В предыдущих исследованиях были получены противоречивые данные относительно взаимосвязи между посещаемостью занятий и академической успеваемостью: в то время как в одних работах отмечается положительная корреляция, в других подобная связь не подтверждается. Это обуславливает необходимость дальнейшего изучения взаимосвязи между этими переменными. Однако в контексте Казахстана наблюдается дефицит исследований данного феномена. В связи с этим в настоящем количественном исследовании изучалась связь между посещаемостью занятий и успеваемостью по четырём математическим дисциплинам на основе данных двух отдельных анонимных онлайн-опросов 60 студентов четвертого курса SDU University, расположенного на юге Казахстана. Данные анализировались с использованием методов дескриптивной и инференциальной статистики. Результаты исследования показали, что в целом студенты согласны с тем, что регулярное посещение занятий может быть связано с академическими достижениями ($M = 4.07$, $SD = 0.93$). Кроме того, корреляционный и регрессионный анализы выявили значимую положительную связь между посещаемостью и успеваемостью по трем дисциплинам, тогда как по одному курсу была зафиксирована крайне слабая и статистически незначимая взаимосвязь. Тем не менее, посещаемость объясняет лишь относительно небольшую долю дисперсии академической успеваемости студентов по всем дисциплинам. Результаты также свидетельствуют о том, что, по мнению студентов, важными факторами успеха в математике являются поддержка сокурсников, качество преподавания, самостоятельная работа и помощь преподавателя. Таким образом, в данном исследовании делается вывод о том, что академические достижения студентов связаны с множеством факторов помимо посещаемости занятий.

Ключевые слова: посещаемость занятий, математика, академическая успеваемость, средний балл (GPA), высшее образование

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