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## COURSE UNIT ECONOMIC MATHEMATICS – FULL-TIME VERSUS DISTANCE LEARNING

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**Abstract:** *The emergence of a new form of education, apart from full-time and part-time education, seems to be inevitable. Obviously it is about distance education. The Republic of Moldova was forced to switch to online education due to the pandemic, so we already have some skills in organizing this form of education. But are students ready to follow this form of education or, more importantly, are universities ready to offer students the organization of the educational process in the form of distance education. This paper attempts to answer the question of how prepared are students for distance learning, based on the results of the questionnaire that ASEM first-year students participated in.*

**Keywords:** distance education, questionnaire, survey

**JEL Classification:** A2, C8

### 1. Introduction

We live in an information society and it is hard to imagine any process that does not take place without the involvement of information technologies. Obviously, these technologies have penetrated the educational process as well.

If until the COVID-19 pandemic, some information technologies were used and implemented in education slowly and gradually, including by teachers, on their own initiative, interest or desire to use something new, then during the pandemic there was a “massive and rapid invasion” of information technologies in the educational process. This phenomenon also refers to Republic of Moldova, while in some countries information technologies have long been used in the educational process, including online education. For example, at the Academy of Economic Studies in Bucharest, the initiation of study programs offered through distance learning took place in the academic year 1998-1999.

In these almost three years of the pandemic, in higher education in Moldova, including the Academy of Economic Studies (ASEM), the form of distance education was used. During this period, both supporters of distance education and opponents of this form of education appeared both among students and among teachers.

Although the Ministry of Education of the Republic of Moldova approved the Framework Regulation on the organization and conduct of higher education at a distance since 2016 (Ministry of Education of the Republic of Moldova, 2016), at least in the Academy of Economic Studies of Moldova, admission to distance learning studies has not been organized until now. Some universities in Moldova have internal regulations for distance learning, but so far they have not implemented this form of study organization.

A research of the necessity of this form of education, in the context of its attractiveness for local students would be welcome.

## **2. The premises and purpose of the research**

The aim of the study is to investigate the opinion of students regarding the form of distance education, as well as the extent to which they are prepared for the form of online education, consider it attractive and see its advantages. For the purpose of the research, a survey was conducted in which the first-year students took part, participants of the Economic Mathematics course unit, in charge of the course - university lecturer Chicu Olga. Survey participants were first-year students, the form of education full-time, the language of instruction Romanian, the specialties of marketing and logistics and general economics. 52% of students from the respective academic groups participated in the questionnaires, students who actively participated in the course and seminar lessons. It should be noted that the students who participated in the questionnaires, in the first semester of the first year of study, were physically present in classes for a month after which they switched to online education due to the pandemic situation in the country. Thus, they were able to draw conclusions regarding the advantages and disadvantages of the two forms of education: regular and online.

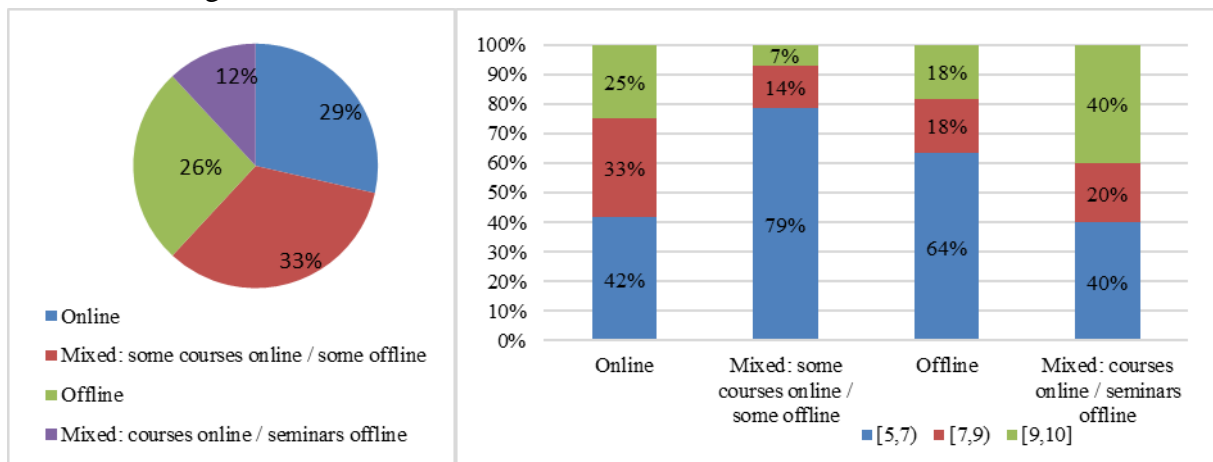
## **3. Survey results**

The questionnaire was not anonymous and took place after the students took the exam so that the results did not influence their answers in any way. One of the reasons for opting for a non-anonymous questionnaire was the fact that we wanted to verify the existence of the dependence between the students' answers and the average grades they obtained in the Economic Mathematics course. It was also important to verify if there is a difference between the marks obtained on mathematics discipline by students in high school, on the baccalaureate for the compulsory mathematics discipline for the real profile and the grade obtained in the economic mathematics course at the university. The results showed that, for the most part, these three grades are the same, varying in some cases by 1 point in either direction.

Another reason for opting for a non-anonymous questionnaire was the fact that in the last question the students' opinion was requested on how the course in offline and online format was organized.

The processing of this information was only possible with the help of additional information such as: class attendance, participation in online and offline seminars, the number of accesses to the teaching materials on the course page on the MOODLE e-learning platform, but also which particular teaching materials were accessed by the respective student. This information is available on the MOODLE platform and can be accessed by the course creator (teacher).

According to the results, the majority of respondents chose online or mixed studies in favour of those with physical presence. More precisely, 29% of respondents chose online (distance) studies as the best form of education organization (figure 1). Among them, 42% obtained a grade in the economic mathematics discipline from the range [5,7), 33% obtained a grade from the range [7,9) and 25% obtained a grade higher than 9. The mixed form of studies, with some subjects taught entirely online and some entirely face-to-face, was selected by 33% of respondents. The type of studies in mixed format, which provides for courses in online format and seminars in offline format, was selected by 12% of the respondents, and 26% of the participants selected the classic form of organization of studies - in offline format.



**Figure 1. The form of studies that students opt for**

**Source:** Developed by the author based on survey results

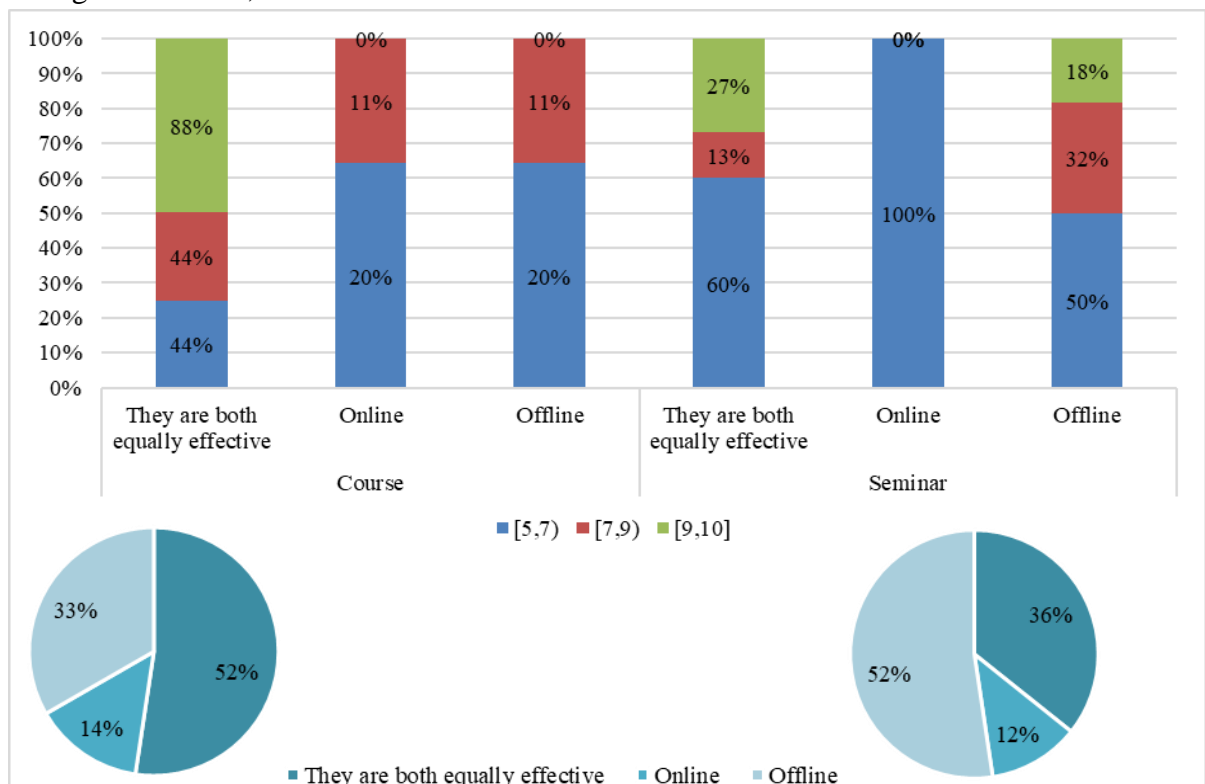
A similar study carried out a year before shows that 13.4% of study participants opt for online studies, 46.3% for physical presence studies and 40.2% for mixed format studies (Chicu O., Chicu V., 2021, p.59). Obviously, comparatively, the situation is changing, the biggest gap being in the option of online studies 13.4% versus 29%. Gradually, students are adjusting to the form of distance education. At the same time, it should be mentioned that the form of studies in mixed format was and is one of the most appreciated by students (40.2% in the academic year 2020-2021 and 12%+33%=45% in 2021-2022).

As far as the economic mathematics course is concerned, the students' choice regarding the form of studies is different from the form of studies in general. In the study, 14% of respondents indicated the online form as the most effective form of course organization and 12% indicated this form for organizing seminars. Regarding the offline form of organizing lessons, 33% of respondents consider it the most effective for the course and 52% for seminars. However, 52% of respondents consider both forms of course organization to be effective, and as for seminars – 36% consider both forms to be effective (figure 2). The following obtained result is of interest: 88% of the students who indicated that both forms of education are effective for the course are students who obtained grades higher than 9 in the exam.

Among the 52% respondents who indicated the offline format of organizing seminars as the most effective, 50% are students who obtained a grade between 5 and 7 in the exam.

Thus, the results of the study show that for students who have a good mathematical knowledge, the form of studies does not have a significant importance, in the sense that they

consider both forms of education effective for the Economic Mathematics course. While students who have a weaker mathematical knowledge opt, for the most part, for studies in offline format. 43% of students indicated that they do not understand everything in the course because they lack the mathematical knowledge, including because they are from the humanistic profile. 21% of students indicated that they have the required mathematical knowledge; however, they encounter difficulties in perceiving information in online classes. And 36% indicated that they have the required mathematical knowledge and do not encounter difficulties in terms of perceiving and assimilating information, both in offline and online classes.



**Figure 2. The most efficient form of organizing lessons in Economic Mathematics**

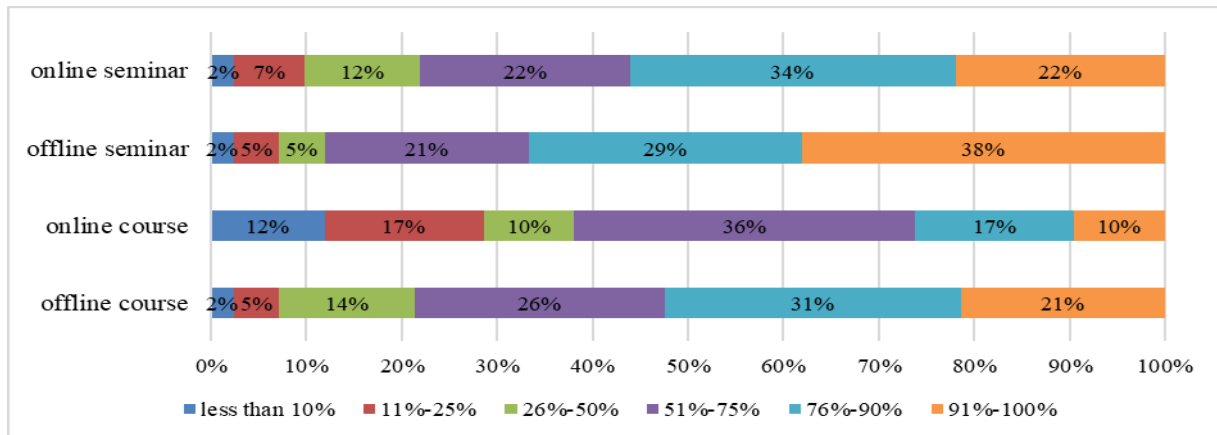
Source: Developed by the author based on survey results

According to the results of the study, the biggest difficulty the students face in online studies is that they cannot force themselves to pay attention in class (86%) or to work independently at the seminars (68%).

In addition, technical problems (45%) are one of the reasons why students opt for studies in offline format. A tiny percentage of students indicated that the reason they opt for offline studies is that they cannot ask questions during lectures and seminars. We consider this issue to be more psychological because the online course was conducted on the Teams platform where chat was available for written questions and there was an opportunity to connect the microphone and ask questions.

At the beginning of the semester, the students who would participate in the study were asked to monitor and note the approximate percentage of the lesson that they paid attention to in both the offline and online classes. The results of the analysis showed that, in general, students were more attentive at the seminars than at course and, as expected, in face-to-face classes students are more

attentive than in online classes (figure 3). The gap is not very big and was predictable, because in the Economic Mathematics course available on the MOODLE platform, students have access to both theoretical materials and solved examples available in video format, image files and .PDF files. Thus, students could access them at any time and study independently if they missed class, or were not paying attention, or did not understand the topic. The materials available on the course page were appreciated both by students who participated in the current survey and by students who participated in last year's survey (Chicu O., Chicu V., 2021, p.58).



**Figure 3. Attention in Economic Mathematics classes**

Source: Developed by the author based on survey results

For distance learning, technical means are of major importance. It is obvious that an adequate technical means facilitates the assimilation of the material and in general the access to the online classes. For the most part, the students who participated in the survey indicated that they use a computer (71% for lecture classes and 79% for seminar classes) or a phone (29% for the course and 19% for the seminar) and tablets are rarely used.

Also, an important factor when students participate in online classes is the conditions in which they work at the time. 95% of students indicated that during online classes they can create conditions where they are not disturbed by any external factors and can concentrate in class. However, 40% of the respondents indicated that there were cases when they connected to the online lessons but were de facto not present in the classes, including for trivial reasons (they fell asleep or were busy with something else), and 60% indicated that there were cases when they could not connect to classes due to technical problems or lack of internet connection, electricity, etc.

A problem in the case of exclusively distance learning is the appreciation of knowledge or more precisely the phenomenon of copying or plagiarism. In the case of online tests and exams, the teacher cannot be absolutely sure that the particular student passes the test, and is not helped by anyone, and does not copy, especially because, at least in the Republic of Moldova, this is a common phenomenon and is not perceived by society in general as a serious problem.

That is why, at least during the pandemic, when there could be no possibility of testing knowledge except in an online format, for teachers, this was a challenge. When creating online tests for students, they had to consider many factors. The tests had to be created in such a way that they were not too easy, not too complicated, excluded the possibility for students to communicate with each other (including through social networks) and help each other, and in the event of help from a third person to write the test for the student, to exclude the possibility of him getting the maximum score, etc.

There are disciplines where the formulation of examination tests is relatively simple, but there are also disciplines for which the formulation of tests in this context is difficult. Economic Mathematics is part of the subjects where formulating the tests for the distance exam, under the conditions of the Republic of Moldova, is a challenge. One obstacle in this regard is the multitude of free online platforms that allow solving examples/problems, some of which also offer step-by-step problem solving. In addition, in the case of solving mathematical examples and problems (we exclude here the problems that involve demonstrations) not only the answer is important, but also the steps in the solution, and in the case of the online test these steps are difficult to take into account. Thus, a simple accidentally missed sign can minimize the final mark to the maximum, although in the case of solving the example by hand, the teacher, most likely, will not charge the student to the maximum.

Obviously, it is possible to formulate problems and examples or questions in such a way as to minimize the possibility of using online platforms for solving, but this requires an increased effort on the part of the teacher, mostly in terms of the time required to formulate such examples. It is also necessary to formulate multiple variants for testing to minimize copying. But not all teachers agree to get involved in the preparation of such tests, and we assume that the main reason is the salary.

The students participating in the survey indicated that if the test were organized online (test on the MOODLE platform) and not in offline format (a few examples that should be solved by hand, not having access to anything other than pen and paper) they would get definitely (48%) or possibly (40%) a better grade and only 12% indicated that the grade would be the same (figure 4). It should be noted that among these 12% are students who obtained no more than 6.6 in the exam.

In the online test students would get a higher grade than in the one organized with physical presence			
Yes, thanks to		No, because of	
<b>Lack of stress</b>	<b>80%</b>	Stress	<b>60%</b>
<b>Using online platforms and applications that solve the examples</b>	<b>60%</b>	The impossibility of using online platforms and applications that solve the examples	<b>40%</b>
<b>Getting help from colleagues and people who know the subject</b>	<b>15%</b>	The impossibility of getting help from colleagues and people who know the subject	<b>40%</b>
<b>Other reasons</b>	<b>10%</b>	Lack of IT knowledge. Lack of computer skills	<b>40%</b>
		Other reasons	<b>20%</b>

**Figure 4. Results expected by students on the test organized in online versus offline format**

Source: Developed by the author based on survey results



#### **4. Conclusions and recommendations**

Speaking of studies, we must take into account that, at least for the discipline of Economic Mathematics, in order to have an understanding of the material studied in university and to have a chance to pass the exam, a minimum set of knowledge in the subject is required, which are formed during lyceum studies.

In the Republic of Moldova, however, there is a problem in this regard. First of all, learning outcomes per country are inequitable, so performance in rural schools is much lower than that in urban schools. Also, in Moldova, academic performance is largely defined by socio-economic status (UNICEF, 2022, p.56). According to the 2020 UN Moldova study, "online education is half as effective as offline education" (UNICEF, 2022, p.56).

Thus, not all first-year students, recent high school graduates, especially among those who had online studies at high school, have a required mathematical knowledge. This, however, is indispensable for the successful promotion of the Economic Mathematics course. Also, although the high school program in the humanitarian profile guarantees that high school students master the topics that are the basis of those in the curriculum of the Economic Mathematics course unit, de facto, in the vast majority of cases, this knowledge is minimal, which is why students encounter difficulties in mastering homework.

The results of the study show that young people in the Republic of Moldova are ready for online studies and can easily switch to it, especially if they have mathematical knowledge from high school. Thus, it is necessary to carry out a research on the extent to which teachers are also ready to be actively involved in the creation of interactive courses on educational platforms. Because both this study and previous studies carried out on samples of first-year students starting in the spring of 2020, showed that students who do well with IT technologies and had access to teaching materials on ASEM's e-learning platform in courses: either video files explaining problem solving or video recording of lessons, indicated that they opt for online studies to the detriment of offline ones. It should be mentioned that, even students who have lack the mathematical knowledge opt for online studies.

Because the students enrolled in the studies have different study profiles (humanist, realist, arts, sports) they also have a different preparation in terms of knowledge in mathematics. In order to ensure an optimal study process, it would be appropriate to restrict the admission of candidates to studies with an economic profile in the sense of admitting only those with a real profile, or to test a priori knowledge in mathematics and oblige candidates who do not have it to pass a minimum math course.

Distance learning involves not only the creation of the legal framework, but also the creation of the corresponding teaching materials, which definitely include at least video recordings of the courses. It is obvious that, in the case of distance learning, universities are oriented not only towards local students, but also towards foreign students. Thus, online courses should at least be in English. All this generates expenses that include not only the appropriate remuneration of teaching staff, but also the procurement of the appropriate technical equipment, as well as expenses for its maintenance and the development and maintenance of the necessary software and much more. Although all the mentioned expenses are considerable, they will certainly pay off in time with proper management.

Inevitably, distance learning belongs to the immediate future in education and will increasingly infiltrate the educational process gradually becoming the norm.

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