GOCE DELCEV UNIVERSITY, STIP, NORTH MACEDONIA

FACULTY OF ELECTRICAL ENGINEERING

ETIMA 2023

SECOND INTERNATIONAL CONFERENCE

27-29 SEPTEMBER, 2023

TECHNICAL SCIENCES APPLIED IN ECONOMY, EDUCATION AND INDUSTRY

УНИВЕРЗИТЕТ
ГОЦЕ ДЕЛЧЕВ
ЕЛЕКТРОТЕХНИЧКИ
ФАКУЛТЕТ

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FACULTY OF ELECTRICAL ENGINEERING,
GOCE DELCEV UNIVERSITY, STIP, NORTH MACEDONIA

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PREFACE

The Faculty of Electrical Engineering at University Goce Delcev (UGD), has organized the Second International Conference ***Electrical Engineering, Informatics, Machinery and Automation - Technical Sciences applied in Economy, Education and Industry-ETIMA.***
ETIMA has a goal to gather the scientists, professors, experts, and professionals from the field of technical sciences in one place as a forum for exchanging the ideas, strengthening the multidisciplinary research and cooperation, and promoting the achievements of technology and its impact on every aspect of living. We hope that this conference will continue to be a venue for presenting the latest research results and developments on the field of technology.
Conference ETIMA was held as online conference. More than sixty colleagues contributed to this event, from five different countries with more than thirty papers.
We would like to express our gratitude to all the colleagues, who contributed to the success of ETIMA'23 by presenting the results of their current research and by launching the new ideas through many fruitful discussions.
We invite you and your colleague to attend ETIMA Conference in the future as well. One should believe that next time we will have opportunity to meet each other and exchange ideas, scientific knowledge and useful information as well as to involve as much as possible the young researchers into this scientific event.

The Organizing Committee of the Conference

ПРЕДГОВОР

Меѓународната конференција ***Електротехника, Технологија, Информатика, Машинство и Автоматика-технички науки во служба на економија, образование и индустрија-ЕТИМА*** е организирана од страна на Електротехничкиот факултет при Универзитетот „Гоце Делчев".
ЕТИМА има за цел да ги собере на едно место научниците, професорите, експертите и професионалците од полето на техничките науки и да претставува форум за размена на идеи, да го зајканува мултидисциплинарното истражување и соработка и да ги промовира технолошките достигнувања и нивното влијание врз секој аспект од живеењето. Се надеваме дека оваа конференција ќе продолжи да биде настан на кој ќе се презентираат најновите резултати од истражувањата и развојот на полето на технологијата.
Конференцијата ЕТИМА се одржа online и на неа дадоа свој придонес повеќе од шеесет автори од пет различни земји со повеќе од триесет труда.
Сакаме да ја искажеме нашата благодарност до сите колеги кои придонесоа за успехот на ЕТИМА'23 со презентирање на резултати од нивните тековни истражувања и со лансирање на нови идеи преку многу плодни дискусии.

Организационен одбор на конференцијата

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THE IMPACT OF ONLINE TEACHING ON THE DENTAL STUDENTS' EXAM SUCCESS

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Abstract

COVID-19 epidemic has changed a number of aspects in various life activities. The epidemic had the greatest impact on the education process itself. Pupils and students from classical teaching in their classrooms and lecture halls have switched to online teaching. At the same time, a significant effort was made by the teaching staff to adapt to the newly created situation. Aiming to assess the impact/influence of the online teaching on the success of students, we set the main goal of this research to make a comparative analysis of students' grades in the same courses in the period before the epidemic and during the implementation of online teaching.
In order to fulfil the purpose of our research, an analysis was made of the grades for three courses of the study program in dental medicine - preclinical periodontology, periodontology 1 and periodontology 2 in the academic year 2018/2019 when the teaching was carried out with physical presence, 2019/2020 when the teaching it was entirely online and for 2020/2021 when a hybrid type of teaching was conducted. The pass rate of the exams and the average grades for the three most important exam sessions - June, September and February are presented.
The results that we obtained within the research showed that there is significant change in terms of the pass rate of the students, as well as the average grade regarding the three courses. The pass rate has shown significant decrease, while the average grade regarding the courses increased during those years. This is solid ground for comparisons to be made with other courses, modules, faculties, even universities, towards locating the reasons for this reality. One possible and very reliable reason can be found in the fact that the change of the teaching type from classic to online and than hybrid is big and fast change for the students, that led to decrease of the pass rate, but most probably the students who passed the exam mastered the material better.

Key words

Epidemic, students, Covid-19

Introduction

The COVID-19 epidemic has changed a number of aspects in various life activities. The epidemic had the greatest impact on the education process itself. Pupils and students from classical teaching in their classrooms and lecture halls have switched to online teaching. at the same time, there was a significant effort by the teaching staff to adapt to the newly created situation.

Millions of college students from all around the world were forced into virtual learning due to the pandemic in 2020. One year later, many colleges in our country, as well as in Europe and United States of America were ready to welcome back students as the new academic year begins, but there was still a lot of uncertainty about having the old good close communication within the classrooms. This has led (at least, until now) to a declineof the classical teaching and surely, for many institutions like our university, will undoubtedly be solid ground to continue offering hybrid and/or online classes and teaching methods in general. Simultaneously, low immunization rates, new Covid variations, and travel limitations will also affect the shape of education in future.

It must be stated that in the United States, students' colleges experiences increasingly rely on online courses. Even before the Covid-19 pandemic forced faculties to switch to distance learning urgently, many students were taking classes online. For instance, in 2016, more than 30% of all undergraduate students took online courses.[15]
The availability of the basic literature for learning the material and further, passing the exams is of great importance in the success of passing the various exams. Two of the teaching courses (preclinical periodontology and periodontology 1) that are taken in this research have corresponding textbooks that are published on the electronic library of the university, while for the third course - periodontology 2, students receive appropriate text from different authors. Also, for the course of preclinical periodontology there is an appropriate practicum for the practical exercises.
What needs to be emphasized is that although there are separate e-courses created for all the three courses within tne university's e-learning platform where all the materials are to be attached and available for the enrolled students, there is no presentation is attached within the e-courses. Those e-courses were the place where e-colloquiums were conducted. However, it must be noted that during the periods when there was online learning, students could download presentations that were uploaded to Microsoft Teams. This was (and still is) one of the most popular and used e-tools within the teaching process.
In accordance with the rules for studying on the first cycle of University Goce Delcev,[18] several elements are important to be considered within the continuous assessment of the student during the semester. The presence and/or activity on the theoretical teaching is valued up to ten points, the presence and/or activity on the practical exercises is valued also with 10 points maximmum, the semester's project (project task) is also valued with 10 points maximmum and there are two continuous assessments of the knowledge - colloquiums that are conducted during the esemester, one in the middle and one at the end, each with 20 points maximmum. The final exam for each course is valued with 30 points. Each of the subjects carries one grade independent of eachother. It should be especially noted that the scoring of the practical teaching is carried out according to the following criterion - 0.3 points for attendance and 0.7 points for previous theoretical preparation and success in working with patients.
Online courses and training are very popular nowadays and more and more institutions and companies are offering courses online. The most important advantage about online learning is that individuals can take courses from the comfort of their office or home.When online teaching is present, students do not interact directly with professors and teaching assistants. One of the most frequently cited difficulties by students is the fact that they feel difficulties to ask their online teacher questions as the communication is often very impersonal (everybody are on channel).However,most of the online courses often offer alternatives, such as online forums,email,andchatrooms in order to remove this negativity. These alternatives can help individuals to get answers to their questions.
Classical teaching primarily helps students and teachers to get to know each other in a better manner. This allows teachers to know the students and evaluate their strengths and weaknesses better, act as mentors, and guide students in their career possibilities. In a traditional classroom, students can directly share their views and clarify their own queries with the teacher, thus getting their questions answered right away.For the most students, also books and notes from the classroom are very helpful for studying and passing exams.
Numerous published studies indicate that, in comparison to traditional face-to-face teaching and learning, near-term valorization of student's learning and performance, such as course completion, grades, and success in subsequent courses, are slightly lower in online conditions.When compared to on-campus programs, bachelor's degree students in online programs perform worse on nearly all test score measures.
According to Fischer et al [8], when compared to students who take the courses required for their major in person, online students have a slightly shorter time for degree completion and are more likely to graduate in four years.

Prior to the transition to distance education as a result of the Coronavirus pandemic, online courses have opened up for postsecondary education, and a significant number of students have taken classes online. [1, 15] For instance, McFarland et al [15], in the fall of 2016, an estimated 5.2 million undergraduates in the United States, or 31% of all undergraduates, were enrolled in at least one online course. There is a number of factors at the department and student levels that are contributing to the increasing availability of online classes and the rising number of students enrolling in them.

According to some studies, there has been significant pressure on university students, but the effects have varied depending on socioeconomic status The most adversely affected students by the confinement were those who lacked adequate computer equipment, access to networks, or a private room where they could take telematic classes. [17]

According to Jamal [12] the following are some of the main benefits of online education: (1) access from any online computer at any time; (2) takes into account busy schedules; (3) course content is better understood and retained, according to some researches; (4) presence of more important discussions; (5) focus on writing, technology, and life skills like time management, independence, and self-control; (6) increased interaction and discussion between students and teachers; (7) a learning environment that is more student-centered; (8)presence of more active learning and less passive listening; (9) a greater sense of synergy and connection; (10) increased creativity and variety in educational activities; (11) adaptation to a variety of learning styles; (12) ability to manage grading online and to document interactions over the internet; (13) make room for more students; (14) reduce the burden on the limited infrastructure of the campus; (15) offer options to students; (16) reach new markets for students; (17) increase enrollment by appealing to existing students.

Also, students while on-line teaching may be able to enroll in courses that they otherwise would not have been able to because of departmental scheduling constraints or over-enrollment in those courses. [9, 14] Students can enroll in additional classes by meeting their individual needs to avoid travel and by assisting students in avoiding scheduling conflicts with jobs, internships, and other out-of-class commitments. [6, 11]

There has been little research done on the significant but cumulative effects of the COVID-19 pandemic on students' academic performance. Aiming to assess the impact of online teaching on the success of students, we set the main goal of this research to make a comparative analysis of students' grades in the same subjects in the period before the epidemic and during the implementation of online teaching.

1. Material, method and essential information about the courses

During this research, an analysis has been conducted regarding the grades for three courses of the study program dental medicine, first cycle of studies, faculty of medical sciences, University Goce Delcev in Stip, Republic of North Macedonia:

- Preclinical periodontology,
- Periodontology 1, and
- Periodontology 2,

The grades that were matter of the analysis were obtained as finals of the teaching of those courses that was carried oud during:

- Academic year 2018/2019, when the teaching was completely carried out with physical presence,
- Academic year 2019/2020, when the teaching was entirely online and
- Academic year 2020/2021, when there was a hybrid type of teaching.

The data were generated from the students' information system of the university – e-index. It is a complex software solution that integrates and automates the administration of the student completely. In terms of academic year, exam sessions in September, February and June are taken into consideration respectively each academic year, with no difference whether it is regular or non-regular exam session.

Periodontology is a science that refers to the periodontium, i.e. the supporting tissues of the tooth. After caries, periodontal diseases are the most common oral disease. Up to 90% of the population has some form of periodontal disease.The pathological processes that occur during different periodontal diseases lead to a gradual but progressive loss of teeth.

Within the curriculum for studies in dental medicine, there are three courses covering the field of periodontology: preclinical periodontology – compulsory course in 8^{th} semester, periodontology 1 in 9^{th} semester and periodontology 2 in 10^{th} semester of the study program. Each of these courses is designed according to the curriculum and consists of lectures and exercises. During the teaching of periodontology 1 and 2, the exercises are clinical practice, and the students work on real patients, participating in the diagnosis and treatment of periodontal diseases.

The skills that the students are expected to acquire with studying and passing the exam for preclinical periodontology course aim to familiarize the students with the anatomy, histology, and physiology of the supporting tissues of the tooth, with the classification and epidemiology of periodontal diseases, with the risk factors and determinants of the disease, as well as with the etiology of the disease. Competencies that students should have after passing the periodontology 1 course are relateted on the occurrence of periodontal disease, clinical signs and symptoms of periodontal diseases, occlusal influences, as well as working with patients in field of periodontology.In the last semester of studying this area is covered with in the periodontology 2 course, where students are trained for the therapy of periodontal diseases.

One assistant professor from the field of periodontology and oral pathology participates in the theoretical teaching of the given courses, while in the practical teaching, an external associate-master of dental sciences participates is also engaged to deliver the necessary material to the students.

2. Results and discussion

The data from the students' information system, related to the prerequisites listed earlier are shown below.

Table 1. Pass rate through the years

Academic year	Course	P/F	Number	Number of passed	Percentage
2018/2019	Preclinical periodontology	Passed	21	57	95,00%
		Failed	2		
	Periodontology 1	Passed	16		
		Failed	1		
	Periodontology 2	Passed	20		
		Failed	0		
2019/2020	Preclinical periodontology	Passed	30	83	89,25%
		Failed	9		
	Periodontology 1	Passed	23		
		Failed	1		
	Periodontology 2	Passed	30		
		Failed	0		

2020/2021	Preclinical periodontology	Passed	13	48	71,64%
		Failed	16		
	Periodontology 1	Passed	18		
		Failed	2		
	Periodontology 2	Passed	17		
		Failed	1		

Source: E-index, University Goce Delcev in Stip

Summary, over the years, the decrease of the pass rate is pretty obvious (Figure 1).

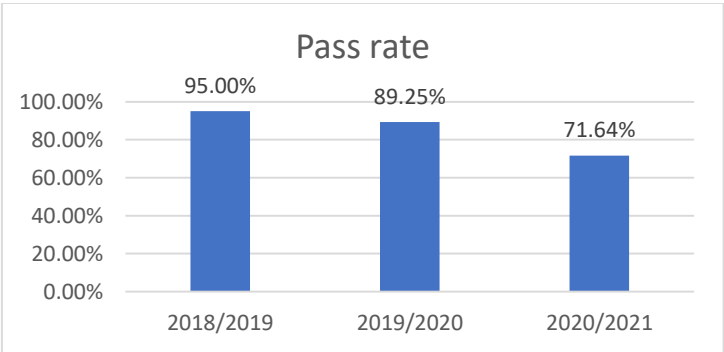

Fig. 1. Pass rate through the years
Source: E-index, University Goce Delcev in Stip

The tendency of the decrease of the pass rate is pretty significant, especially for the last academic year 2020/2021, where 71% of the students that applied for final exam has passed it. Regarding the average grades related to the courses through the academic years, that indicates how much students have learned from the material, based only of the sample of the students that have passed the exam, the results are below. We assume that higher grade means higher quality of learning and understanding of the material from the student (it is pretty general in this research).

Table 2. Grades average by courses and academic year

Academic year	Course	Average	Average by academic year
2018/2019	Preclinical periodontology	6,17	6,34
	Periodontology 1	6,40	
	Periodontology 2	6,44	
2019/2020	Preclinical periodontology	6,78	6,46
	Periodontology 1	6,33	
	Periodontology 2	6,24	
2020/2021	Preclinical periodontology	6,40	7,16
	Periodontology 1	7,63	
	Periodontology 2	7,30	

Source: E-index, University Goce Delcev in Stip

Average grades show tendency of increase through the years (figure 2).

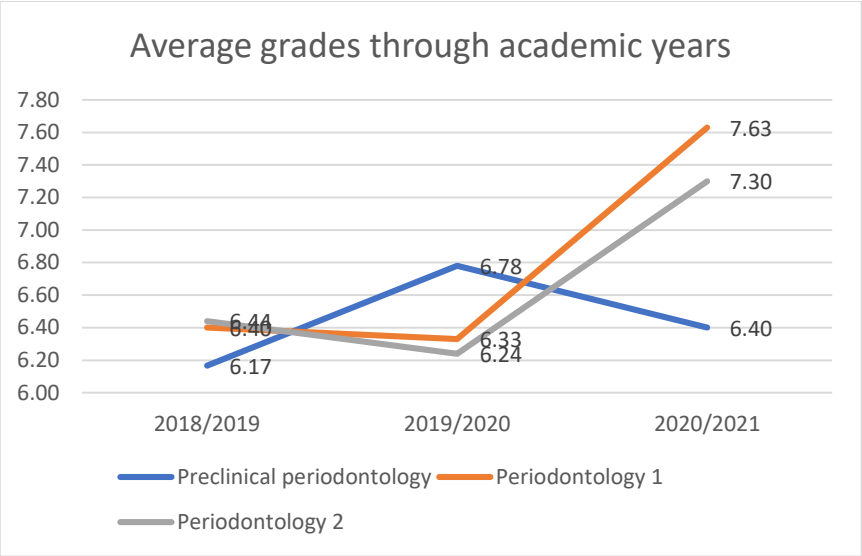

Fig. 2. Average grades through the academic years by courses
Source: E-index, University Goce Delcev in Stip

It is clear that there was a tendency of increase of the grades' average in general, even though it is not the case with all the courses.

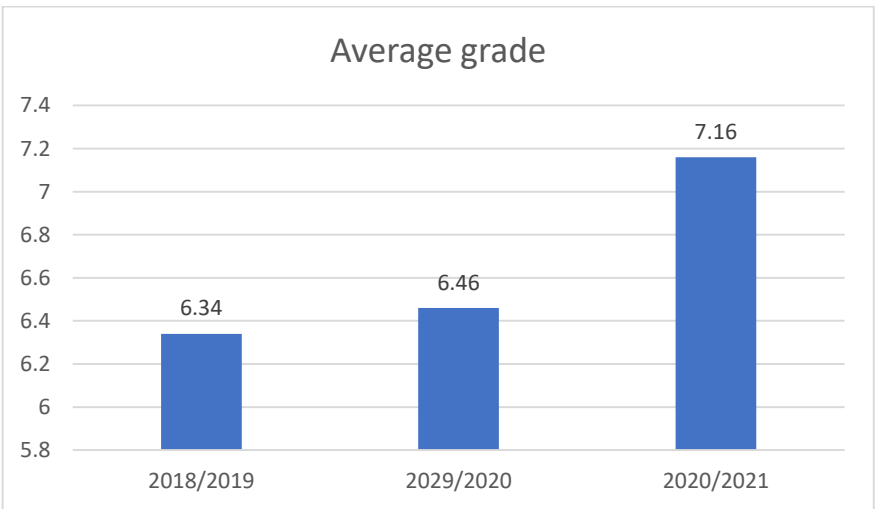

Fig. 3. Average grade through the academic years
Source: E-index, University Goce Delcev in Stip

The difference is particularly noteworthy during the year when everything was hybrid, with highest grade average of 7,16.
In contrast to the results of our study, Bashir et al [3] indicated that students achieved higher grades with online assessments.
Even after adjusting for the effects of additional variables that may contribute to the differences, the findings indicate that the pandemic has a small but significant impact on grades in higher education. The highest grade increasing effect ever reported in the literature, 9.21%, was found by Karadag in 2021.[13]
Online and distance learning are a part of higher education. From this point of view, a higher priority should be given to educators' abilities for teaching online. Grades in mandatory courses, according to Carter and Lara [5] should be assigned as successful/unsuccessful and these courses should not be counted toward the general weighted grade point average without increasing the existing online education capacities of higher education institutions and online

education competencies of educators. It is advisable to write guides on effective assessment and evaluation procedures for online learning.

Working independently in an online course may have advantages and disadvantages, despite Berry's [4] research suggesting that students do not view it as ideal. Students found online learning to be more flexible than traditional face-to-face learning, according to Hass and Mathew's [10] study comparing traditional face-to-face courses to online courses.

The majority of online and hybrid courses offer students access to a wide range of educational resources. The researchers discovered in a previous study that students with the highest access rates also had the highest academic achievement.[16]

Due to its complexity, the term "academic performance" is frequently disputed. However, it is widely acknowledged that the best measure of a student's academic performance is their grades in the university-level courses they take.[2] According to these studies, the COVID-19 lockout has had negative effects on students' stress levels, schools' and universities' lack of adaptability, students' and teachers' lack of knowledge of the technologies and implementation methodologies.[7]

At the and we have to note that we are aware that our study has some limitations. It is challenging to extrapolate our results to other universities worldwide. Also, the sample size we have available is poor. Despite this drawback, our findings demonstrate the detrimental impact of the digital learning on the educational outcomes for students. Access to reliable internet is essential for students' academic success, especially institutions—like our university—integrate online learning to combat the effects of the Covid19 pandemic.

Conclusions

Based on the processed data, we can notice that the pandemic and online teaching in the given academic years significantly affect the pass rate of the exams, while it decreases over the years. On the contrary, it has been observed that in the year in which there is hybrid teaching (combined teaching) there is a significant improvement in the average grade for the examined subjects. We think that this phenomenon is due to the lower passing of the exams, but also to the fact that those who passed the exam mastered the learning material better.

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