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SCHOOL MATHEMATICS AND DIGITAL LITERACY

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Abstract

In this article, we focus on the intended development of digital literacy of pupils in all schools, which is presented in the Strategy of the Education Policy in the Czech Republic until 2030+, issued by the Ministry of Education, Youth and Sports in the year 2020. The use of information technologies needs to be integrated into the methods and content of various subjects. From this point of view, we consider the training of future mathematics teachers. How to use digital technology in teaching mathematics?
We deal with a questionnaire survey conducted among students of mathematics teaching at the Faculty of Education, Palacký University in Olomouc in 2021. The objectives of the research were to determine the current readiness of future mathematics teachers to use digital technologies, their awareness of the benefits of digital technology in mathematics in teaching, their view on appropriate use of digital technologies in teaching and their attitude to mastering the basics of programming and the subsequent use of this skill in teaching mathematics. We analyze and process the data obtained from the questionnaire using standard statistical methods.
These findings are very beneficial for 21st century teacher educators. The ability to properly use digital technologies in teaching mathematics has an undeniable pedagogical benefit for the education of a new generation of students. The results of the survey show that students, who are mostly 19 to 21 years old, are acutely aware of the importance of digital technologies today.

Keywords: *Mathematics teachers, digital literacy, pedagogical contribution, questionnaire.*

1. Introduction

In this article we are based on the idea of the intended development of digital literacy of pupils of all schools, which is presented in the Strategy of the educational policy of the Czech Republic until 2030+, (Ministry of Education, Youth and Sports, 2020). We address the views of future mathematics teachers on the applications of digital technologies in mathematics teaching at schools and their effectiveness.

2. Methods

The research investigation mentioned in the abstract was performed on students of the Mathematics Teacher program, Faculty of Education, Palacký University in Olomouc, Czech Republic. To become a mathematics teacher in (lower) secondary education in the Czech Republic, a student must complete three years of bachelor study and two years of master study.

A questionnaire was created, which was distributed online in the spring of 2021 among bachelor students of the Mathematics Teacher program. Many of our students took part in the survey, a total of 60 students (40 first-year and 24 second-year students). A four-point Likert scale was used for the processed data.

3. Results

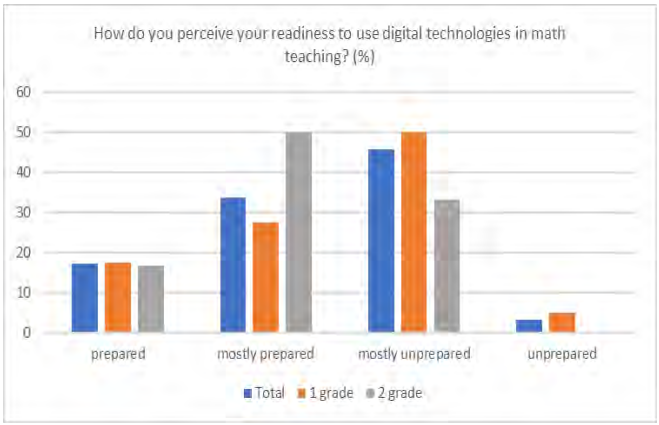
We will list the individual items of the questionnaire and the results obtained.

3.1. How do you perceive your readiness to use digital technologies in mathematics teaching?

In the first half of the bachelor's study, only 34 respondents (53.1%) feel ready for the use of digital technologies in teaching and 30 respondents (46.9%) feel unprepared. Of these, 11 respondents (17.2%) feel fully prepared, 23 respondents (35.9%) feel rather prepared, and 28 respondents (43.8%) feel

rather unprepared, and 2 respondents (3.1%) feel completely prepared. not ready. Given that students still have half of their bachelor's studies and then two more years of master's studies, we can consider the result quite satisfactory. Now let's look at what students expect from further higher education in this regard. For more information for students in total and separately in the first and second year of bachelor's study, see *Figure 1*.

Figure 1. Students' readiness to use digital technologies in mathematics teaching in total and separately in the first and second year of bachelor's study.



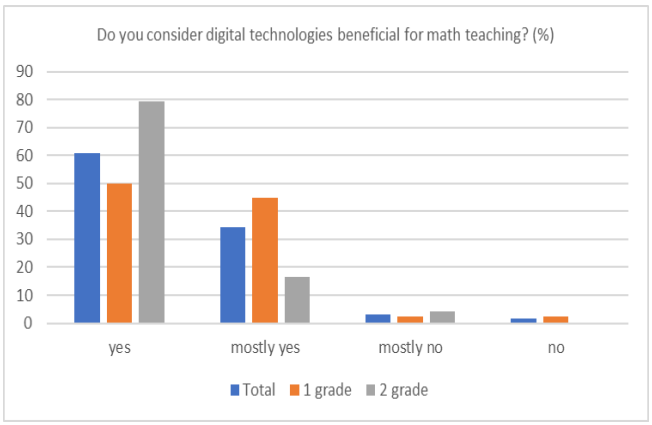
3.2. Do you expect to be sufficiently prepared after graduating from mathematics teaching?

Students' expectations are quite high, 60 respondents (93.8%) expect to be sufficiently prepared for teaching mathematics using DG, of which 19 (27.9%) answer yes and 41 (64%) rather yes. Furthermore, 3 respondents (4.7%) answer rather no and only 1 (1.6%) do not answer at all.

3.3. Do you consider digital technologies beneficial for mathematics teaching?

In the answers to the question about the contribution of DG for mathematics teaching, most positive answers predominate, namely a total of 61 (95.3%), 39 respondents (60.9%) are fully convinced, 22 respondents (34.4%) answer more yes. The answer does not appear in 2 respondents (3.1%) and not only in 1 respondent (1.6%). For more information for students in total and separately in the first and second year of bachelor's study, see *Figure 2*.

Figure 2. Students' opinion (in total and separately in the first and second year of bachelor's study) on the benefits of digital technologies for mathematics teaching.



3.4. How can you use digital technology in teaching math? Specify some ideas

Students most often state use for plotting functions and various graphs: 28 answers, facilitating calculations and practicing the curriculum: 27 answers, greater clarity of interpretation: 21 answers, suitability for teaching geometry and drawing: 18 answers, more fun math: 4 answers.

3.5. Is it beneficial for a math teacher to be able to program and use this skill occasionally during math teaching (primary or secondary school)?

We receive quite surprisingly many positive answers to this question, from 56 respondents (87.5%), of which 24 (37.5%) agree completely and 32 (50%) tend to agree. Furthermore, 4 respondents (6.3%) tend to disagree and so did 4 respondents (6.3%) disagree at all.

3.6. Can you write a simple program in some programming language?

10 respondents (15.6%) can write a simple program in a programming language. These are mainly the following Python programming languages (6 respondents), some version of the C language (4 respondents), then Visual Basic (1 respondent). However, it is interesting that out of 54 respondents (84.4% of the total number) who do not know any programming language, even 43 students (80%) are interested in learning some programming language.

3.7. Indicate what mathematical software can you use? (Excel, Wolfram Cloud, etc.)

All students (except one) stated that they can use at least one, but usually two or more, of the following supporting software in mathematics. Most often EXCEL (28 replies), Wolfram Cloud (17), GeoGebra (10) Wolfram Alpha (8), Maple (1), Mathematica (1).

4. Conclusions

Due to the interest of future mathematics teachers to know the basics of programming (see **3.6**.), we offer students an optional course Programming for Mathematics Teachers. The aim of the course is to develop algorithmic thinking and give students insight about how a computer program is created and how it functions.

A research survey of students preparing for the profession of lower secondary mathematics teacher shows that students understand the challenge of today's introduction of digital technologies into practice, including education. In addition to developing mathematical literacy, they are also interested in digital literacy and their interconnections. It is possible to teach mathematics without digital technologies, but nowadays there is no justification for that. It is necessary to find a suitable application of digital technologies in teaching mathematics.

Universities preparing prospective teachers must also prepare for this situation. The mentioned research survey is the starting point for our Mathematics Department for projects that integrate digital technologies into teaching in all types of schools in a suitable and non-violent way. Nowadays, when even simple applications are available that allow complex symbolic calculations, there is still a lot of (unnecessary) effort in schools in mechanical calculations, so for teaching mathematics there is no time left (Wolfram, 2020). One of the projects focuses on Computer-Based Mathematics teaching and aims to create sample notebooks in the Wolfram Cloud program for teaching mathematics of children aged 11 to 15. Our other projects also focus on developing mathematical literacy, often with the support of digital technologies.

Acknowledgements

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