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The Readiness of Preservice Teachers for the Distance Education of Physics in Greece

Konstantinos T. Kotsis, Georgia Nikou, and Georgios Stylos

ABSTRACT

The teaching of Physics at all levels must be based on experiment and exploration. Virtual labs prove valuable for distance education the course. The present work has as its object of study the investigation of the readiness of the prospective Primary Education teachers for the distance education of the Physics course. 134 students of the Department of Primary Education of the University of Ioannina participated in the research that was carried out. The questionnaire completed by the students consists of thirty-five multiple-choice, closed-ended questions. According to the results, it seems that, in general, the students, although they are largely familiar with the computer and the internet, do not know how to use the platforms and digital tools to teach a Physics course remotely. However, they are largely familiar with the computer and the internet but do not know how to use the platforms and digital tools to teach a Physics course remotely. Finally, most students consider that they are moderately prepared to face a distance education in Physics.

Keywords: Distance Education, Experiment, Physics.

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I. Introduction

Teaching the Physics course in Primary Education (5th and 6th Grade) is a first attempt to contact the children with Physics. For students, it is an occasion for collaboration with their classmates, mobilization, observation, and research. At the same time, it is a great challenge for teachers to make the lesson interesting and beneficial for students.

Physics is an integral part of all Study Programs. They are already taught in primary school, with the main goal for students to observe and interpret the natural phenomena around them (Koulaidis, 2001).

Unfortunately, in practice, the teaching techniques the teacher adopts to present the course material are mainly the lecture (monologue), the questions, and, in rare cases, the demonstration experiment. The teacher plans activities that enhance the memorization of the material and evaluates the students based on their oral and written performance (Panouklia, 2015). That is, the teachers of Physics use teaching approaches with traditional characteristics (e.g., reading through the book), while they do not use the teaching approaches provided by modern Analytical Programs (Plonczak, 2008; Stylos & Kotsis, 2013; Stylos *et al*., 2018). On the other hand, students adopt the teacher's science and internalize the knowledge presented to them without being actively involved in the learning process.

According to the newest Analytical Teaching Program of Physics for Elementary Schools (Government Gazette, 2003), which is based on the model of learning through investigation, special emphasis is placed on the active participation of students and scientific processes (Dailianis, 2021). Students are the ones who determine the topics that are relevant to their interests and needs. They decide on the methodology to collect and analyze the data and determine the acceptable solution to their problem. The teacher simply guides them and facilitates classroom activities. The model's innovation is recognized as an essential factor for learning the ideas that students have developed about the world and the various phenomena that happen around them before they are even taught in the classroom. Also, knowledge is not passively transferred from the teacher to the students but is actively constructed by the learning subject, and the teacher coordinates classroom activities (Vinni, 2020).

The philosophy of the specific model is that students actively participate in the learning process, which evolves in specific stages, while at the same time conducting simple experiments to lead to the acquisition of knowledge. The teacher's role is to organize and coordinate the research course so that the students, with appropriate guidance, assimilate the new knowledge (Panouklia, 2015).

The teacher who teaches the Physics course remotely should make the online course interesting and enjoyable and make the students understand both the theoretical framework and the laboratory (experiments) to lead them to master the new knowledge.

According to modern research that has been carried out, the integration of Information and Communication Technologies

(ICT) in education in general, but also distance education in particular, has a positive effect on students (Voogt *et al*., 2013). New technologies seem to significantly promote communication and collaboration among students and activate their interest. In addition, they cultivate their thinking and increase their creativity (Tsotsas & Chrysikou, 2021). In the modern educational reality, Information and Communication Technologies (ICT) are recognized as useful tools to support the teaching of Physics at all levels of education (Staugiannoudakis & Kalogiannakis, 2020).

As far as the Greek educational reality is concerned, interest in using ICT is extremely low. Teachers often find it difficult and usually refuse to include it in their teaching (Tzimoyiannis & Siorenda, 2007). However, what can give significant impetus to teachers to include ICT in their teaching seems to be the continuous information and training in new technologies to be able to use them properly to improve the teaching practice (Kostakis, 2019). In particular for Physics, Virtual Laboratories are very useful, allowing us to study a phenomenon through a computer's software. That is, they attempt to substitute the real laboratory and the equipment it has (Tsihouridis *et al*., 2013). They are also valuable in investigating invisible phenomena to the human eye. (Tzimoyiannis & Mikropoulos, 2000).

According to UNESCO data, in November 2020, in 188 countries of the world, 91.3% of pupils and students did not go to school for reasons of health protection imposed by the Covid-19 pandemic. Therefore, the education of the students for quite a long time was carried out remotely through a special platform.

For this, the readiness of prospective Primary Education teachers to face a similar situation and cope with their obligations, teaching Physics remotely, was investigated.

II. Research

Distance teaching at the University level is very old (Rumble & Harry, 1982). The purpose of this research is to investigate the readiness of prospective Primary Education teachers regarding distance education in Physics. In particular, the opinions and knowledge regarding the techniques applied in both asynchronous and modern distance education are examined.

The research was conducted in two phases. Initially, a pilot study was conducted in November 2021, for life, at the University of Ioannina. The questionnaire was distributed to a total of ten (10) students of the Department of Primary Education. The pilot survey was conducted to identify any errors and omissions in the questions and to observe the time required to complete the questionnaire. for the purpose of testing, checking, and improving the questionnaire. Then, the main research was conducted to draw conclusions, which was carried out for life in early 2022 at the Department of Primary Education of the University of Ioannina.

A total of 134 students (108 women and 26 men) of the Pedagogical Department of Primary Education of the University of Ioannina participated in the research. All participants were in their 4th year. The sample was taken by the random sampling method.

The questionnaire, which each participant was asked to fill in, consists of four parts. First, there are questions about the participant's demographic characteristics, such as gender, year of study, and the number of courses from previous years. The first part includes questions about students' familiarity with distance education, a five-point Likert scale, and a closed type. The second part includes questions concerning the knowledge of prospective Primary Education teachers regarding the asynchronous distance education of Physics, as well as the problems of its implementation. Also, the third part includes questions related to the knowledge of prospective teachers regarding modern distance education of Physics, as well as the problems of its application. Finally, the fourth part consists of questions on a five-point Likert scale and closed type related to prospective Primary Education teachers' opinions and readiness regarding the implementation of distance education in Physics.

The time to complete the questionnaires was observed to be approximately 20 minutes, as in the pilot survey. All questionnaires were valid. After completion, the results were entered into IBM SPSS Statistics 26.0 software to create the database and perform the statistical analysis.

The statistical analysis of the data was carried out in the IBM SPSS Statistics 26.0 software, both with descriptive and inductive statistics methods.

III. Results

134 Department of Primary Education students at the University of Ioannina participated in the research, of which 80.6% (N=108) were women and 19.4% (N=26) were men. Most students were in their 4th year of study and declared that they "owed" less than 5 courses, at a rate of 90.3% (N=121).

The largest percentage of students, 53% (N=71), answered that they are very familiar with using the computer internet and moderately familiar with working with students (47%). They prefer combining the two methods (synchronous and asynchronous) for the distance education of Physics. He argues that during distance education, it would be very useful for the students to repeat the experiment after the teacher has experimented.

It was established from the respondents' answers that most students (53%) do not know the platforms that help in distance education, as well as the necessary technological means that the student must have for the implementation of modern and asynchronous distance education.

In addition, the student's attitude towards special training courses concerning distance education in Physics can be seen in the bar graph (Fig. 1) and is particularly positive.

Regarding students' readiness to teach a Physics course remotely, it was found that 47.8% of students consider themselves moderately prepared to face a similar situation to make the course beneficial to students.

The usefulness of the remote Practical Exercise for teaching Physics was also investigated. The students' answers are shown in the bar graph (Fig. 2). As can be seen, the largest percentage of students, 36.6% (N=49), answered that a remote Practical Exercise for distance education in Physics would help them a lot. A smaller percentage of students 25.4% (N=34) consider that a remote Internship would help them to a moderate extent.

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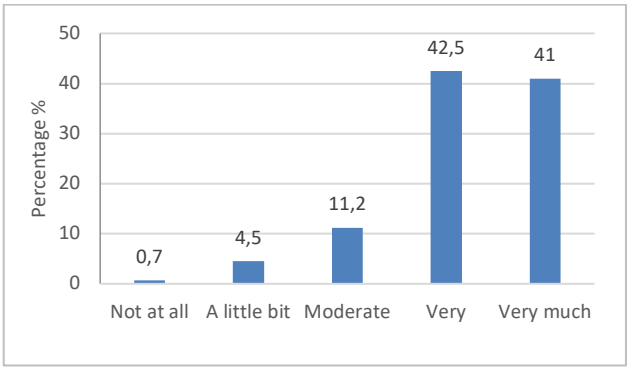

Fig. 1. Distribution of responses to the question "How much should you be educated at University, with courses about distance education?".

Whereas 17.2% (N=23) of the students consider that a remote Internship for distance education in Physics would not help them at all.

Regarding the students' familiarity with the use of the computer and the internet, most students answered that they are very familiar, with the majority of answers coming from men (53.8%). Also, most male students (61.5%) consider themselves moderately familiar with working with students.

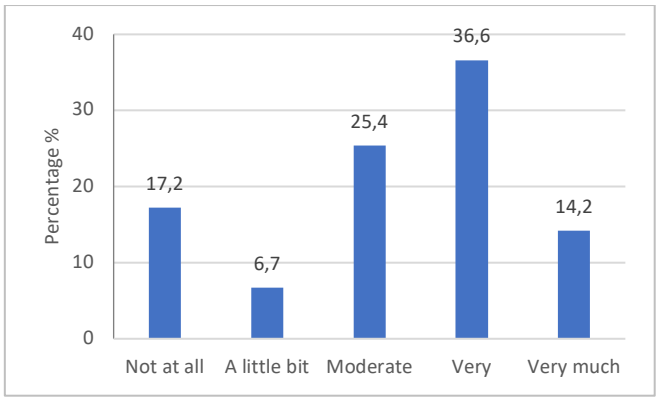

Fig. 2. Distribution of responses to the question "Do you think a distance practice course would help you for distance education in Physics?".

Regarding the degree to which students believe that student assessment is properly implemented during distance education in Physics. However, most of the students' answers are almost balanced. Females score a higher percentage in the moderate option (42.6%).

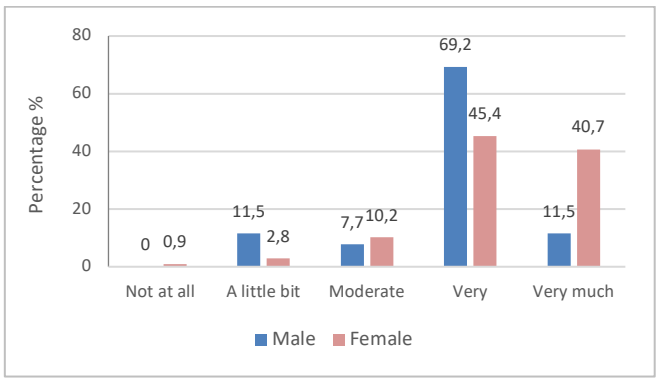

Fig. 3. Response rates of the usefulness of software that helps absent students.

In addition, the responses to the usefulness of various platforms, which help to make the material given in the classroom available to absent students, are shown in the bar graph (Fig. 3).

Also, it was found that most students had chosen the course ¨Laboratory Approach to Physics¨ (a course that includes experiments to teach concepts of Physics), but the largest percentage who chose the course were male (92.3%).
The usefulness of the specific course, regarding the possible distance education of the Physics course, can be seen in the bar graph (Fig. 4).

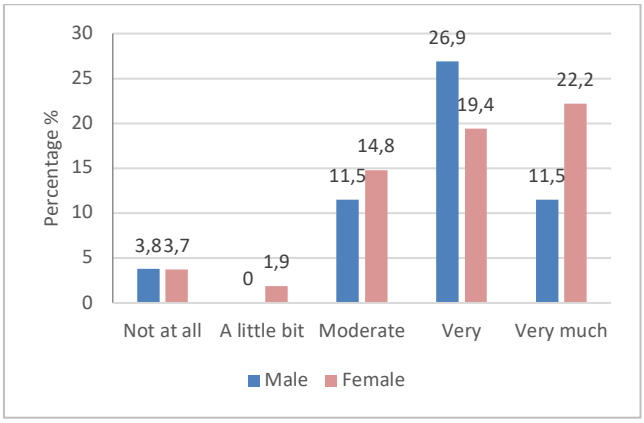

Fig. 4. Response rates of course usefulness. "Laboratory Approach to Physics".

Both the majority of males and females answered that in the teaching of Physics, it is more effective for the experiment to be carried out by the students.

Regarding how students prefer to teach a Physics course remotely, most students responded that they prefer a combination of both methods: synchronous and asynchronous, with the majority of responses coming from students who are very familiar with using computers and the internet (64.8%).

Although most students answered that they are very familiar with the use of e-learning software, the largest percentage came from those who are very familiar with the use of the computer and the Internet.

Furthermore, it was found that although the majority of students responded that it would be very, very useful for distance education to provide programs that help make extra study material available to those students who want it, most responses came from those who are very familiar with the use of computers and the Internet.

Also, the students who answered that they are very familiar with working with students consider that the evaluation of students is applied very correctly during distance education in Physics (21.6%). However, several students with the same familiarity with working with students argue that, to a small extent, the assessment of the students is correct (29.7%).

Regarding students' familiarity with the use of the computer and the Internet, it was found that all students (100%) who consider that the students are not at all familiar with the computer-internet understand the experiment more when it is performed directly by the educational. While the students who consider that they are too familiar with the computer internet argue that the experiment is better understood by the students when it is shown through a video (50%) or a simulation (25%).
Finally, it was observed that a fairly large percentage of students who had not chosen the course "Laboratory Approach to Physics" consider themselves to be moderately

prepared for distance education in Physics (39.6%). However, most students who had chosen the specific course answered the same (53.1%).

IV. Conclusions

At this point, the results of the research carried out among the students of the Pedagogical Department of Primary Education of the University of Ioannina are presented to investigate the readiness of prospective Primary Education teachers for distance education in Physics.

In particular, from the research carried out, it was found that both sexes are very familiar with the use of computers and the Internet. But women are more familiar with the use of e-learning programs and the Zoom and Skype platforms, which help modern distance education. Also, most women believe that for the implementation of modern and asynchronous distance education, the student must have headphones and speakers, as well as a microphone during the implementation of modern distance education.

In addition, the majority of women argue that the cognitive deficiencies of prospective teachers in ICT are very inhibiting in the implementation of modern distance education and consider it necessary to have programs that help make available additional material for study to those students who want it. Finally, they argue that an experiment is best understood when the students themselves perform it.

On the contrary, most men do not support the above to the same extent. From the research carried out, it was found that the majority of men chose the course "Laboratory Approach to Physics", and also that they argue that it would be very useful during distance education to provide programs that help to dispose of the material given in class to absent students and organize students' obligations.

In addition, it was observed that students who are very familiar with the computer and the internet are very familiar with the use of e-learning programs and the use of Zoom and Webex platforms. They argue that the existing platforms, which help in the distance education of Physics, should be greatly enriched with more tools. Furthermore, it was found that students who are very familiar with the computer and the internet consider that it would be very useful for distance education to provide programs that help make available additional material for study to those students who want it.

Regarding students' familiarity with working with students, no dependence was observed on whether they could, as future teachers, remotely assess students or the achievement of the goals they had set for the specific course.

In addition, regarding students' familiarity with the use of computers and the Internet, it was found that students who think that students are not at all familiar with computers and the Internet understand the experiment more when it is performed directly by the teacher. Whereas the students who think that they are too familiar with the computer internet argue that the experiment is better understood by the students when shown through a video or a simulation.

Finally, it was observed that the choice of the course "Laboratory Approach to Physics" by the students does not affect, in their opinion, their readiness for distance education in Physics.

In conclusion, the research carried out at the Department of Primary Education of the University of Ioannina found that the students are familiar with the Natural Sciences but not with the distance education course. Many students unfamiliar with the Internet do not know how to use the platforms that assist in distance education other than those they have used while teaching the University's courses remotely. Also, many students do not know the necessary technological means, which the student must have to implement modern or asynchronous distance education. In addition, they seem to prefer a combination of the two methods (synchronous and asynchronous) in the distance education of Physics and argue that the lack of technological means in schools, as well as the teachers' and students' insufficient knowledge of ICT, prevent the implementation of the distance education.

In addition, it was observed that students do not choose courses related to ICT but prefer Physics courses, which offer familiarity with the experimental process. Nevertheless, there is a positive attitude towards their training with special courses, which will help them acquire the appropriate knowledge to teach a Physics course remotely. Finally, they consider themselves moderately prepared to teach Science at a distance and say that it would be very helpful for them to do distance Practice in the given subject.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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1. Stylos, G., Sargioti, A., Mavridis, D., & Kotsis, T.K. (2021). Validation of the Thermal Concept Evaluation Test for Greek University Students' Misconceptions of Thermal Concepts. *International Journal of Science Education*, 43(2), 247–273. https://doi.org/10.1080/09500693.2020.1865587.
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