

Benefits of Digitalization of Textbooks for Improving the Educational Process – A Case Study in the Republic of North Macedonia

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Abstract: *Integration of key questions in teaching and studying is an important factor for a sustainable development of education, including the improvement of teaching quality too. Thus, encouraging critical thinking among students, solving logical tasks based on analyses, a motivation for participating in activities and problem solving, provides a sustainable educational development. Technology needs to support teachers, not to take over their place in education. The enlargement of professional ICT use will influence positively on the enlargement of ICT competencies of teachers. In this context is the research which has the aim to analyze the efficiency of the digital platform www.nastava.mk, the success of students in using the platform according to their academic level, the intensity of using the platform, way and reason for using the platform and the influence of ICT competencies of teachers for achieving a greater success of students. Results have shown that there is a significant connection between academic success and the success of using the platform among students, also, there are statistically significant differences of students' success on the platform according to the intensity of using the platform itself as well as existing statistically significant differences of students' success on the platform according to the teacher's ICT competencies.*

Keywords: digitalization, digital platform, education, skills, competencies

1. INTRODUCTION

Digital competencies represent an important part of contemporary education. Following contemporary ways of studying and teaching, technology and informatics in primary education are important for the educational process in The Republic of North Macedonia [1]. For a normal function of a contemporary society, according to the European frame for digital competencies, it is necessary to fulfill the parameter for producing digital contents. Thus, digitalization of teaching contents takes a particular place by using the digital platform **nastava.mk** [2]. This digital platform represents an innovative source of digital textbooks for fourth, fifth and sixth grade. The platform provides personal way of studying that is adjusted to every student by using contemporary digital and interactive contents. Through these multimedia contents, a teacher has the opportunity for a creative and dynamic way of acquiring knowledge using a fast, quality and simple method. The professional use of information and communication technology positively influences on the enlargement of ICT skills among teachers [3].

By registering on the platform and signing in with codes, students can use the platform and the textbooks in any time and from any place with an internet connection. This enables a flexible studying and an individual research. The digital platform does not replace textbooks, but it is an additional option for studying. Students can choose whether they use the digital textbook or the printed textbooks or both of them. After reading the content, students can check their knowledge through quizzes and interactive tasks. Except from immediately knowing whether the answer is correct or incorrect, the system gives the correct answer after several unsuccessful attempts [4].

The digital platform offers the opportunity for visual marking and pointing out the given contents by offering notes for personal thinking and reminders. The platform is available only for registered users through their own accounts with the highest standards for security of personal data. The system itself offers a fast and easy communication between teachers and students, assigning homework, revision tests, as well as individually following the development of every student.

1.1. Navigation of the platform

In the part of *my contents* there are all textbooks approved by the Ministry of Education and Science of the Republic of North Macedonia [5]. There are textbooks for fourth, fifth and sixth grade on the languages used for tutorials in North Macedonia. The teacher creates a grade for realization of tutorials with students. Parents can create a family group with their children who still study. It is especially significant that the platform offers data for the list of most successful students, grades and schools that joined the platform.

The most successful school in the country in the time of setting up of the platform is Municipal Primary School *Petar Zdravkovski Penko*, Butel, Skopje with 31003 points, on the second place is Municipal Primary School *Dituria*, Bogovinje with 231785 points. Also, on the platform you can notice the most successful students in the country and the number of points they have. The most successful student has got 21700 points, and the second student on the list has got 21600 points [2].

For a successful usage of the platform there was training for all teachers in North Macedonia who teach in these grades. These contents were included in the training: registration of teachers, usage of textbooks, registration of students, and how parents can monitor the process of using digital textbooks. Continually, through different channels, there is a technical support for all questions that arise related to the usage of the platform.

2. METHODOLOGY OF RESEARCH

As it was said in the introduction, this work analyses the efficiency of the digital platform *nastava.mk*, which presents an innovative resource of digital textbooks for fourth, fifth and sixth grade. The platform offers a personal studying adjusted to every student using contemporary digital and interactive contents. Except from external motivation caused by the interesting digital contents, an inner motivation in students occurs [6]. Students can individually progress, with their own intensity of studying and to compete with themselves collecting points from quizzes, solving tasks. Through these multimedia contents a teacher has the opportunity on a creative way and in a dynamic atmosphere to create a fast, quality and simple access in acquiring knowledge.

There is no strict connection between a student and a teacher when digital textbooks are used, because students can self-evaluate themselves in any moment, and teachers are there to encourage them in the process of learning, progress and studying. Therefore, students' success on the platform is analyzed by their points and the teacher's creativity for using contents from the platform itself.

There is data for students' results from half-term, the intensity of using the platform (I do not use it or I use it every day), as well as the way and the reasons for using the platform (from an assignment given by the teacher to using it just for fun). During the research all the interviewed students were with a high academic level of success because there was a very small number of students who had a low academic success. Students with a high level of academic success usually joined the platform. As we can conclude from the further analyses of the premises, the key point is that the students with a high level of academic success have not reduced their success. This fact can help students with a lower level of academic success to improve their success, but the most important thing is to motivate them to use the platform itself. The role of the teacher is important for this process. For the teachers, the level of ICT competencies is evaluated through a survey of 23 indicators for ICT competencies for mathematics as a subject (the influence of their creativity on the students' success by using the platform).

2.1. Aims of teaching

The aim of this research results from the above mentioned data, and that is analyses of mathematics in primary education according to the usage of digital tools in teaching, more precisely analyzing the efficiency of the digital platform *nastava.mk* which represents an innovative resource of digital textbooks for fourth, fifth and sixth grade. So we have analyzed the efficiency of the platform, students' success using the platform depending on the academic results of the students, the intensity of using the platform, the way and reason for using the platform and the influence of teachers' ICT competencies on students' success (as creativity for giving solutions in the platform).

2.2 Techniques, methods and examples of research

This research has been conveyed by using the two data bases from the platform for success analyses of students through fully acquired points, and on the other hand by using the technique Vetting (close-ended questions with Likert Scale), by using survey sheets as a research instrument for evaluating mathematics teacher's ICT competencies.

The analyses is done by using quantitative tests with a percentage frequency of the given answers according to the Likert scale by using descriptive statistics of numeric and percentage values as well as conclusive statistics with a quotient of connection and t-tests for the potential differences of arithmetic means.

There were 92 students in total from fourth, fifth and sixth that were being surveyed and 9 mathematics teachers, teachers from different ethnic groups were included, from Municipal

Primary School *Petar Zdravkovski Penko*, municipality of Butel, Skopje (310032 points in total) and municipal Primary School *Ditura*, Bogovinje (231785 points in total).

2.3. Research premises

Based on the presented aim and objective of the research, we have structured the following premises in continuation:

X1. There is a significant connection between the academic results of students in mathematics with the results from the platform *nastava.mk*.

X2. There is a significant difference in success between mathematics students according to the intensity of using the platform itself by students.

X3. There is a significant difference in success between students by using the platform according to the way and reason of using the platform by the students.

X4. There is a significant difference in success between students according to the level of ICT competencies of mathematics teachers.

3. FINDINGS AND RESULTS

By summarizing the results and working on data that are generated from the platform for 92 students in total, it is concluded that students have reached a maximum of 21700 points and a minimum of 18702 points with an arithmetic mean of $M=20742$ ($sd=595,446$) as presented in Table 1.

Table 1. Description of students' success on the platform

N	Valid	92
	Missing	0
Mean		20742,14
Median		20640,00
Mode		20604
Std. Deviation		595,446
Minimum		18702
Maximum		21700

In Table 2 there is a presentment of a statistical description of academic success of students from the first term of school year 2023/24, with a middle arithmetic mean of $M=4,039$ ($sd=,703$).

Table 2. Description of the academic success of students in the first term of school year 2023/24

N	Valid	92
	Missing	0
Mean		4,0387
Median		4,2150
Mode		3,36 ^a
Std. Deviation		,70308
Minimum		2,40
Maximum		5,00

After working on data for students, results have shown that over 46% of them have used the platform several times a month, around 23% two or three times a week, 18% declared that they have

not used it and 12% that they have used it every day (Fig. 1).

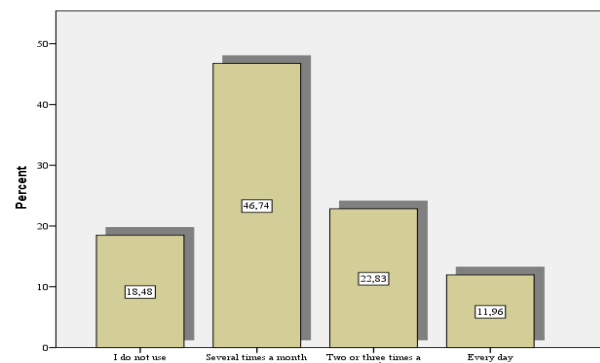


Figure 1. The intensity of use of the platform by the students

For the way and reason of using the platform, about 23% of students declared that they have used the platform as an assignment given by the teacher, 21% use it just to show their skills and knowledge, in a fewer percent they have declared that they use it as a substitute or replacement in studying and around 14% declared that they use it for other types activities (Fig. 2).

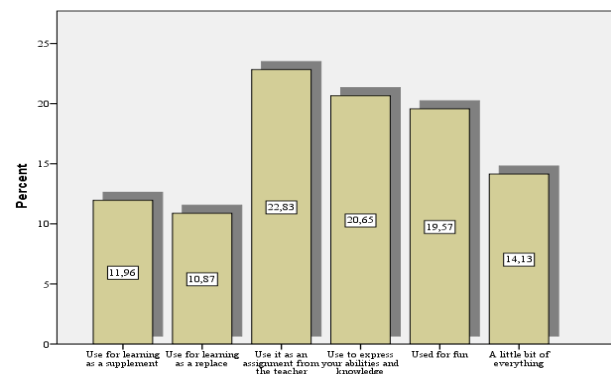


Figure 2. Method and reason for using the platform by students

On the other hand, after working on data for the level of ICT competencies of mathematics teachers, with the survey, results have shown that 39% of them have middle ICT competencies, 37% are with high ICT competencies, opposed to 24% with low ICT competencies (Fig. 3).

Based on the assumed premises between the potential connection of academic success of students in the platform X1 the following results are given: There is a significant connection between the academic success of students with the success in mathematics in the platform *nastava.mk*, in other words it is assumed that students with high academic success will also have a great success in using the platform. The platform has a great influence on the academic achievements of the students. These results enable the development of personalized programs for the support of students with a lower academic success in order to improve their results. It is a key fact that students' success has not reduced while using the platform.

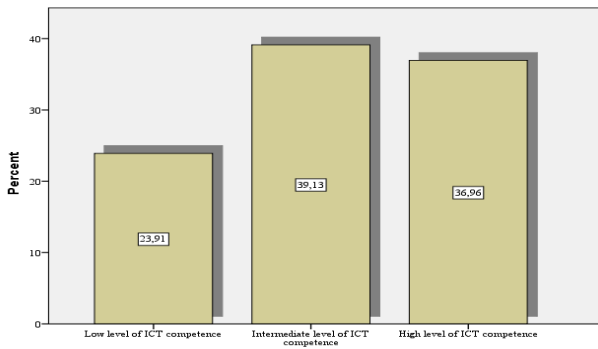


Figure 3. The level of ICT competences of mathematics teachers who are responsible for the success of students in the platform

The direction of the (a positive way up and right) line of connection in Figure 4 with R^2 Linear=0,400 means that there is a significant connection between the academic success and the mathematics success in the platform. In other words the good and the excellent students have good and excellent results in the platform.

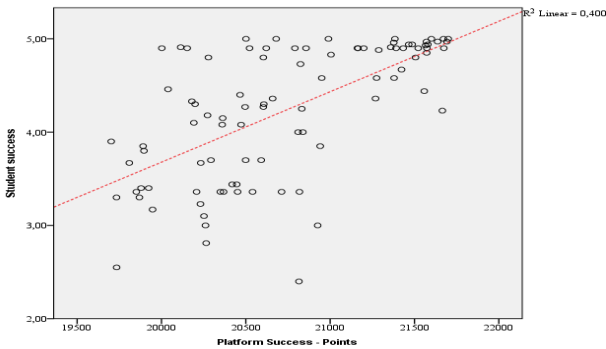


Figure 4. The relationship between student success and platform success

About X2. There is a significant difference in the success of students in mathematics in the platform according to the intensity of using the platform itself by the student, in Table 3 there are arithmetic means of the success in the platform according to the intensity of using the platform itself by the students.

Table 3. Success of the digital platform according to the intensity of its usage by students

	N	Mean	Std. Deviation	Std. Error	F	Sig.
I don't use	17	20781,18	619,032	150,137		
A couple of times a month	43	20765,98	539,475	82,269		
Two or three times a week	21	20446,38	584,080	127,457	3,854	,012
Every day	11	21153,27	577,960	174,262		
Total	92	20742,14	595,446	62,080		

For $F=3,854$ with $Sig=,012$ ($p<0.05$) we have concluded that there are statistically significant differences in the students' results on the platform according to the intensity of using the platform itself (Fig. 5). The differences are leveled in two

groups thus in the first one there are students with a great success of using the platform every day opposed to the second group with a lower success of students who use the platform two or three times a week, a couple of times a month and those who do not use it (rarely, only the teacher).

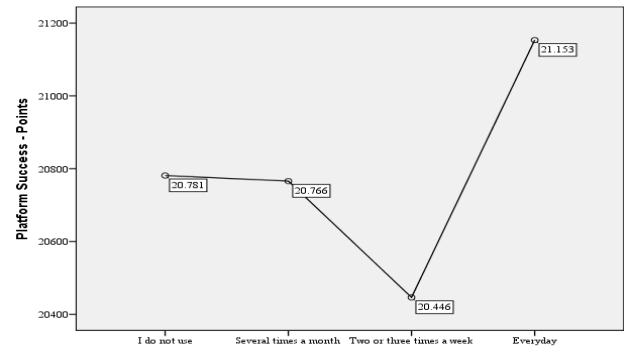


Figure 5. Intensity of use of the platform by the student and success in the platform - Points

Also about X3. There is a significant difference in the success of students in mathematics on the platform according to the way and reason for using the platform itself by the student. In Table 4 there are arithmetic means of the success in the platform according to the way and reason of using the platform itself by the students.

Table 4. Success of the platform according to the way and the reason of its usage by students

	N	Mean	Std. Deviation	Std. Error	F	Sig.
Used for additional studying	11	20690,18	606,642	182,910		
Used for studying as a replacement	10	20920,90	542,559	171,572		
Used as an assignment	21	20691,19	601,894	131,344		
Used to show personal skills and knowledge	19	20658,16	530,755	121,763		0,652 ,0189
Used for fun	18	20525,28	648,593	152,875		
From different things	13	21153,92	489,805	135,848		
Total	92	20742,14	595,446	62,080		

For $F=,652$ with $Sig=,189$ ($p>0.05$) we have concluded that there are statistically significant differences in the students' results on the platform according to the intensity of using the platform itself.

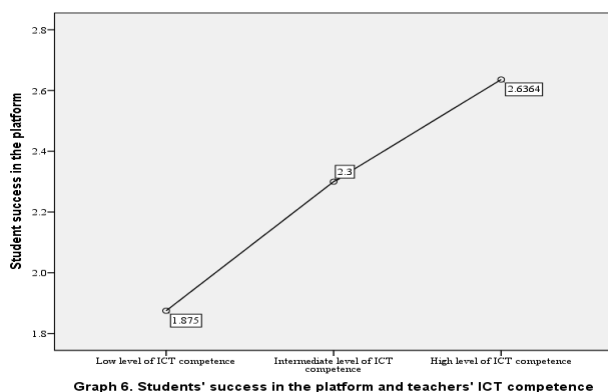
About X4. There is a significant difference in students' success in Mathematics in the platform according to the level of ICT competencies of the mathematics teacher, teachers who explain the usage of the platform with their own creativity and competencies, in Table 5 there are arithmetic means of the success in the platform according to the level of ICT competencies of the mathematics teacher.

Table 5. *The success in the platform according to the way and the ICT competencies of the mathematics teacher*

	N	Mean	Std. Deviation	Std. Error	F	Sig.
Low level of ICT competencies	22	20822,73	475,331	101,341		
Middle level of ICT competencies	36	20652,78	627,222	104,537	2,689	,025
High level of ICT competencies	34	20784,62	633,865	108,707		
Total	92	20742,14	595,446	62,080		

For $F=2,689$ with $Sig=,025$ ($p<0.05$) we have concluded that there are statistically significant differences in students' success in Mathematics on the platform according to the level of ICT competencies of the mathematics teacher.

The differences are leveled in two groups thus in the first one there are students with a middle and high level of success of teacher's ICT competencies opposed to the second group with a lower success of students whose teachers have low level of ICT competencies (Fig. 6).

**Figure 6.** *Students' success in the platform and teachers' ICT competence*

4. CONCLUSION

Based on the collected data and results we have concluded that over 46% of students used the platform several times a month for Mathematics, about 23% two or three times a week, 18% declared that they have not used it and 12% that have used it every day. On the other hand around 23% of students have declared that they have used the platform as an assignment given by the teacher, 21% used it just to show their personal skills and knowledge, in a smaller percentage they have declared that they used it as an extra way of studying and around 14% declared that they have used it for other different activities. For the ICT competencies of teachers, it resulted that 39% of them have shown middle ICT competencies, 37% high ICT competencies, opposed to 24% with low ICT competencies.

Based on these data, after the analyses done for interpretation of the premises, we have concluded that there is a significant connection for achieving a greater success in mathematics for students who used the platform because of maintaining a high level of motivation. In other words the good and the excellent students have shown good and excellent results presented on the platform. Also, there are statistically significant differences in the success of students who used the platform according to the intensity of using the platform by them, a presentment of high results of students who use the platform.

There are statistically significant differences between the success of students shown in the platform according to the level of ICT competencies of the mathematics teacher, a presentment of high success of students corresponds to teacher's middle or low level ICT competencies opposed to a presentment of a low success of students that corresponds to a low level of teacher's ICT competencies. In reference to the significant contribution that the digital mathematics textbooks have for a greater success of students in future, it is necessary to convey certain research for quality and permanent knowledge among students for a longer period of time. Sustainability of motivation, which is obvious for using digital textbooks in all subjects, students, teachers and parents need be a matter of future research too. A special challenge is also the influence of key factors for a better motivation in using the platform and if students are really going to show higher results.

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