EFFECTS OF THE COVID-19 PANDEMIC ON UNIVERSITY PEDAGOGY: STUDENTS' EXPERIENCES AND CONSIDERATIONS

Katerina Kedraka,
Christos Kaltsidis[i]
Laboratory of Teaching and
Professional Development of Bioscientists,
Department of Molecular Biology and Genetics,
Democritus University of Thrace,
Greece

Abstract:

Due to the coronavirus crisis, universities worldwide have faced sudden pressure to change from face-to-face delivery of courses to digitally enhanced teaching for distance learning. We present a small case study of 75 students from the Department of Molecular Biology and Genetics of the Democritus University of Thrace, Greece on their experiences of the transition from face-to-face to distance learning during this crisis. We used a questionnaire with closed-ended and open-ended questions to record the students' "fresh" experience of their new educational reality. Students consider distance learning to be interesting, modern, adequate, and convenient, but not able to replace their experience of social interaction with fellow students and teachers. They continue to express worries about lessons, examinations, and laboratory work, which may be due to the specific and high demands of the biosciences. This crisis is an opportunity for universities to improve the use of digital tools for an enhanced learning and teaching experience. This should be supported by investment in digital infrastructure for improving distance learning in higher education.

Keywords: university pedagogy, COVID-19 pandemic, distance learning, students' considerations

1. Introduction

The COVID-19 pandemic has affected many aspects of social, cultural, and economic life, including education. While each educational stage faces unique challenges, higher education is leading in triggering a learning revolution. Both the World Economic Forum (2020) and the World Bank, in its 2020 agenda proposals for the post-COVID-19 era,

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[i] Correspondence: email ckaltsid@mbg.duth.gr

underline the need for a rebirth of educational systems. The challenge for universities lies in succeeding in digital education since the demand for the almost immediate digital transformation of courses, both graduate and postgraduate, not only require incorporation of technologies, but also creation or deeper modification of teaching and learning processes to fulfill the needs of each area of study (UNESCO, 2020). Indeed, the real challenge is how quickly the required adaptations would be made in the context of the current pandemic. Some of the adjustments for effective university education are linked to priorities that did not exist in the past but have arisen due to the pandemic. Some of these changes may disappear in the future, but some may continue as "the new normal," as the academic community returns to routine teaching conditions in lecture halls and workshops.

In Greece, the COVID-19 pandemic forced universities to adopt online education, since it was the only solution to continue with the spring semester of 2020. All types of teaching activities were suspended from March 11, 2020, following the Joint Ministerial Decision 16838/10.03.2020 (B 783). Educational institutions were challenged to find effective solutions to continue the learning process. The proposed solution was distance learning in the case of all non-laboratory courses, a practice that has been widely followed in many universities around the world (QS, 2020). Karalis and Raikou (2020) argue that this experience has had a catalytic effect on Greek university teaching, promoting the rapid use of alternative teaching approaches and digital tools. Kamarianos, Adamopoulou, Lambropoulos and Stamelos (2020) in their research conclude that most of the students did not have any difficulty in switching to online teaching and they think it was a good chance to learn new skills and make new experiences.

At the Democritus University of Thrace, online courses began on March 30, 2020. In this paper, we attempt to "capture the moment" by recording the "fresh" feelings of students during this critical period as well as their opinions about the e-learning methodology used. It is important to note that the Department of Molecular Biology and Genetics (MBG), where this study was carried out, is located in the city of Alexandroupolis, at the eastern border of Greece. Therefore, most students' family homes are far from the campus. According to unpublished data from MBG's records, only 8% of the students are from Alexandroupolis and the nearby areas. Consequently, when the shutdown of universities was announced, the vast majority of students returned home and continued their studies via digital tools and platforms. Another significant aspect is that the field of molecular biology and genetics is strongly experimental, and as in other STEM (science, technology, engineering, and mathematics) disciplines, studies are substantially based on laboratory work. Thus, although the faculty succeeded in integrating some form of online learning into coursework, moving all courses online proved challenging, especially those involving laboratory work.

Distance learning has its own peculiarities that make it stand out from traditional face-to-face learning; it must adapt digitally advanced teaching approaches and techniques to modern integrated teaching methodologies pedagogically suitable for the

target group of students (Kedraka, 2016). The way teaching is conducted is different, and its purpose often differs from that of traditional curricula, as it provides opportunities to people who either cannot or do not want to participate in classroom learning (Holmberg, 2002). According to Keegan (2001), the physical distance between teachers and students, the possibility of two-way communication, and the use of technology to connect the teacher with the students are some of the characteristics of distance learning. The teacher's role in distance learning is completely different from that in face-to-face learning. In the former, the role is mainly advisory, supportive, and guiding (Fragoulis & Valkanos, 2016; Vogiatzaki, 2019). In addition, teachers may face new challenges related to online teaching. For example, they may be confronted with students who are not willing to participate and remain silent, and truants simply connecting to the lesson without attending. At the same time, they must become familiar with online teaching and be able to resolve any technical issues that may arise (Farrel et al., 2019).

Therefore, the pedagogical development of STEM disciplines in a virtual environment needs different insights into how learning occurs through e-learning methodologies. Curriculum design and course development need different approaches and conceptual planning (Koutselini, 2020) that take into account specific time planning and scheduling of the sequence of academic outcomes in terms of skills development and knowledge, in a way that allows students in the biosciences to have successful and rewarding experiences in their studies, especially when it comes to experimental teaching approaches.

2. Methodology

This study was conducted in May 2020 with students in the MBG Department of the Democritus University of Thrace. It was designed to be twinned with a study conducted at the University of Patras by Karalis and Raikou (2020), so that results can be compared at the next phase between the two higher education institutions in Greece. In this first release of results, we mean to present an initial picture of some aspects related to the first impressions of students of their e-learning experience. The survey was conducted with students who attended two courses at the MBG Department with part of their content incorporating some units dedicated to distance learning. After long and deep discussions during the courses on the COVID-19 pandemic which led to the introduction of the new learning environment to the students, the questionnaire was created, and the students informed about it by the instructor. It was delivered in May 2020 via a web link, and the results were presented to the students and thoroughly discussed as part of the courses. It included closed-ended and open-ended questions. Seventy-five (N = 75) students participated in the study; 47 (62.7%) were women and 28 (37.3%) were men. Forty (53.3%) of the students were sophomores attending the 2nd year of their studies, 31 (41.3%) were juniors, and the remaining 4 (5.3%) were seniors who attended because they had not passed the courses during their regular academic program. In the closed-ended questions the responses in the survey were scaled from 1 (not at all) to 5 (very much).

3. Results

A. Feelings at the time the university suspended face-to-face courses

The students were asked about their feelings when the university closed down to deal with the pandemic. When the university suspended its educational function, the students were not happy (not at all/very little) about the interruption of courses (70.7%); in fact, they were not at all indifferent about the situation (90.7%). They were curious (quite, very much) about what would happen to their studies (73.3%), and expressed a great deal of anxiety about replacement of the teaching hours lost due to quarantine (70.7%) and fear whether they could abruptly continue their studies (50.7%), as well as sorrow over the interruption of their studies (42.7%). It is notable that the students did not show any fear (not at all/very little) of the coronavirus pandemic (56%; see Table 1).

Table 1: Emotions of students
when the University of Thrace closed due to the COVID-19 pandemic

Initial Emotions	Not at all		A little		Quite		Much		Very much		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Joy at classes not being held	24	32.0	29	38.7	9	12.0	8	10.7	5	6.7	75	100
Curiosity about what would happen	4	5.3	5	6.7	11	14.7	27	36.0	28	37.3	75	100
Fear of the COVID-19 pandemic	18	24.0	24	32.0	18	24.0	10	13.3	5	6.7	75	100
Sorrow over the interruption of studies	8	10.7	11	14.7	24	32.0	17	22.7	15	20.0	75	100
Fear of the possibility of non-continuation of studies	8	10.7	19	25.3	10	13.3	20	26.7	18	24.0	75	100
Anxiety about the new educational framework	7	9.3	6	8.0	24	32.0	24	32.0	14	18.7	75	100
Concern about when and how the courses will be completed	4	5.3	9	12.0	9	12.0	29	38.7	24	32.0	75	100
Indifference, because it did not bother me	63	84.0	5	6.7	3	4.0	1	1.3	3	4.0	75	100

It is interesting to see what the students mentioned as their immediate response to the closing down of the university. Their feelings were mainly negative, since the dominant responses were anxiety, insecurity, fear, and concern for the future of their studies, according to keywords (see Table 2) selected through an open-ended question asking them what they felt just after they were informed that the university was suspending face-to-face teaching.

Table 2: What students felt
when the University of Thrace closed due to the COVID-19 pandemic

Keyword describing the first impression after the shutdown of the university	Number of times the keyword appears in student responses
Anxiety	15
Curiosity	9
Joy	9
Insecurity	7
Fear	7
Concern	6
Worry	5
Sadness	4
Uncertainty	1

We quote some answers clearly showing the first impressions of students about their new experience: "Anxiety, sadness, and concern about what exactly would follow"; "Anxiety, insecurity about the future"; "Joy, because I would enjoy a kind of short break which was welcome for a short time"; and "Fear, anxiety, and concern regarding both teaching exams."

B. Students' emotions at the time of the survey

Table 3: Students' emotions at the time of the survey

Emotions	Not at all		A little		Quite		Much		Very much		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Joy at continuing the lessons	5	6.7	5	6.7	20	26.7	28	37.3	17	22.7	75	100
Pleasure at not having to commute to attend classes	12	16.0	14	18.7	16	21.3	18	24.0	15	20.0	75	100
Relief that I will not lose the semester	3	4.0	2	2.7	5	6.7	31	41.3	34	45.3	75	100
Enthusiasm for the new experience	16	21.3	17	22.7	26	34.7	9	12.0	7	9.3	75	100
Disappointment that the new educational environment does not work me	18	24.0	18	24.0	18	24.0	13	17.3	8	10.7	75	100
Insecurity because I do not know what will happen with the lessons	10	13.3	9	12.0	18	24.0	16	21.3	22	29.3	75	100
Curiosity about how studies would continue	4	5.3	4	5.3	15	20.0	23	30.7	29	38.7	75	100
Looking forward to returning to my student routine	7	9.3	5	6.7	7	9.3	11	14.7	45	60.0	75	100

The students were asked how they felt when the courses restarted. They expressed their satisfaction (quite/very much) that the semester would not be lost (86.6%), while they were curious about the way in which their studies would continue (69.4%). At the same time, they were eager to return to their educational routine (74.7%). On the other hand,

some students appeared not to be excited (not at all/very little) by the new experience of distance learning (44%), and implied that they were rather disappointed because the new environment was not satisfactory for them (48%; see Table 3).

The responses to the question "What are your feelings today?", today meaning two months after the shutdown of the university, showed that the students continued to feel anxious, insecure, and worried, but some positive feelings, such as calmness, satisfaction, joy, and optimism, were also evident.

Table 4: Students' emotions at the time of the survey

Keyword	Number of times the keyword appears in student responses
Anxiety	15
Anguish	8
Insecurity	6
Uncertainty	6
Fear	5
Joy	5
Sadness	3
Curiosity	3
Optimism	3
Satisfaction	2
Worry	2
Calmness	2
Desperation	2

The responses to an open question asking the students to describe what they felt showed that, after two months of distance learning, their anxiety seemed to have ceased, but they wanted to return to their normal university routine. It is clear that they were more confident and relaxed, and, at the same time, conscious that it was not a holiday, but an emergency situation.

> *"Fear is always at the back of everyone's mind. But now there is satisfaction and relief that I will not have to risk my health to return to university either for exams or for labs. Stress and anxiety still exist, but they have to do only with the exam program."*

> *"I strongly want to go back to my usual student life. That is, if we come back."*

> *"What started as a two-week 'vacation' ended up being a permanent situation and so I now have a completely different point of view and feelings. My initial joy for the unexpected holidays has turned into anxiety and concern about my studies. Will I return to school again this year?"*

> *"I'm calm, I study better, I don't run to catch up. We also got familiar with online education."*

"The initial joy turned into disappointment and sadness because I miss socializing with my teachers and classmates."

C. Evaluation of the new educational environment

From the students' assessment of the new educational environment compared to the previous one, it is evident that understanding of the course content (62.7%), development of new skills (56%), and the convenience of attending courses (53.3%) were considered positive aspects of distance learning, while the lack of interaction between students (61.4%) was considered negative (see Table 5).

Table 5: Assessment of the new educational environment (compared to the previous one)

Assessments	Not at all		A little		Quite		Much		Very much		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
The content of the course is comprehensible	3	4.0	8	10.7	17	22.7	30	40.0	17	22.7	75	100
New skills related to distance education are being developed	8	10.7	10	13.3	15	20.0	21	28.0	21	28.0	75	100
The teaching method of distance education covers the prerequisites of the course	5	6.7	21	28.0	23	30.7	18	24.0	8	10.7	75	100
The new way of teaching is interesting	9	12.0	16	21.3	22	29.3	17	22.7	11	14.7	75	100
Communication with the teacher is satisfactory	7	9.3	15	20.0	26	34.7	22	29.3	5	6.7	75	100
Student participation in the course is great	10	13.3	19	25.3	19	25.3	20	26.7	7	9.3	75	100
Attending is easy	7	9.3	8	10.7	20	26.7	22	29.3	18	24.0	75	100
The interaction between teacher and students is satisfactory	10	13.3	19	25.3	27	36.0	14	18.7	5	6.7	75	100
The interactions between students is satisfactory	23	30.7	23	30.7	12	16.0	14	18.7	3	4.0	75	100

The selected qualitative data show that the MBG students considered e-learning exciting, offering the comfort of home and more free time, but they missed socialization and interaction with their fellow students and teachers. It is interesting to note that some students felt more relaxed about online participation in the courses.

"In the beginning, distance education was a solution, which I faced with enthusiasm, but now it seems this solution is not the best."

"Certainly, the feeling of being home gives you more comfort, but it can easily end in monotony and loneliness. I miss the interaction with my friends and the wet-lab work."

"Distance education is OK, but it cannot replace a course in the lecture hall. But it is a very good alternative."

"I believe that it cannot replace face-to-face learning, no way! Of course, due to the current situation, we should be grateful that we managed to continue our education, even under these conditions."

"Very comfortable, I prefer it. I ask questions without being ashamed or feeling that I will say something stupid and expose myself. This environment is more pleasant and easy for me."

D. Factors affecting e-learning

In assessing the factors that affected e-learning, the students did not seem to care (not at all/very little) whether the instructor's camera was turned on (37.3%), in contrast to the instructor's adequacy (quite/very much) in handling the platform (61.3%; see Table 6). More than half of the students (52%) were deeply concerned about the inability to work with their classmates, while their views about the lack of visual contact were split.

Table 6. Factors affecting students' e-learning

Factors	Not at all		A little		Quite		Much		Very much		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
The teacher's camera should be on	18	24.0	10	13.3	28	37.3	14	18.7	5	6.7	75	100
Teacher's deficiencies in handling the platform	2	2.7	8	10.7	19	25.3	21	28.0	25	33.3	75	100
Non-visual communication with my fellow students	17	22.7	13	17.3	12	16.0	14	18.7	19	25.3	75	100
Inability to cooperate with my fellow students	9	12.0	16	21.3	11	14.7	21	28.0	18	24.0	75	100

Students were asked about their preferred types of communication during delivery of lessons. They preferred (quite/very much) chat to written communication to pose questions (54.7%), while there was a remarkable reluctance (not at all/very little) to participate in the course (65.4%). It is also interesting that many students felt uncomfortable (not at all/very little) about using their microphone (36%; see Table 7).

Table 7: Students' preferred ways of communicating with the instructor

Type of communication	Not at all		A little		Quite		Much		Very much		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
On chat	2	2.7	12	16.0	20	26.7	18	24.0	23	30.7	75	100
Speaking on the microphone	7	9.3	20	26.7	17	22.7	18	24.0	13	17.3	75	100
I do not wish to participate in the course	29	38.7	20	26.7	13	17.3	6	8.0	7	9.3	75	100

E. What aspects of their university life did the students miss?

The aspect of university life the students appeared to miss the most (quite/very much) was social. The majority of students missed social interaction (76%), their classmates (76%), face-to-face communication during lessons (70.6%), and their teachers (61.4%; see Table 8).

Table 8: What did the students miss about their university life?

	Not at all		A little		Quite		Much		Very much		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Teachers	5	6.7	8	10.7	16	21.3	26	34.7	20	26.7	75	100
Fellow students	6	8.0	5	6.7	7	9.3	20	26.7	37	49.3	75	100
Library	9	12.0	12	16.0	20	26.7	16	21.3	18	24.0	75	100
Classes	6	8.0	9	12.0	17	22.7	19	25.3	24	32.0	75	100
Students' refectory	17	22.7	17	22.7	16	21.3	10	13.3	15	20.0	75	100
Live communication during the lesson	4	5.3	4	5.3	14	18.7	19	25.3	34	45.3	75	100
Social interaction	5	6.7	5	6.7	8	10.7	11	14.7	46	61.3	75	100

4. Discussion

According to the findings of this small study, MBG students seem to have significant concerns about their studies, focused on the important changes in university teaching brought about by the COVID-19 pandemic, in particular the issue of delivering laboratory courses in the biosciences. Their initial anxiety about the future of their studies turned into relief and satisfaction when they learned that the courses would continue through distance learning methods. However, insecurity and curiosity about what would happen next was obvious, which may be explained by the timing of the survey: at the time the survey was conducted, the students had not yet been informed whether examinations would take place or how the laboratory courses would be replaced. In its report on educational challenges in the COVID-19 era, the OECD (2020) notes that higher education institutions and policy makers should explore secure systems for taking examinations from home. As Karalis and Raikou (2020) concluded, although students are quite familiar with new technologies for communication and learning and are positive about the experience of synchronous and asynchronous learning, they greatly appreciate face-to-face teaching because it offers them the opportunity to interact with teachers and fellow students and to be part of the university environment.

The pandemic appears to have had a positive impact on the MBG students' learning as many of them were able to effectively use the e-learning platforms; this was

not the case in Owusu-Fordjour, Koomson, and Hanson (2020). Nevertheless, our results show that students have a clear preference for face-to-face education. This may be explained by the lack of previous experience of online learning, which, in fact, was not a free choice for our students, as is usually the case in "formal" distance learning programs which are chosen consciously by learners for their own reasons (professional or family).

The students consider the new educational environment as an opportunity to develop new skills that may help them in their professional careers. University students are old enough to handle online work and are technologically savvy enough to navigate new digital tools and methods (Farrel et al., 2019); therefore, they do not seem to have technical difficulties in learning through e-courses. However, our students note that the most important disadvantage about distance learning is the inability to interact with fellow students and instructors, together with non-visual communication during online courses and the lack of cooperation with their classmates. On the other hand, they say that whether the instructor's camera is turned on is not of great importance. These findings confirm those of Farrel et al. (2019) who argue that students seek meaningful online interactions and expect their educators to be effective in live online teaching and learning approaches, while poor online tutorials cause them discomfort.

However, learning and collaborating in an online environment may not always come easily to teachers and students (OECD, 2020). It is interesting that the students in our study imply that they do not appraise the instructor's digital weaknesses. It is likely that they want their teachers to have basic know-how of educational platforms and applications. The issue of instructors' ability to master digital tools and platforms for teaching has been identified by the European Commission; therefore, a Digital Competence Framework for Educators was proposed to serve as a diagnostic tool to determine the main weaknesses in this regard of university teachers (Redecker, 2017). The Framework has four areas with a pedagogical perspective: creation and sharing of digital content; methods and practices of teaching (including interaction with learners); assessment approaches used; and transversal aspects such as accessibility and personalization.

The most interesting finding in this study is the anxiety and concern about their studies the students have felt and still feel. They express their worries about lessons, examinations, and laboratory work. How can this be explained? Is it due to the high demands of the biosciences or due to the heavy program of study in the MBG Department? Or should we attribute the students' anxiety to general insecurity about the educational system and its ability to protect their studies? Further research on this finding would be useful.

5. Conclusions

The results of this small survey show that MBG students consider distance learning to be interesting, modern, adequate, and convenient, but not able to replace their experience of social interaction with fellow students and teachers. They appreciate that digital learning

has prevented their studies from being delayed and the efforts made by their lecturers during the pandemic. However, as they state, they long to return to "their lecture halls and labs," their educational routine, and "normality."

According to the WHO, the risk of resurgence of the pandemic remains. If this is the case, the necessary social isolation measures may disrupt school-based education for several months in most countries around the world, as well as in Greece. It seems that the most crucial impact of the pandemic on university teaching is the expectation, if not the demand, of continuity of teaching activity using a virtual modality. However, it is also possible that higher education institutions would, in any case, incorporate digital teaching, as it has proved to be an attractive, cheap, and easy way to deliver courses. Thus, this crisis could be an opportunity for universities to jump-start the use of digital tools for enhancing the quality of learning and teaching. This should be supported by investment in digital infrastructure. Providing high quality online education is an expensive affair that will would need not only further investment but also further evidence to ensure that the new opportunity for digitally enhanced learning is taken up in the right way (Murphy, 2020).

Therefore, universities should move forward with distance learning during the next academic year and develop and implement effective online educational responses to the COVID-19 pandemic (Reimers, & Schleicher, 2020). As Karalis and Raikou (2020) concluded, the experience of the pandemic can serve as a good reason for renewal and development of teaching and learning in universities, and immediate action should be taken by policy makers and faculty for training educational staff on new teaching methods and developing strategies for improving distance learning in higher education.

About the Authors

Katerina Kedraka (BA, MSc, PhD) is an Associate Professor of Teaching and Job Skills of Bioscientists in the Department of Molecular Biology and Genetics in Democritus University of Thrace. Her research and publications in international and Greek conferences, as well as in scientific journals, focus on Adult Education, Career Management, Pedagogy and Didactics. She is the Head of a master's degree "Didactics of Biosciences" and she leads the Lab "Teaching and Professional Development of Bioscientists". Recently she has been appointed as the manager of the Teaching and Learning Center of Democritus University of Thrace. Her scientific interests focus on University Pedagogy, Adult Education / Lifelong Learning, Career Management, Guidance, Gender Issues in education and employment.

Christos Kaltsidis is an ICT teacher in secondary education. He has studied Computer Science at the TEI of Thessaloniki and has a masters' degree in Adult Education from the Hellenic Open University. He is a PhD candidate at the Department of Molecular Biology and Genetics of the Democritus University of Thrace and his research interests include the adaption of Virtual Reality in Education, University Pedagogy, and Distance Education. He works as a detached member in the Laboratory of Teaching and Professional Development of Bioscientists.

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