

Dydaktyka / Didactics

Online or in-person learning? The impact of course mode on the outcomes of studying accounting at the academic level

Nauczanie zdalne czy tradycyjne? Wpływ formy zajęć na wyniki nauczania rachunkowości na poziomie uniwersyteckim

BARTŁOMIEJ LISICKI*

Received: 16.04.2024 – Revised: 14.05.2024 – Accepted: 15.05.2024

Abstract

Purpose: The main goal of this paper is to verify how the way classes are conducted impacts the grades of students in accounting subjects at the university level.


Methodology/approach: The study was conducted over six academic years, divided into three two-year research sub-periods (PRE-COVID, COVID-19, and POST-COVID). In these periods, traditional (in-person) and distance (online) forms of studying were observed. Differences in the grades of students in the individual sub-periods were calculated using the Kruskal-Wallis test and a post hoc test (Dunn's test with Sidak's correction).

Findings: Based on 851 student grades, significant statistical differences were noted. Moreover, after performing the post hoc test, these differences were significant in relation to the sub-periods (PRE-COVID & COVID-19 and COVID-19 & POST-COVID), which were characterized by different forms of education.

Research limitations/implications: This research allows us to indicate the impact of the way classes in accounting were conducted. The research results may constitute the basis for making decisions regarding the development of accounting programs and forms of studying at universities. A limitation of the study is the lack of comparison of grades obtained by students of other economic faculties in the country.

Originality/value: The research on the impact of the form of studying on grades in accounting subjects in Polish higher education significantly contributes to filling the research gap regarding the studying of economic subjects, particularly accounting.

Keywords: in-person studying; online studying; accounting; education; COVID-19.

* Bartłomiej Lisicki, PhD, University of Economics in Katowice, Department of Accounting,  <https://orcid.org/0000-0002-8455-4312>, bartlomiej.lisicki@ue.katowice.pl

Streszczenie

Cel: Głównym celem artykułu jest weryfikacja wpływu formy prowadzenia zajęć na kształtowanie wyników nauczania (ocen) studentów z przedmiotów z obszaru rachunkowości prowadzonych na poziomie uczelni wyższej.

Metodyka/podejście badawcze: Badanie przeprowadzono na przestrzeni sześciu lat akademickich, które to podzielono na trzy dwuletnie podokresy badawcze (PRE-COVID, COVID-19, POST-COVID), w których prowadzono odpowiednio tradycyjną i zdalną formę nauczania. Zróżnicowanie ocen w poszczególnych podokresach badania wykazano przy użyciu testu Kruskala-Wallisa oraz testu post hoc (test Dunna z korektą Sidaka).

Wyniki: Opierając się na 851 ocenach studentów z wymienionych przedmiotów zauważono istotne statystyczne zróżnicowanie ocen uzyskanych z przedmiotu rachunkowości w przyjętych podokresach badania. Ponadto po wykonaniu testu post hoc różnice te były istotne w odniesieniu do podokresów (PRE-COVID i COVID-19 oraz COVID-19 i POST-COVID) charakteryzujących się odmiennymi formami kształcenia.

Ograniczenia/implikacje badawcze: Opracowanie pozwala na wskazanie wpływu jednego z prezentowanych w literaturze przedmiotu czynników oddziaływania na wyniki kształcenia (oceny), jakim jest forma prowadzenia zajęć z zakresu przedmiotów ekonomicznych (rachunkowości). Uzyskane i rozwijane w przyszłości rezultaty badawcze mogą stanowić podstawę do podejmowania decyzji w zakresie kształtowania programów i form nauczania rachunkowości na uczelniach wyższych. Pewnym ograniczeniem jest brak porównania ocen uzyskiwanych przez studentów innych uczelni ekonomicznych w kraju.

Originalność/wartość: Przeprowadzone badania nad wpływem formy nauczania na uzyskiwane przez studentów oceny z przedmiotów z obszaru rachunkowości w warunkach polskiego szkolnictwa wyższego z uwzględnieniem okolo pandemicznej rzeczywistości istotnie przyczyniają się do wypełnienia luki badawczej dotyczącej nauczania przedmiotów ekonomicznych, a w szczególności rachunkowości.

Słowa kluczowe: nauczanie stacjonarne, nauczanie zdalne, rachunkowość, edukacja, COVID-19.

Introduction

Education has played a pivotal role in human life for thousands of years. Its main task was (and still is) to prepare an individual for life in a changing world. Thanks to education, a person can discover their talents, develop interests, and shape their personality (Kupisiewicz, 1999, pp. 36–38). The institutions that allow for the above are schools and universities.

Education also plays a crucial role in the multi-level development of young people. The education received at school, followed by university studies, helps in preparing graduates for their future careers. To succeed in their chosen profession, graduates need to acquire new skills and qualifications relevant to their field of expertise. These specialized skills are essential for their chosen profession and specialization (Żeber-Dzikowska et al., 2014, pp. 88–89). Therefore, assessing the effectiveness of educational processes at the school and university levels is necessary, with recent studies by Mappadang et al. (2022) and Zalewska and Trzcińska (2022) emphasizing the importance of this assessment.

As part of this verification, academic exploration examines curricula, studying methods and conditions, student backgrounds, demographic data, and measures of learning and outcomes (Jordan, Samuels, 2020). The impact of these factors on students' learning outcomes has been the subject of research by many authors for years (i.a., Zalewska, Trzcińska, 2022; Callaghan, Papageorgiou, 2015; Du, 2011). Among this research, one can also find studies that focus on the effectiveness of studying courses related to accounting (Chiu et al., 2014; Ngwenya, Maistry, 2012).

Factors that have gained importance in recent years are how the COVID-19 pandemic and the online studying methods and techniques that were used then impacted learning results (Mishra, Agrawal, 2022). This paper follows the trend of these studies by focusing on the relationship between the measures of learning outcomes (grades) and the studying methods adopted. The unique value of this study lies in the analysis of three consecutive comparative periods, namely, the period before the COVID-19 pandemic (PRE-COVID), during (COVID-19), and after it ended (POST-COVID), in which traditional (in-person) learning, online learning, and a return to traditional education took place.

This research's main aim is to examine how the mode of conducting classes impacts the outcomes of studying accounting at the university level. Given the above, the main research hypothesis was posed: The mode of conducting classes (in-person/online) affects the students' learning outcomes (grades) in accounting subjects. Therefore, students obtain, on average, higher grades in accounting-related subjects during online learning than during in-person learning.

The paper was motivated by the fact that research in this area is important to examine the impact of the selected factors on how the grades of economics subjects students (particularly accounting) are affected. This will give universities a basis upon which to improve their curricula and studying modes and provide an opportunity to make the quality of studying in the field of economics better. This is important for Polish universities, for which similar research is still rare.

The research is based on the end outcomes of students in three accounting-related courses:

- Accounting,
- Financial Accounting,
- Tax Accounting.

The research sample included grades achieved from the summer semester of the 2017/2018 academic year to the winter semester of 2023/2024 inclusive (six whole academic years). The research period was divided into the three sub-periods indicated above in which the two different studying styles were conducted in-person. The statistical significance was assessed employing the Kruskal-Wallis (1952) nonparametric test, allowing us to verify the hypothesis about the mean quality of the examined variable in several populations. A post hoc test was conducted using Dunn's (1964) test with Sidak's (1967) correction to clarify the Kruskal-Wallis test results.

The structure of the paper is composed of four main points. First, the results of the literature review are discussed. Second, the research methodology is presented, along with a detailed description of the research sample, to provide an in-depth

understanding of the study's approach. Third, the results of the statistical research are presented, followed by a discussion that analyzes the outcomes of the study. Finally, the research conclusions are presented, along with the contributions that the study makes to the field.

1. Literature review

When assessing the quality of education, the effectiveness of educational methods is one of the main elements. In the Polish educational system, effective education means that graduates possess a broad and relevant range of specialist knowledge within their field. However, accurately verifying the knowledge remains a challenge as there are no universally accepted, global indicators to determine which students are best prepared for their chosen profession (De Vries, 2022, p. 2).

Throughout university education, course grades awarded to students are a helpful tool. The assessment scale commonly used includes grades from unsatisfactory (2.0) to very good (5.0). This system is very easy to measure and provides a relatively balanced benchmark and performance comparison between students. However, a disadvantage is the lack of differentiation in evaluating knowledge levels, making it difficult to precisely compare learning outcomes. Nonetheless, it remains the most frequently used student assessment system at universities in Poland.

Learning outcomes, which may be equivalent to the grades received, are determined by many factors. They include personal factors related to the individual characteristics of the students and teachers, as well as environmental factors (Lisicki, Szewieczek, 2023, p. 6). Analyzing the literature in this area reveals the main factors that shape learning outcomes:

- **Instructional factors:** These encompass student attitudes toward learning, motivation and engagement, and the quality of teaching, including the techniques used by the teacher (Mappadang et al., 2022; Økland, 2012; Bouslama et al., 2003).
- **Contextual factors:** This category includes the student-teacher relationship, the quality of learning materials (textbooks and notes), and the nature and role of assessments (Parsons, Mayer, 1990).
- **Student characteristics:** These factors include gender, background, and age (Callaghan, Papageorgiou, 2015; Haynes, 2017; Mohrweis, 2010).
- **Prior academic achievements:** Previous performance in similar courses can also influence current learning outcomes (Chiu et al., 2014; Al.-Rashed, 2001).
- **Delivery format:** The mode of education delivery, including traditional (in-person), remote (online), and blended (Asgari et al., 2021; Bonnini, Cavallo, 2021; Du, 2011; Eom et al., 2006).

Previous research has shown that the delivery format is a well-established factor that influences learning outcomes. Studies have shown that grades are equally important, no matter whether the classes were conducted in-person (on-campus) or online (remotely).

This paper aims to determine whether the teaching mode affected the grades of accounting students. Accounting is a unique field of study with a strong empirical character, also in terms of learning outcomes. It requires students to acquire unique skills, develop analytical thinking, work and a team and under time pressures, and above all, gain specialized, advanced knowledge (Rydzewska-Włodarczyk, 2014; Gos, Hońko, 2011). This uniqueness indicates how studying, learning, and assessment happen, especially since the practical nature of accounting involves special studying techniques.

Prior studies have yielded mixed findings. Chiu et al. (2014) found that the format in which courses are delivered (in-person vs. online, in the form of pre-recorded online lectures) did not significantly affect accounting students' final outcomes. They suggest that the student's average grade from previous semesters was a factor that determined the final grade. Similar conclusions were reached by Fortin et al. (2019), who examined the outcomes of students in four advanced accounting subjects. They found that the choice of studying mode (i.e., online, blended or in-person) did not affect student achievements.

However, Chen et al. (2012) reached different conclusions. They found that the effectiveness of online learning compared to in-person learning depends on the level of the course. In more advanced study programs, the outcomes were better than in courses that covered the basic principles.

The COVID-19 pandemic and the resulting restrictions around the world necessitated a rapid shift to online learning at universities. Many accounting programs had to significantly revise their curricula and transition from in-person studying to online delivery (Strielkowski, 2020, p. 2). This paper examines the impact of this shift on educational effectiveness, as measured by student grades.

It joins the growing body of literature on this issue. For example, Alanzi and Alfraih (2023) investigated the relationship between the outcomes of accounting students during both online and in-person learning in Kuwait. They compared the average grades from the semester before and during the pandemic. Their findings suggest that accounting students achieved better outcomes during the online learning period.

Aldahray's (2022) study in Saudi Arabia yielded slightly different results. This study examined student performance in introductory and advanced accounting courses delivered online. In general, student outcomes improved in both qualitative and less quantitative courses, while in the case of more quantitative subjects, the outcomes were worse.

Nasu and Silva (2022) analyzed the outcomes achieved by accounting students in Brazil based on the results of the mandatory ENADE (National Student Performance Examination) test for undergraduate students. They noted that gender and mode of instruction (in-person /online), as well as age and region of education, were important in explaining the likelihood of students receiving a score of zero on the exam. Students who attended classes in person paid more attention to questions regarding accounting issues compared to online students, who more often obtained a zero result in this part of the exam.

Syukur (2021) how the teaching of accounting in Thailand changed during the COVID-19 pandemic. The study investigated the undergraduate course “Introduction to Accounting” taken by students of Management, i.e., students not directly involved in accounting. The research found that student outcomes differed significantly depending on gender and field of study. However, the mode of teaching had no significant impact on the differences in grades.

In the existing research, it is difficult to clearly state whether the form of teaching (in-person/online) is important for shaping students’ grades in accounting-related subjects. Most researchers indicate that factors such as gender or field of study have a stronger impact than the teaching mode (Nasu, Silva, 2022; Syukur, 2021; Du, 2011). Nonetheless, other research (Alanzi, Alfraih, 2023; Chiu et al., 2014) shows that teaching mode is important. Therefore, further exploration of this topic is warranted to clarify the issue.

The presented research provides the basis for analyzing a sample of students studying accounting at Polish universities. This study is particularly important because it is difficult to find current research in the Polish literature that examines the impact of the teaching mode on the grades of students in accounting-related courses, especially in the periods preceding, during and immediately after the COVID-19 pandemic. The justification for this research lies in the desire to explore factors that significantly determine the effectiveness of studying (i.e., as measured by student grades) in the area of accounting. Ultimately, the goal is to inform the development of accounting curricula in a way that best prepares graduates for the demands of the accounting profession.

2. Research methodology

To determine the effectiveness of accounting education in Poland, it was necessary to define a variable that would make it possible to assess the diversity of educational outcomes achieved depending on the teaching mode. The final grades of students from the first semester, including their outcomes from the final test (classes) and the exam (lecture), were chosen as the indicator of the effectiveness of the education mode. The students’ grades were adopted as the dependent variable; the typical grading scale for studies in Poland will be used in this investigation (European Commission, 2023). The following numerical equivalents of the grades were used:

- 2.0 – unsatisfactory,
- 3.0 – satisfactory,
- 3.5 – satisfactory plus,
- 4.0 – good,
- 4.5 – good plus,
- 5.0 – very good.

The final grades from three courses taught at one of the oldest public economic universities in Poland were used to verify the impact of the teaching mode on students’ learning outcomes (grades) obtained in accounting-related courses. Each

course is taught in the Finance and Accounting for Business degree program, which is the flagship accounting degree at this university. The courses include:

- Accounting,
- Financial Accounting,
- Tax Accounting.

These courses were taught in the second (Accounting) and third semester of the undergraduate degree (Financial Accounting) and the fourth semester of the post-graduate degree (Tax Accounting), respectively. The first two are majors, while the last one is a specialization course taught in the Accounting and Taxes major of the Finance and Accounting in Business degree courses. The research sample consisted of the assessments of both full-time and part-time students. Unfortunately, the numbers of full-time and part-time students in each sub-period of the study differed quite significantly; therefore, this study did not separately verify the impact of the teaching mode on the grades obtained individually by full-time and part-time students.

The study period began in the academic year of 2017/2018 (in the summer semester) and ended in 2023/2024 (in the winter semester). It covers the whole six academic years. The entire research period was divided into three sub-periods: before, during and after the COVID-19 pandemic. The period before the pandemic (PRE-COVID) expresses the time of the in-person studying mode, devoid of the considerable impact of digital education tools. The COVID-19 period reflects the time when studying and examining students took place online (e-learning). The last period – POST-COVID – concerns the learning outcomes achieved after the return to in-person studying.

For each of the three courses studied, two academic years were distinguished, which were assigned to the three distinguished sub-periods of the study. Since one of the courses (Financial Accounting) was conducted in the winter semester while the other two were taught in the summer semester, it is necessary to indicate which academic years fell into particular sub-periods for individual courses:

- Accounting (PRE-COVID: 2017/2018–2018/2019, COVID-19: 2019/2020–2020/2021, POST-COVID 2021/2022–2022/2023);
- Financial Accounting (PRE-COVID: 2018/2019–2019/2020, COVID-19: 2020/2021–2021/2022, POST-COVID 2022/2023–2023/2024);
- Tax Accounting (PRE-COVID: 2017/2018–2018/2019, COVID-19: 2019/2020–2020/2021, POST-COVID 2021/2022–2022/2023).

The research sample ultimately consisted of the grades of 851 students (308 in Accounting, 207 in Financial Accounting, and 336 in Tax Accounting) achieved from the summer semester of the 2017/2018 academic year to the winter semester of the 2023/2024 academic year. Crucially, in each of the years, the students were required to complete uniform exam sets that were graded by the same lecturer. Therefore, it is possible to avoid any bias regarding the impact of exam difficulty (a semester test) on the final grade in the course, which could interfere with research on the impact of the teaching mode on the students' final grades (Lisicki, Szewieczek, 2023, p. 5). Detailed numbers of assessments in individual sub-periods of the study in which stationary or online learning was conducted are presented in the empirical part of the study.

The significance of variance in the grades of three selected courses students in individual sub-periods was calculated based on the Kruskal-Wallis test. This test is used to verify the hypothesis about the insignificance of differences between the medians of the studied variable in more than two populations (i.e., PRE-COVID, COVID-19, and POST-COVID for each selected course of study). It is the most popular alternative to the parametric, one-way analysis of variance ANOVA (Fisher, Mackenzie, 1923), which requires several assumptions, such as the distribution of variables close to normal, the quality of groups, and the homogeneity of variances. If significant differences are found in any of the analyzed courses across the three sub-periods, it will also be necessary to perform a post hoc test. This paper employed Dunn's (1964) test with Sidak's (1967) correction. The results are presented in the next section.

3. The impact of the studying mode on the learning outcomes in accounting subjects

To facilitate statistical analysis and verify the hypothesis, Table 1 presents the distribution of student grades in the three courses for the three research sub-periods. The table includes the frequency of each grade, the average and median grades, and the sample size for each course.

Table 1. Distribution of student grades in the three accounting courses in each sub-period

Statistics/sub-period	Accounting		
	PRE-COVID	COVID-19	POST-COVID
Research sample size (N)	100	90	118
Mean value	3.50	3.84	3.42
Median	3.5	4	3.5
Grade frequency (n)			
2.0	24	9	33
3.0	15	10	23
3.5	15	16	15
4.0	16	22	9
4.5	19	22	20
5.0	11	11	18
Statistics/sub-period	Financial Accounting		
	PRE-COVID	COVID-19	POST-COVID
Research sample size (N)	48	66	93
Mean value	3.16	3.17	3.20

Statistics/sub-period	Financial Accounting		
	PRE-COVID	COVID-19	POST-COVID
Median	3	3.25	3
Grade frequency (n)			
2.0	15	21	25
3.0	12	12	24
3.5	7	15	15
4.0	7	9	18
4.5	4	5	8
5.0	3	4	3
Statistics/sub-period	Tax Accounting		
	PRE-COVID	COVID-19	POST-COVID
Research sample size (N)	146	90	100
Mean value	3.24	3.33	3.25
Median	3	3	3
Grade frequency (n)			
2.0	46	19	35
3.0	28	28	17
3.5	19	15	11
4.0	21	7	13
4.5	26	15	13
5.0	6	6	11

Source: author's own elaboration.

When analyzing the distribution of grades in each sub-period, a much higher mean value in the COVID-19 sub-periods is immediately evident for Accounting. The mean value equals 3.84, while in the period just before the pandemic (PRE-COVID), it was 3.50, and directly following it (POST-COVID), it recorded its lowest value of 3.42. As a result, the online teaching mode for the Accounting course was characterized by a higher average final grade. The same is true for the median, which is 0.5 grades higher in the COVID-19 sub-period. Moreover, the distribution of grades in individual sub-periods is noticeably different. During in-person (on-campus) studying, approximately one-fourth of students achieved the lowest grades (2.0). However, during online learning, only one in ten failed the course on the first try. This relationship was only apparent in the Accounting course, which served as an introduction to accounting and was the first interaction students had with the course.

For the other courses taught in subsequent semesters, the average grade for Tax Accounting was only slightly higher for online learning during the COVID-19 sub-period. And in the case of Financial Accounting, it was even similar to the sub-periods in which in-person studying was conducted. There are also very similar medians in the sub-periods for these two courses. Moreover, in these two more

“advanced” accounting courses, the percentage of students who received the two lowest grades (2.0 and 3.0) is very similar, amounting to approximately 52% for Tax Accounting and 53% for Financial Accounting. The situation is similar for the two highest grades (4.5 and 5.0), which were received by approximately 23% of Tax Accounting students and 13–14% of Financial Accounting students in the examined sub-periods.

Examining the mean values and grade distributions in the three courses does not provide a clear answer regarding the impact of study mode on student grades. Therefore, statistical inference is necessary to verify the significance of differences between grades from each sub-period in each of the analyzed courses.

A one-way variance analysis by ranks (Kruskal, Wallis, 1952) was used to assess the significance of differences between the students’ average grades in the selected sub-periods. It allowed us to indicate whether the differences in values (grades) were statistically significant. Test statistics calculated using the Kruskal-Wallis test are presented in Table 2.

The application of the Kruskal-Wallis test is justified by the non-normal distribution of variables. This normality was verified based on the Lilliefors (1969) test, and its results are also presented in Table 2. The Lilliefors test confirms that the distribution of each variable in the analyzed sub-periods deviates significantly from a normal distribution.

The Kruskal-Wallis test was conducted to determine whether the medians of the students’ grades were significantly different in the three previously distinguished research sub-periods. This is observable only for Accounting ($p < 0.05$). The test statistic H calculated based on 308 grades (assigned to the appropriate sub-period) equals 7.5523, which is not in the 95% confidence level (0; 5.9915). This suggests that at least one median grade in the Accounting course is significantly different from the others. Therefore, it can be assumed that the varied teaching mode (in-person – online – in-person) is reflected in the students’ grades students (Alanzi, Afraih, 2023; Du, 2011).

Unfortunately, the statistical significance of differences in the median student grades was recorded only for the Accounting course. For both Financial Accounting and Tax Accounting, there were no significant differences in the distribution of grades in the three sub-periods. Therefore, further research should focus on the course that showed statistically significant differences in the three sub-periods examined, i.e., Accounting.

The significant result of the test statistic H does not conclude the analysis of the variance in the student’s grades in the Accounting course. While it indicates that at least one median grade (in selected sub-periods) is statistically significantly different from the others, it does not specify which groups differ. To determine if the studying mode impacts learning outcomes, a post hoc test is necessary. This test is required when a statistically significant H test value is obtained as part of a one-way analysis of variance employing the Kruskal-Wallis test. Based on the result of a one-way variance analysis alone, it is not possible to determine which groups exactly differ statistically significantly. Therefore, multiple comparisons between the studied groups must be conducted, which may be done by employing post-hoc tests (Waked, Salameh, 2015, p. 149).

Table 2. Descriptive statistics and statistics of the Kruskal-Wallis test for students' grades in the analyzed accounting courses course in each sub-period

SUMMARY ACCOUNTING						
Sub-periods	Sample size (n)	Median	Average	Std. deviation	Skewness	Kurtosis
PRE-COVID	100	3.5	3.50	1.03	-0.23	-1.22
COVID-19	90	4	3.84	0.85	-0.72	-0.09
POST-COVID	118	3.5	3.42	1.10	0.01	-1.40
Kruskal-Wallis test	p-value normality test	Rank sum (R)	R ² /n	H	p-value	
PRE-COVID	0.00000018	14896	2218908.16	7.5523	0.02291*	
COVID-19	0.00003732	15798	2773075.60			
POST-COVID	0.00000614	16892	2418132.75			
SUMMARY FINANCIAL ACCOUNTING						
Sub-periods	Sample size (n)	Median	Average	Std. deviation	Skewness	Kurtosis
PRE-COVID	48	3	3.16	0.96	0.24	-1.00
COVID-19	66	3.25	3.17	0.95	0.16	-1.02
POST-COVID	93	3	3.20	0.89	0.02	-1.01
Kruskal-Wallis test	p-value normality test	Rank sum (R)	R ² /n	H	p-value	
PRE-COVID	0.0001247	4895	49918.03	0.1243	0.9397	
COVID-19	0.0003849	6823.5	705456.85			
POST-COVID	0.0003519	9809.5	1034691.29			
SUMMARY TAX ACCOUNTING						
Sub-periods	Sample size (n)	Median	Average	Std. deviation	Skewness	Kurtosis
PRE-COVID	146	3	3.24	1.00	0.03	-1.36
COVID-19	90	3	3.33	0.93	0.11	-0.95
POST-COVID	100	3	3.25	1.10	0.17	-1.39
Kruskal-Wallis test	p-value normality test	Rank sum (R)	R ² /n	H	p-value	
PRE-COVID	0.000000019	24301	4044784.94	0.4063	0.8162	
COVID-19	0.000007485	15656	2723448.18			
POST-COVID	0.000001349	16659	2775222.81			

* p < 0.05

Source: author's own elaboration.

This problem was observed for the students' grades from the Accounting course. It was noted that in the three sub-periods, there was significant statistical variation in students' grades. To pinpoint which sub-periods have statistically significant average grades, we employed a post hoc test. For this purpose, Dunn's (1964) test was applied to grades in the Accounting course. This test is used for simple comparisons of both equal and different groups. It includes a correction for tied ranks and should be adjusted for multiple testing. For this, Sidak's (1967) correction was employed, which helps maintain a stricter significance level. With this correction, Dunn's test considers differences to be statistically significant if $\alpha < 0.01695$. The test statistics calculated using Dunn's test with the Sidak correction for pairs of sub-periods are presented in Table 3.

Table 3. Test statistics of Dunn's test for students' grades in the Accounting course in the chosen pairs of research sub-periods

Pair of sub-periods	Mean rank difference	Z	Mean rank standard error	p-value
PRE-COVID – COVID-19	-30.57	2.0855	12.74	0.0133*
COVID-19 – POST-COVID	5.81	0.4872	11.92	0.6261
COVID-19 – POST-COVID	32.38	2.6384	12.27	0.0083**

* $p < 0.05$, ** $p < 0.01$

Source: author's own elaboration.

Using Dunn's test with Sidak's correction, we identified which pairs of more than two groups of variables show statistically significant differences. This test allowed us to indicate between which sub-periods there were significant differences in students' grades in the Accounting course. The data in Table 3 show that the significant mean rank difference in the Dunn test is significant in two out of the three pairs of sub-periods. Both of these pairs were carried out in mixed modes (in-person/online). Moreover, the signs of the average rank differences in these pairs indicate that students achieved higher grades when learning online than when attending classes in-person. Moreover, comparing students' grades between the three sub-periods, when Accounting was taught only in the in-person mode, no significant differences between these sub-periods occurred.

The results provide only partial support for our initial hypothesis. The studying mode does influence students' grades in accounting courses, with students receiving higher grades, on average, when studying in-person. However, this impact is observed only in the introductory course. In the more advanced courses (conducted in subsequent semesters of education), the distribution of grades was statistically insignificant in the sub-periods examined. Therefore, the research hypothesis cannot be fully supported.

Conclusions

Effective teaching is crucial for future professionals, and teaching styles and methods evolve to meet changing market expectations. This prompts continuous research on curricula, methods, and studying conditions (Jordan, Samuels, 2020). These studies also explore the effectiveness of accounting courses (Chiu et al., 2014; Ngwenya, Maistry, 2012).

Recent research increasingly investigates the impact of studying methods and modes on students' learning outcomes (Papageorgiou, 2015; Du, 2011). The COVID-19 pandemic has only further highlighted this area's relevance (Zalewska, Trzcińska, 2022; Mishra, Agrawal, 2022). This paper examined how the mode of instruction affected learning outcomes (grades) in accounting courses at a Polish university.

The research aimed to understand how the teaching mode impacts the outcomes of studying accounting at the university level. Based on a total of 851 student grades (308 in Accounting, 207 in Financial Accounting, and 336 in Tax Accounting) employing the Kruskal-Wallis (1952) test and Dunn's (1964) post hoc test, statistically significant differences in grades were found in students' grades in the Accounting course during the three research sub-periods. Students obtained statistically higher grades when it was taught online.

However, a similar relationship was not observed for the other two courses (Financial Accounting and Tax Accounting), where differences in grades were not statistically significant. Students' grades in these other courses indicate that the mode of studying has no impact on the final grades (Alanzi, Afraih, 2023; Nasu, Silva, 2022; Fortin et al., 2019; Du, 2011). This was confirmed by Fortin et al. (2019), who examined students' grades in four advanced accounting courses and found no relationship between them and the studying mode (in-person/online).

This difference might be because Accounting is most students' first exposure to the subject, requiring increased attention. This is much more difficult when classes are conducted in person. However, in subsequent accounting subjects, students already have the fundamental knowledge that allows them to understand the material regardless of the class format (Fortin et al., 2019; Ngwenya, Maistry, 2012). The results partially support our main hypothesis, aligning with previous research (Alanzi, Afraih, 2023; Nasu, Silva, 2022). However, further verification is needed, for example, by examining grades in other accounting courses.

These findings have implications for academia, as they significantly expand the findings of previous studies on the effects of studying courses in economics. The study of a Polish public university offers a valuable perspective that complements the limited research in this area. The results also have practical implications, especially in the area of economic education, which translates into the operation of business practice. Universities use these findings to make decisions on the development of accounting studying modes. They also provide an opportunity to improve the quality of education in accounting and finance by adjusting curricula, enhancing professional competencies and skills of students as future professionals,

and refining teaching methods in Polish universities and universities around the world.

One limitation of the study is that it only focuses on the grades achieved by students from a single economic university in Poland (due to the inability to obtain similar data from other economic universities in Poland). Therefore, the results cannot be generalized but should be treated as a cognitive case study. Future research replicating this study in other accounting programs would further solidify these findings.

References

- Alanzi K., Alfraih M. (2023), *Does students' commuting influence their academic performance?* "Journal of Applied Research in Higher Education", 15 (5), pp. 1706–1716; <https://doi.org/10.1108/jarhe-07-2022-0211>.
- Aldahray A. (2022), *Do accounting students always perform better online? The COVID-19 experience*, "Accounting Education", pp. 1–19; <https://doi.org/10.1080/09639284.2022.2147799>.
- Al-Rashed W. (2001), *Determinates of Accounting Students' Performance in Kuwait University*, "Journal of King Abdulaziz University-Economics and Administration", 15 (2), pp. 3–17; <https://doi.org/10.4197/eco.15-2.1>.
- Asgari S., Trajkovic J., Rahmani M., Zhang W., Lo R., Sciortino A. (2021), *An observational study of engineering online education during the COVID-19 pandemic*, "Plos One", 16 (4), pp. 1–17; <https://doi.org/10.1371/journal.pone.0250041>.
- Bonnini S., Cavallo G. (2021), *A study on the satisfaction with distance learning of university students with disabilities: Bivariate regression analysis using a multiple permutation test*. *Statistica Applicata*, "Italian Journal of Applied Statistics", 33 (2), pp. 143–162; <https://doi.org/10.26398/IJAS.0033-008>.
- Bouslama F., Lansari A., Mahmoud Al-Rawi A., Abonamah A. (2003), *A Novel Outcome-Based Educational Model and its Effect on Student Learning, Curriculum Development, and Assessment*, "Journal of Information Technology Education: Research", 2, pp. 203–214; <https://doi.org/10.28945/323>.
- Callaghan C.W., Papageorgiou E. (2015), *Gender differences in locus of control and student performance in the South African context of accounting studies*, "Meditari Accountancy Research", 23 (3), p. 348–368; <https://doi.org/10.1108/medar-02-2014-0018>.
- Chen C., Jones K., Moreland, K. (2012), *Online Accounting Education versus In-Class Delivery: Does Course Level Matter?*, "Issues in Accounting Education", 28 (1), pp. 1–16. <https://doi.org/10.2308/iace-50303>.
- Chiu V., Gershberg T., Sannella A. J., Vasarhelyi, M.A. (2014), *Does a live instructor matter?* "Journal of Emerging Technologies in Accounting", 11 (1), pp. 1–25; <https://doi.org/10.2308/jeta-51058>.
- Jordan E., Samuels J. A. (2020), *Research Initiatives in Accounting Education: Improving Learning Effectiveness*, "Issues in Accounting Education", 35 (4), pp. 9–24; <https://doi.org/10.2308/issues-2020-019>.
- De Vries J., Dimostheneous A., Schildkamp K., Visscher A. (2022), *The Impact on Student Achievement of an Assessment for Learning Teacher Professional Development Program*, "Studies in Educational Evaluation", 74, 101184; <https://doi.org/10.1016/j.stueduc.2022.101184>.

- Du C. (2011), *A Comparison Of Traditional And Blended Learning In Introductory Principles Of Accounting Course*, "American Journal of Business Education", 4 (9), pp. 1–10; <https://doi.org/10.19030/ajbe.v4i9.5614>.
- Dunn O. (1964), *Multiple comparisons using rank sums*, "Technometrics", 6, pp. 241–252; <https://doi.org/10.2307/1266041>.
- Eom S., Wen H., Ashill N. (2006), *The Determinants of Students' Perceived Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation*, "Decision Sciences Journal of Innovative Education", 4 (2), pp. 215–235; <https://doi.org/10.1111/j.1540-4609.2006.00114.x>.
- Fisher R., Mackenzie W. (1923), *Studies in crop variation. II. The manurial response of different potato varieties*, "The Journal of Agricultural Science", 13 (3), pp. 311–320; <https://doi.org/10.1017/S0021859600003592>.
- Fortin A., Viger Ch., Deslandes M., Callimaci A., Desforges P. (2019), *Accounting students' choice of blended learning format and its impact on performance and satisfaction*, "Accounting Education", 28 (4), p. 353–383; <https://doi.org/10.1080/09639284.2019.1586553>.
- Gos W., Hońko S. (2011), *Propozycja modyfikacji programu kształcenia księgowych w wyższych uczelniach w świetle Krajowych Ram Kwalifikacji*, "Zeszyty Teoretyczne Rachunkowości", 62 (118), pp. 127–150; <https://skwp.pl/files/zg/ZTR/ZTR62.pdf>
- Haynes K. (2017), *Accounting as gendering and gendered: A review of 25 years of critical accounting research on gender*, "Critical Perspectives on Accounting", 43, pp. 110–124; <https://doi.org/10.1016/j.cpa.2016.06.004>.
- Kruskal W., Wallis W. (1952), *Use of ranks in one-criterion variance analysis*, "Journal of the American Statistical Association", 47, pp. 583–621; <https://doi.org/10.1080/01621459.1952.10483441>.
- Kupisiewicz C. (1999), *O reformach szkolnych. Wybór rozpraw i artykułów z lat 1977–1999*, Wydawnictwo Akademickie Żak, Warszawa.
- Lilliefors H.W. (1969), *On the Kolmogorov-Smimov test for the exponential distribution with mean unknown*, "Journal of the American Statistical Association", 64, pp. 387–389.
- Lisicki B., Szewieczek A. (2023), *Teaching mode in the PRE-COVID, COVID-19, and POST-COVID periods and students' learning outcomes on the example of Accounting study program*, "International Journal of Public Administration, Management and Economic Development", 8 (2), pp. 1–16; <https://doi.org/10.60026/ijpamed.v8i2.113>.
- Mappadang A., Khusaini K., Sinaga M., Elizabeth E. (2022), *Academic interest determines the academic performance of undergraduate accounting students: Multinomial logit evidence*, "Cogent Business & Management", 9 (1), 2101326; <https://doi.org/10.1080/23311975.2022.2101326>.
- Mishra A., Agrawal A. (2022), *Investigating report cards to predict the academic performance of new MBA students*, "Prabandhan: Indian Journal of Management", 15 (3), 8; <https://doi.org/10.17010/pijom/2022/v15i3/168846>.
- Mohrweis L. (2010), *The Omitted Variable In Accounting Education Research: The Non-Traditional Student*, "American Journal of Business Education", 3 (11), pp. 1–6; <https://doi.org/10.19030/ajbe.v3i11.56>.
- Nasu V.H., Da Silva B.G. (2022), *Nota Zero, e Agora?* "Revista De Educação E Pesquisa Em Contabilidade", 16 (4), p. 405–427; <https://doi.org/10.17524/repec.v16i4.3060>.
- Ngwenya J., Maistry S.M. (2012), *Teaching and Assessment in Accounting: An exploration of teachers' experiences in a rural KwaZulu-Natal school*, "Journal of Social Sciences", 33 (1), pp. 21–30; <https://doi.org/10.1080/09718923.2012.11893083>.

- Økland G. (2012), *Determinants of Learning Outcome for Students at High School in Norway: A Constructivist approach*, "Scandinavian Journal of Educational Research", 56 (2), p. 119–138; <https://doi.org/10.1080/00313831.2011.568622>.
- Parsons P., Meyer J. (1990), *The academically 'at risk' student: a pilot intervention programme and its observed effects on learning outcome*, "Higher Education", 20 (3), pp. 323–334; <https://doi.org/10.1007/bf00136233>.
- Rydzewska-Włodarczyk M. (2014), *Kompetencje specjalistów w zakresie rachunkowości zarządczej*, "Folia Pomeranae Universitatis Technologiae Stetinensis, Oeconomica", 311 (75) 2, pp. 189–198; <https://foliaoe.zut.edu.pl/pdf/files/magazines/2/46/590.pdf>.
- Sidák Z. (1967), *Rectangular Confidence Regions for the Means of Multivariate Normal Distributions*, "Journal of the American Statistical Association", 62 (318), pp. 626–633; <https://doi.org/10.2307/2283989>.
- Strielkowski W. (2020), *COVID-19 pandemic and the digital revolution in academia and higher education*, "Education. Computer Science", 1, pp. 1–6; <https://doi.org/10.20944/preprints202004.0290.v1>.
- Syukur M. (2021), *Roles of gender, study major, and origins in accounting learning: A case in Thailand*, "The International Journal of Management Education", 19 (3), 100555; <https://doi.org/10.1016/j.ijme.2021.100555>.
- Waked M., Salameh P. (2015), *Maternal waterpipe smoke exposure and the risk of asthma and allergic diseases in childhood: A post hoc analysis*, "International Journal of Occupational Medicine and Environmental Health", 28 (1), pp. 147–156; <https://doi.org/10.13075/ijomeh.1896.00316>.
- Zalewska, E., Trzcińska, K. (2022), *Efektywność zajęć zdalnych w czasie pandemii COVID-19* [Effectiveness of distance learning during the COVID-19 pandemic], "Wiadomości Statystyczne. The Polish Statistician", 67 (10), pp. 48–61; <https://doi.org/10.5604/01.3001.0016.0659>.
- Żeber-Dzikowska I., Reczyńska D., Cisło Ł. (2014), *Rola edukacji w przygotowaniu absolwentów do warunków współczesnego rynku pracy*, "Społeczeństwo. Edukacja. Język", 2, pp. 85–99.

Funding

The paper has been financed by funds for maintaining research potential allocated to the Faculty of Finance of the University of Economics in Katowice in 2023 and 2024.