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O. Shkolnyi

National Dragomanov Pedagogical University, Ukraine
shkolnyi@ukr.net

ORCID: 0000-0002-3131-1915

Yu. Tykhonenko

National Dragomanov Pedagogical University, Ukraine
jt.yulia@gmail.com

ORCID: 0000-0002-7003-6266

ADVISABILITY AND POSSIBILITY OF USING ICT DURING PREPARATION FOR THE EIA IN MATHEMATICS

ABSTRACT

Formulation of the problem. At present, any researches on the methodology of organizing and conducting external independent assessment of academic achievements in mathematics of Ukrainian graduates has become extremely relevant. In particular, this is due to the fact that from 2021 the EIA in mathematics is mandatory in the system of state final attestation. The aim of this work is to determine the advisability and possibility of using information and communication technologies in preparation for the EIA in mathematics. To achieve this goal, we organized a statistical survey of students, the results of which can then be used to create guidelines for professionals in preparation for independent assessment.

Materials and methods. To achieve the goals of the article, we use empirical methods: our own survey using an electronic tool (Google form), monitoring the learning process of students, as well as analysis of their achievements results. In the paper we use the set of scientific cognition methods: comparative analysis to clarify different views on the problem; systematization and generalization to formulate conclusions and methodological advices; generalization of the author's pedagogical experience and observations.

Results. According to the survey of Ukrainian graduates, most of them choose a combined approach in preparation for the EIA in mathematics, i.e. use both electronic learning tools and printed textbooks. Most students prefer to prepare for testing with a tutor or on the special offline courses. Independent preparation is mostly inherent for students of classes and schools of physical and mathematical profile. More than 80% of respondents have a positive attitude for using of e-learning tools in preparation for the EIA, and the most popular of them are online test platforms and video tutorials on YouTube. 64% of surveyed students are satisfied with their own level of preparation for the EIA in mathematics, and among the reasons for dissatisfaction are the lack of knowledge and skills acquired at school. However, most respondents believe that preparation for the EIA should be completely provided by the state on a free basis. At the same time, the main way to improve the system of preparation for external examination students consider the need for funding of teachers and test participants.

Conclusions. Electronic aids in preparation for the external examination in mathematics are still unpopular. The reason for this may be the low level of technology dissemination in our country. That is why offline courses and tutors are the most typical choice of entrants in preparation for the EIA. The willingness of students to pay tutors shows the current inability of the state to provide students with the necessary level of knowledge in general and for the EIA in particular within the school curriculum. Thus, in Ukraine there is a situation when the "shadow" education system dominates in quality and popularity over the official one. The problem facing the state is how to regulate the shadow sector of educational services in such way that it does not hinders, but helps and contributes to ensuring the proper quality of education.

KEY WORDS: EIA and SFA in mathematics, information and communication technologies, e-learning aids.

INTRODUCTION

Formulation of the problem. In modern educational researches, external independent assessment of academic achievement (EIA) in mathematics is now perhaps the most relevant topic. Indeed, this type of state standardized assessment is a classic "high stakes testing" (see, for example, (Au, 2011), (Berliner, 2011), (Lingard, 2013)) and performs a dual function in

Ukraine: it is, in fact, the only a tool for competitive selection for admission to Ukrainian universities, as well as a test of state final attestation (SFA) for graduates. According to the decision of the Ministry of Education and Science of Ukraine (MES of Ukraine, 2019) from 2020/2021 academic year EIA test in mathematics is mandatory in the SFA system. This fact further enhances the already significant public attention to the content and organization of preparation for this type of testing.

It should be noted that the existence of the EIA is now perceived by Ukrainian society ambiguous. In addition to positive reviews, which still dominate (see (Rating Group Ukraine, 2018)), there are also negative ones. Moreover, it cannot be said that these negative responses are rare. For instance, very recently a petition for the complete abolition of the EIA on the website of electronic petitions of the Cabinet of Ministers of Ukraine received more 25 thousand votes (Cabinet of Ministers of Ukraine, 2019). Therefore, it is obvious that the existing system of independent assessment needs a detailed analysis by specialists in order to further improve and develop it.

Analysis of current research. The history of the introduction and formation of the EIA can be traced by sources (Liashenko, 2008), (Dvoretska, 2015), (Shvets et. Al. 2020) and others. It is now difficult to say what was the main reason for the introduction of the independent testing system. On the one hand, the level of corruption in admission to Ukrainian universities in the early 20th century was so high that public opinion required decisive action in response from the state (Protasova et. al., 2012). In addition, the problem of inadequate assessment of students' achievement and the same corruption during the matriculation exams has caused concern not only among education officials, but also in a significant number of parents. It is clear that the introduction of the system of independent assessment of the quality of students' knowledge was a significant step towards overcoming both of these problems.

On the other hand, the development of test technologies was actively funded in Ukraine by the J. Soros Institute of Open Society and the American Council under the USETI program (see (McLaughlin, 2013) and (Liashenko, 2008)). The country's course to implement its own educational system in European and the worldwide systems required steps to harmonize the quality standards of assessment of student's achievement with world traditions. Therefore, the deployment of the external testing system took place in stages and with extensive use of world experience. Experts from USA, Finland, Poland, Lithuania, Georgia and other countries were involved. However, approaches to "high stakes testing", for example, in Finland and the United States differ significantly. Therefore, it cannot be said that the current system of independent assessment in our country copies the system of entrance and final examinations of any of these countries. Ukraine has followed a combination of several approaches to the system of independent testing. Therefore, in particular, in the test of EIA in mathematics there are now tasks with the choice of one correct answer from several alternatives – multiple choice questions (MCQ), typical of American tests, and open-ended tasks with full explanation, inherent in testing the leader of educational comparative researches rankings – Finland (Sahlberg, 2015).

The aim of the article. In this article, we focus on the study of advisability and possibility of using information and communication technologies (ICT) in preparation for the EIA in mathematics. Namely: on the basis of statistical survey and analysis of our own experience we are going to disclose the attitude to the applications of modern technologies in the process of preparation for testing in mathematics of Ukrainian entrants. This will allow us to formulate guidelines for specialists in preparing for the EIA in mathematics that, which help to ensure a proper quality of this training.

MATERIALS AND METHODS

To achieve this aim we use the theoretical method of analysis of methodological literature on the research question. We also exploit some empirical methods: our own poll with help of Google form electronic tool, observation of the educational process in secondary schools and on the special exam preparation courses, as well as analysis of students' achievements. In this article we also use a set of methods of scientific knowledge: comparative analysis to clarify different views on the problem and determine areas of research; systematization and generalization in order to make conclusions and formulate recommendations to preparing for national standardized assessments of academic achievement in mathematics; generalization of the author's pedagogical experience and observations.

RESULTS

We have developed a statistical survey to find out the attitude to the EIA in mathematics and to the methods of preparation for it. Unfortunately, in the context of the COVID19 pandemic, it has been conducted exclusively online using Google forms, social networks and messengers (Telegram, Viber, Facebook, Instagram). This, of course, limits in some way the audience of respondents, but still allows us to draw certain conclusions about existing trends and patterns. The poll has been conducted mainly among 2021 entrants and current students who passed the external examination in the last few years. A total of 150 people took part in the survey. Among them, the majority (51%) have an average level of training in mathematics (7-9 points), a high level (10-12 points) have 35% of respondents, and an initial and sufficient (1-6 points) – the remaining 14%. Also, among the respondents, 45% are students of classes and schools of physic and mathematics or economic profile, the rest are students of secondary schools or schools with a profile other than mathematical or economic.

Below we provide the complete list of questions and poll results in the form of tables and chart, as well as add comments to them.

Question 1. How do you prepare for the external examination in mathematics?	
<i>Answers</i>	<i>% of all respondents</i>
On specialized offline courses in a group, using both printed manuals and online platforms and electronic manuals	20,16%
With tutor offline, using printed manuals only	13,95%
With tutor online, using both print guides and online platforms and electronic manuals	13,18%

No special training is required, there are enough math lessons at school	13,95%
With tutor offline, using both printed tutorials and online platforms and electronic manuals	12,40%
Independently, using printed manuals only	5,43%
On specialized offline courses in a group, using printed manuals only	5,43%
With tutor online, using only online platforms and electronic tutorials	5,43%
Independently, using both printed manuals and online platforms and electronic manuals	4,65%
Independently, using only online platform and electronic manuals	3,10%
On specialized online courses in a group, using only online platforms and electronic tutorials	2,33%

As we can see, only online training (in courses, with a tutor or independent) is unpopular among children. However, it should be noted that only 11% of all respondents use printed textbooks only, and the rest of respondents use online support for preparation for the EIA. It is also interesting that the weaker the level of basic mathematical training of the student, the more often he or she uses ICT. Independent preparation for the EIA is inherent for students of classes and schools with physical and mathematical profile (70% of all students who prepare independently).

The results of the survey show that for students with a high level of mathematical training there is no difference what way choose to prepare for external examination. On the other hand, middle-level students prefer to work with a tutor or in offline courses (about 60% of all such respondents), online training is less popular among them (only 20%).

For students of schools and classes of physical and mathematical profile, the method of preparation for the external examination in mathematics is also almost not significant, only slightly dominate offline training with a tutor (almost 30% of all such respondents), but partly it is the part of general trend. For students of classes and schools of other profiles, offline courses (more than 35% of all such respondents), online work with a tutor (28%) and offline work with a tutor (24%) significantly dominate.

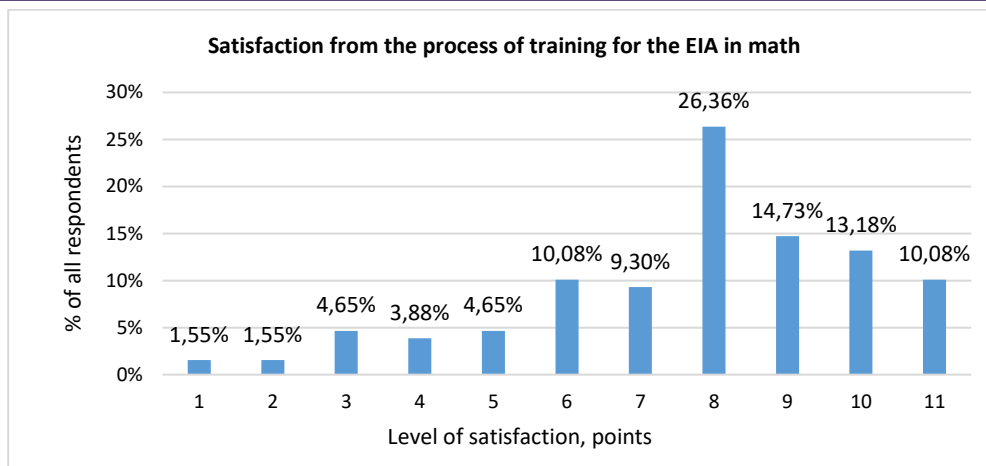
Question 2. What kind of e-learning tools do you prefer when preparing for the external examination in mathematics?	
<i>Answers</i>	<i>% of all respondents</i>
I do not use e-learning tools because I do not have the appropriate technical means (computer, smartphone) and/or Internet access	0,00%
I do not use e-learning tools because I do not feel the need for it, although I have the technical ability to do so	13,18%
I use electronic versions of printed manuals	44,96%
I use online platforms for testing	65,12%
I watch video tutorials on YouTube or other resources	59,69%
I use websites with reference material on mathematics	38,76%
I use online calculators to solve test problems	31,78%
I use other (non-online) application software that allows me to solve test problems.	13,18%

The most popular electronic means of training among students are online test platforms (www.zno.ua, www.osvita.ua and the Ukrainian Center of Education Quality Assessment (UCEQA) website www.testportal.gov.ua), as well as lessons on YouTube (mostly on request on a specific topic). In fact, the only online calculator that students use in preparation for the EIA is Photomath.

Question 3. How useful are e-learning tools for you in the process of preparation for the external examination in mathematics?	
<i>Answers</i>	<i>% of all respondents</i>
E-learning tools are more useful than not, at least they do not interfere with the process of preparation for the EIA in mathematics	47,29%
These tools are definitely useful, without them I can not imagine preparation for the EIA in mathematics	35,66%
It is difficult to answer and evaluate the benefits for electronic tools in the process of preparation for the EIA in mathematics	12,40%
Electronic tools more hinder than help in preparation for the EIA in mathematics	2,33%
These tools clearly harm the process of preparation for the EIA in mathematics	2,33%

More than 80% of respondents have a positive attitude to the use of electronic tools in preparation for the external examination in mathematics, and less than 5% of respondents negatively perceive such resources. This indicates that ICT is a convenient tool for preparing for the EIA, and therefore, it makes sense to develop this area, make it more effective and expand its scope.

Question 4. What is the level of your satisfaction from the process of preparation for the external examination in mathematics? Rate it on the scale from 0 to 10 (0 - completely dissatisfied, 10 - completely satisfied).



As we can see, 64% of respondents have a high level of satisfaction from the process of preparing for the EIA in mathematics (score 7 and above). A significant number (41%) of dissatisfied with the results of their own preparation for the EIA are either training independently or believe that no special training is required. Most of those who are satisfied with the results of preparation for the EIA (60%) work offline with a tutor or on special courses. The share of online training for dissatisfied with the preparation for the EIA is 23%, and for satisfied this amount is 19%. This suggests that online training is unpopular with all groups, but the higher the level of satisfaction, the less people prepare online.

Both print and electronic tools are used by the majority of respondents, but the share of those who choose a combined approach is greater the higher the level of satisfaction with the state of training. Only electronic tools are used by 7% of dissatisfied students and 13.5% of satisfied students. The share is small, but increasing. So far, only electronic training tools are generally unpopular, but satisfied students use them a little more often.

Question 5. Who in Ukraine should organize and implement the preparation of students for the external examination in mathematics?	
<i>Answers</i>	<i>% of all respondents</i>
The state, which must fully provide free training for the EIA of all graduates	52,71%
Nobody, it is a personal matter of each individual entrant	31,78%
Private structures and tutors, which must fully ensure the preparation for the EIA of all graduates as paid service	9,30%
The state, which must fully ensure the preparation for the EIA of all graduates as additional paid service	6,20%

Most of the respondents believe that the preparation for the EIA should be fully provided by the state on a free basis. Note that formally the training process (both organizational and educational) has already provided by the state, because the topics and sections of testing are covered by the school curriculum. The fact that the majority chooses additional means of training indicates problematic moments in the state education system (lack of time, resources, etc.), at least in the context of preparation for final exams.

Question 6. What are the ways to ensure the proper quality of preparation for the external examination in mathematics, in your opinion, should be done first?	
<i>Answers</i>	<i>% of all respondents</i>
There is no need to do anything, because the external examination must be completely canceled and return to the system of final and entrance exams	8,53%
There is no need to do anything, but it is necessary to abolish the obligation of external examination in mathematics	34,11%
There is no need to do anything, because the current situation completely satisfies me	13,18%
Teachers' salaries need to be raised	45,74%
Teachers should be obligated to conduct free consultations and classes on preparation for the EIA in mathematics	26,36%
Teachers should be obligated to conduct consultations and classes on preparation for the EIA in mathematics with an additional fee	18,60%
It is necessary to stimulate teachers by prizes and thanks for ensuring proper preparation for the external examination in mathematics	48,06%
It is necessary to stimulate graduates by prizes and thanks for high results at the external examination in mathematics	48,84%

As we can see, a significant number of respondents feel the need for material encouragement of teachers and students to improve the proper quality of preparation for the EIA. However, entrants who receive high scores on external examination

tests have the opportunity to obtain higher education at state expense. The rhetorical question arises: "Isn't this such the reward that should encourage students to properly prepare for independent assessment?"

CONCLUSIONS

Based on the results of the poll, we can say that *electronic tools in preparation for the EIA in mathematics are still unpopular*. One of the reasons for this situation may be the general weak level of technology dissemination in our country. Note that the survey was conducted mainly in large cities, but even there the situation with the spread of technology is not ideal. In other regions situations with technologies is much worse. It is also obvious that there is *very little diversity among the list of e-resources used by respondents*. This is one of the reasons that they have no significant interest in this method of preparation for external examination. In fact, the market of electronic support for teaching mathematics in Ukraine is almost empty. The software that is currently available in this market does not satisfy potential users. That is why offline courses and tutors are now the most spread choice of entrants in preparation for the EIA in mathematics.

It is also interesting that *among possible ways for ensuring the proper quality of preparation for the EIA nobody indicated the development of information and communication technologies*. Most of the proposals were limited to the funding of teachers and students, and a rather large proportion of respondents believe that nothing needs to be done at all. This means that *students are not aware about training for analogues of the EIA in other countries and do not understand what they can expect from the system of this preparation*.

It is nice that only a small proportion of students support administrative ways for solving of existing problem connected with preparation for the EIA (to obligate teachers prepare students for the EIA free or with an additional funding). Most students understand that such methods are outdated and cannot give results in modern conditions. Therefore, there is hope that over time the situation will improve. The willingness of students to pay for tutors and special courses shows the current inability of the state in schooling to give children good knowledge in general and prepare them for external evaluation in particular (although most respondents believe that the state should do it). This suggests that *the best teachers do not work at the school now, but work as a tutor most of the time*. The reason for this is obviously the insufficient funding of teachers and low motivation of their professional growth in the "white" sector of education.

Thus, currently in Ukraine there is a situation when the "shadow" education system dominates in quality and popularity over the "official". This state of affairs is quite unnatural, and therefore there is an urgent problem that needs to be solved quickly. Otherwise, the gap between the level of student needs (particularly, in preparation for the EIA) and teachers' opportunities will grow due to the low financial and moral interest of teachers in the formal sector, and education itself will go more and more "into the shadow". Technology not only does not prevent this, but also contributes to it, because for extra money and moral incentives tutors and course staff create interesting and modern content using ICT, which increases their popularity among students and allows them to earn even more. Online tutoring, as already mentioned, is not very popular yet, but more and more students are no longer afraid of this method of training, because it gives them access to the best tutors in the country, regardless of place of residence.

The problem facing the state is *how to regulate the shadow sector of educational services in such way that it does not hinders, but helps and contributes to ensuring the proper quality of education*. Methods of pressure (administrative and economic) obviously do not work, because they are not popular among students who do not care who gives them the necessary knowledge and skills in general and prepares for external examination in particular. This problem is now very acute for the MES of Ukraine and the UCEQA. We believe that it is extremely important to understand the role of standardized assessments and ways of preparing for them in the system of ensuring the formation of appropriate competencies of Ukrainian students, as well as their readiness for successful life in society and moral satisfaction with the quality of this life.

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ДОЦІЛЬНІСТЬ ТА МОЖЛИВІСТЬ ВИКОРИСТАННЯ ІКТ ПІД ЧАС ПІДГОТОВКИ ДО ЗНО З МАТЕМАТИКИ

О.В. Школьній, Ю.В. Тихоненко

Національний педагогічний університет імені М.П. Драгоманова, Україна

Анотація.

Формулювання проблеми. Наразі дослідження, що стосуються методики організації і проведення зовнішнього незалежного оцінювання навчальних досягнень з математики українських випускників, набули надзвичайної актуальності. Це пов'язано, зокрема, з тим, що з 2021 року тест ЗНО з математики є обов'язковим в системі державної підсумкової атестації. Метою даної роботи є визначення доцільності й можливості використання інформаційно-комунікаційних технологій при підготовці до ЗНО з математики. Для досягнення цієї мети ми організували статистичне опитування учнів, результати якого в подальшому можуть бути використані при створенні методичних рекомендацій для фахівців з підготовки до незалежного оцінювання.

Матеріали і методи. Для досягнення цілей статті ми застосовуємо емпіричні методи: власне опитування за допомогою електронного засобу (Google form), спостереження за навчальним процесом учнів, а також аналіз результатів їхніх досягнень. У дослідженні використано комплекс методів наукового пізнання: порівняльний аналіз для з'ясування різних поглядів на проблему; систематизація та узагальнення для формулювання висновків і методичних порад; узагальнення авторського педагогічного досвіду і спостережень.

Результати. Як показало опитування українських випускників, більшість із них обирають комбінований підхід під час підготовки до ЗНО з математики, тобто використовують як електронні засоби навчання, так і друковані посібники. Більшість учнів надає перевагу підготовці до тестування з репетитором або на офлайн курсах. Самостійно готуються, в основному, учні класів і шкіл фізико-математичного профілю. Понад 80% опитаних позитивно ставляться до використання електронних засобів навчання в процесі підготовки до ЗНО, причому найбільш популярними з них є тестові онлайн платформи та відеоуроки на YouTube. 64% опитаних учнів задоволені власним рівнем підготовки до ЗНО з математики, а серед причин невдоволення називають недостатку знань, умінь і навичок, отриманих у школі. Однак, більшість опитаних вважають, що підготовку до ЗНО повинна цілком забезпечувати держава на безкоштовній основі. При цьому основним шляхом до вдосконалення системи підготовки до ЗНО учні вважають необхідність матеріального заохочення вчителів та учасників тестування.

Висновки. Електронні засоби при підготовці до ЗНО з математики поки що є малопопулярними. Причиною цього може бути слабкий рівень поширення технологій у нашій країні. Саме тому офлайн курси та репетитори є найбільш розповсюдженим вибором абітурієнтів при підготовці до ЗНО. Готовність учнів платити репетиторам і на курсах показує нинішню неспроможність держави в рамках шкільного навчання дати учням необхідний рівень знань взагалі та для складання ЗНО зокрема. Таким чином, в Україні склалася ситуація, коли "тіньова" система освіти домінує за якістю і популярністю над офіційною. Проблемою, яка виникає перед державою, є врегулювання тіньового сектору освітніх послуг так, щоб він не заважав, а сприяв забезпеченню належної якості освіти.

Ключові слова: ЗНО і ДПА з математики, інформаційно-комунікаційні технології, електронні засоби навчання.

