

# LEARNING MATHEMATICS USING DIGITAL TOOLS

- **E=MD<sup>2</sup>**: Excellence in Math Education through (e) –  
Debate and Diversity

**TSD**

International Conference  
TOWARDS SUSTAINABLE DEVELOPMENT  
**Mother Teresa University**

<https://conference.unt.edu.mk>



### Context of the problem:

In today complex society, learning and understanding mathematics and natural sciences has become necessary for full development of everyone.

One of the priorities of the European Union and our country was to increase the level of mathematics knowledge for the students in all ages (**from 2011 to 2020y to be increased from 10% to 40%)- the newest report in 2021 show the increasing of math knowledge and skills <20%**)

In the development of economy based on knowledge, development of math competences is necessary and big priority (**EU - till 2030 >40%???**)

Till 2030y, the EU will have job for more them 100 000 000 people with high level of math, language and digital competences

### Situation in Macedonia and in the region:

❖ Mathematics is not favorite subject among students in all level of education.

Promoting the need of math competences is necessary for changing students' attitudes toward math (why???)

Teachers should give maximal effort to contribute in increasing the effectiveness of studying math (when, how much???)

To overcome the phenomena that mathematics is not popular subject, the development of new methods by teachers is necessary in teaching math and the students should be active in the realization of the teaching process. ( how???)

By the NCTM, “***Effective mathematics teaching*** requires understanding what students know and need to learn and then challenging and supporting them to learn it well.”

- ❖ Students learn mathematics through the experiences that teachers provide.
- ❖ Teachers must know and understand deeply the mathematics they are teaching.
- ❖ There is no one "right way" to teach.
- ❖ Effective teaching requires deciding what aspects of a task to highlight, how to organize and orchestrate the work of students.
- ❖ Effective teaching requires continuous efforts to learn and improve. Teachers need to increase their knowledge about mathematics and pedagogy.

## Motivation for working:

- ❖ Realized projects in the field of mathematical education, where different methods are considered without any innovativeness
- ❖ There have been not developed an approach by which students will **actively participate in the process of teaching mathematics** in a way that they alone will choose the method that would be included in the curriculum content.
- ❖ Negative Math debate in Macedonia – excluding mathematics as obligatory subject in the state mature which is opposite than experiences over the world, decreasing obligatory hours in national curriculum...
- ❖ Teachers should be **seriously prepared** to answer to the requirements of the economy based on knowledge, and the ability to “offer product” with appropriate qualifications and competences on the labor market

## **Motivation for working:**

- ❖ Weaker students' results on international tests in mathematics and other natural sciences
- ❖ “Fear” of mathematics is one of the reasons why students don't go in gymnasium and technical schools. Natural sciences and technical faculties also are less attractive for students when they make choice what to study
- ❖ Students are not asked anything about this problems!!!

## Lessons learned – past European Math projects

### MathLabyrinth

**Main result: First interactive math e-book for secondary education in MK-2016**

[www.math-labyrinth.eu](http://www.math-labyrinth.eu)

### Math Debate – the voice of students

**Main result: First educational e-platform for learning mathematics - 2018**

[www.mathdebate.eu](http://www.mathdebate.eu)

**LearnersMot2-** Creating a continuous supportive learning environment for the 45+, low-educated and low skilled-adults

**Main result: First on-line course and web-application for learning mathematics and increasing digital competences in area of adult education in MK**

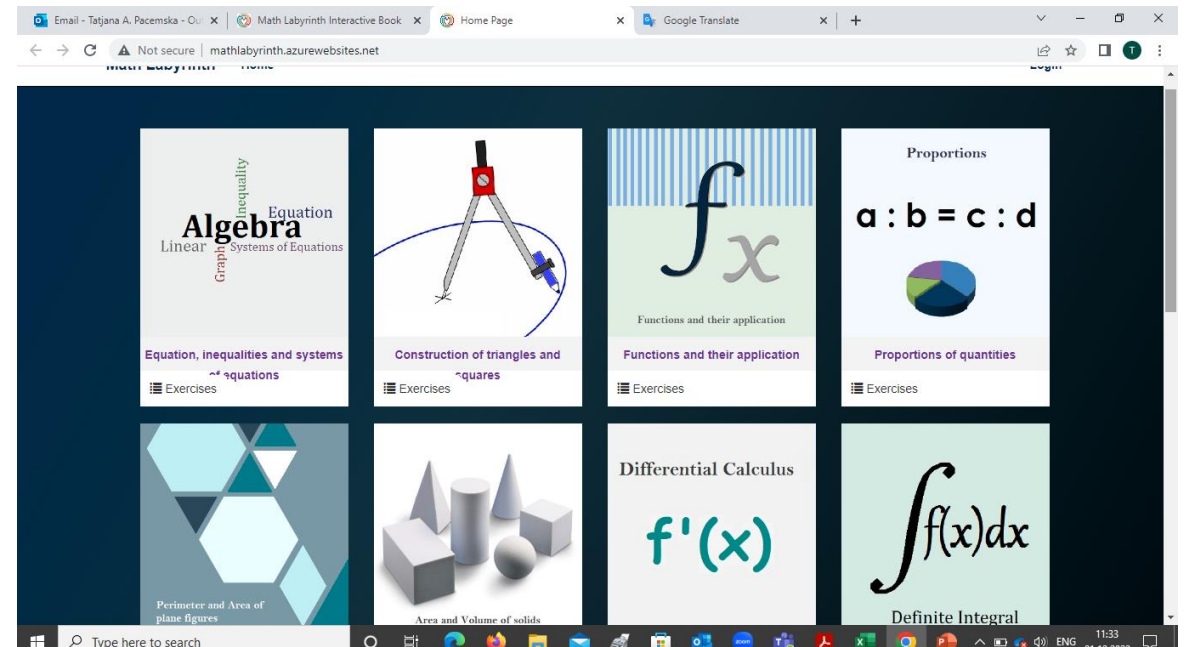
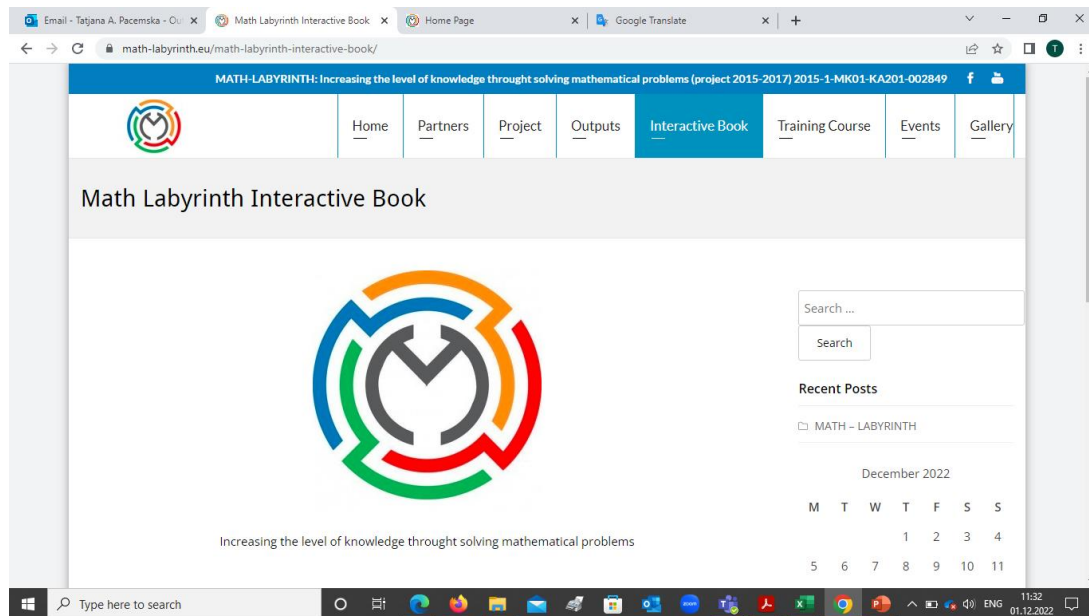


# Lessons learned – past European Math projects

## MathLabyrinth

Main result: First interactive math e-book  
for secondary education in MK-2016

[www.math-labyrinth.eu](http://www.math-labyrinth.eu)






Math Debate – the voice of students

Main result: First educational e-platform for learning mathematics - 2018

[www.mathdebate.eu](http://www.mathdebate.eu)



HomePartnersProjectOutputsEventsGalleryE-Debate

EDUCATION BASE

The modern Educational WordPress Theme

MATHDEBATE

"MATH Debate – the Voice of Students – Searching Excellence in Math Education through Increasing the Motivation for Learning"

TOPICS

The topics of the project are: Key Competences (incl. mathematics and literacy) – basic skills; New innovative curricula/ educational methods/development of training courses; ICT – new technologies – digital competences

PROJECT TITLE

Project title: MATHDebate – the Voice of Students – Searching Excellence in Math Education through Increasing the Motivation for Learning Reference number: 2016-1-MK01-KA201-021659 Implementation period: December 2016 – November 2018

PROJECT TITLE

MATH Debate

RegisterLogin

Select Grade

Grade Other

Grade 10-11

Grade 11-12

Grade 12-13

Grade 13-14

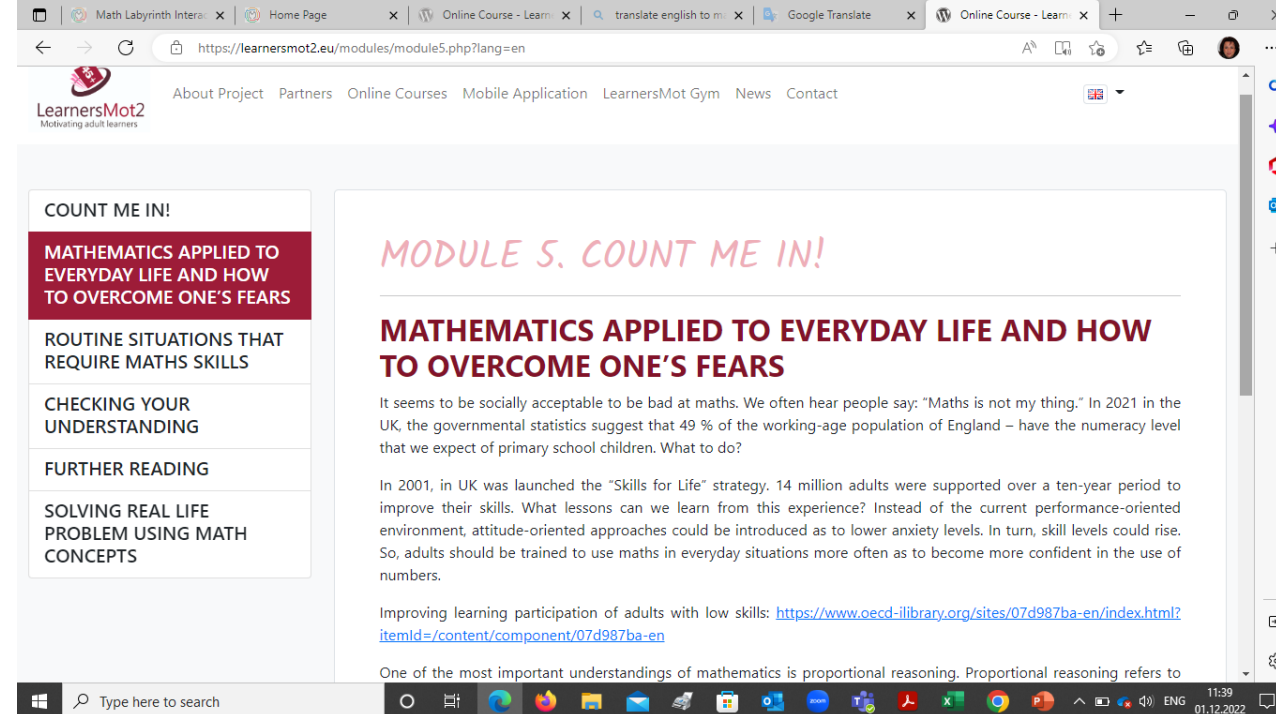
WATCH LIVE CHANNEL

Today Debates

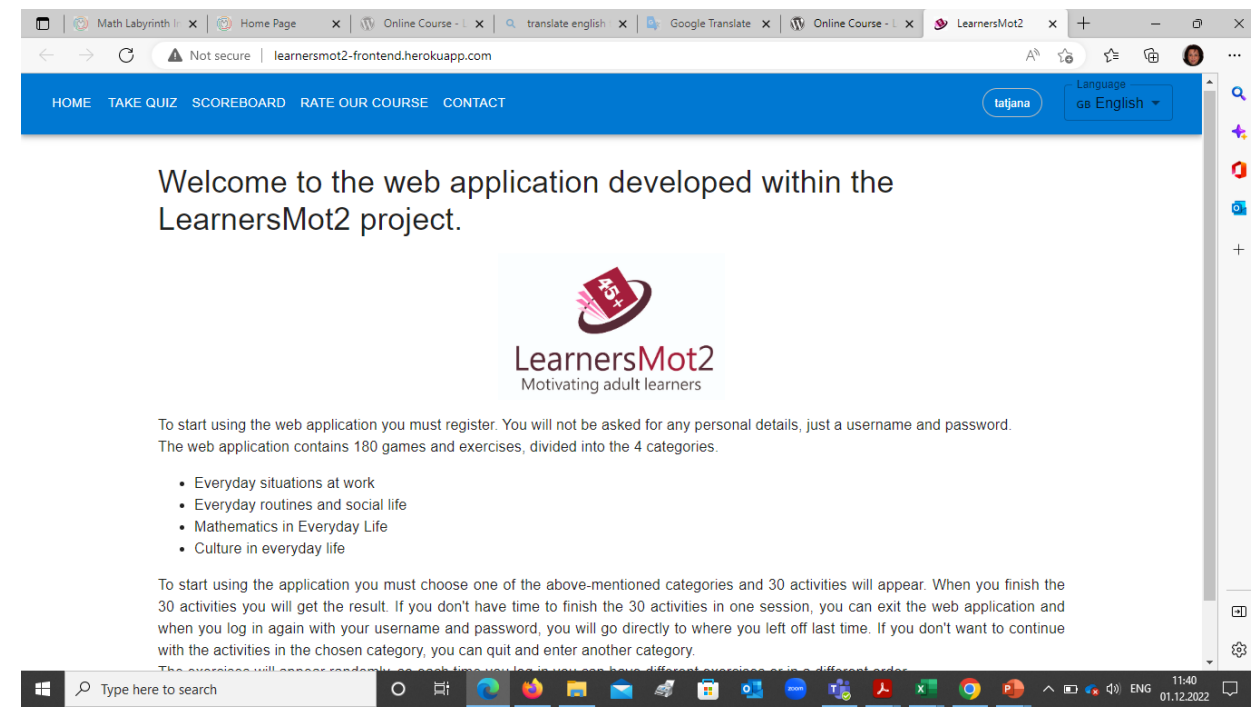
Topic Name	Debate Date
Methods of learning data	13-10-2017 12:00

**LearnersMot2-** Creating a continuous supportive learning environment for the 45+, low-educated and low skilled-adults

**Main result: First on-line course and web-application for learning mathematics and increasing digital competences in area of adult education in MK**

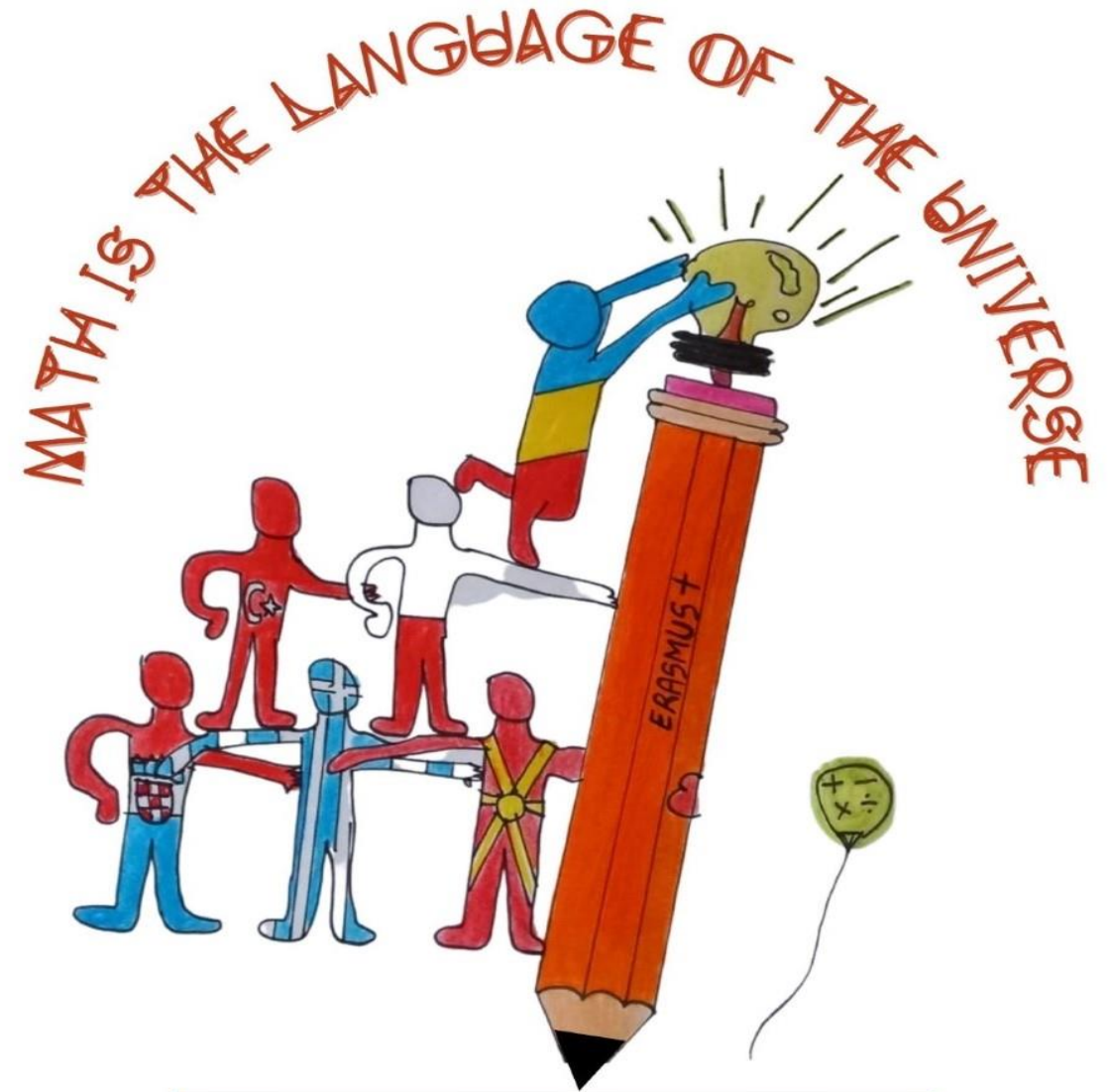


The screenshot shows the LearnersMot2 website with the URL <https://learnersmot2.eu/modules/module5.php?lang=en>. The page features a sidebar with a list of topics: 'COUNT ME IN!', 'MATHEMATICS APPLIED TO EVERYDAY LIFE AND HOW TO OVERCOME ONE'S FEARS', 'ROUTINE SITUATIONS THAT REQUIRE MATHS SKILLS', 'CHECKING YOUR UNDERSTANDING', 'FURTHER READING', and 'SOLVING REAL LIFE PROBLEM USING MATH CONCEPTS'. The main content area displays the title 'MODULE 5. COUNT ME IN!' in pink, followed by the heading 'MATHEMATICS APPLIED TO EVERYDAY LIFE AND HOW TO OVERCOME ONE'S FEARS' in bold. The text discusses the social acceptability of being bad at maths, citing UK statistics from 2021 where 49% of the working-age population has a numeracy level below primary school children. It mentions the 'Skills for Life' strategy launched in 2001, which supported 14 million adults over a ten-year period. A link is provided for improving learning participation: <https://www.oecd-ilibrary.org/sites/07d987ba-en/index.html?itemId=/content/component/07d987ba-en>. The page also mentions that proportional reasoning is one of the most important understandings of mathematics.



The screenshot shows the LearnersMot2 web application home page. The URL is [learnersmot2-frontend.herokuapp.com](http://learnersmot2-frontend.herokuapp.com). The page has a blue header with navigation links: 'HOME', 'TAKE QUIZ', 'SCOREBOARD', 'RATE OUR COURSE', and 'CONTACT'. A user profile 'tatjana' is logged in, and the language is set to 'gb English'. The main content area welcomes users to the web application, stating it was developed within the LearnersMot2 project. It includes the LearnersMot2 logo and explains that users must register with a username and password. The application contains 180 games and exercises divided into four categories: 'Everyday situations at work', 'Everyday routines and social life', 'Mathematics in Everyday Life', and 'Culture in everyday life'. It also mentions that 30 activities will appear when a category is chosen, and users can quit and enter another category.

Ongoing EU Math projects:



Co-funded by the  
Erasmus+ Programme  
of the European Union





**$E = MD^2$ : Excellence in Math Education  
through (e-) Debate and Diversity**

[www.excellenceinmath.eu](http://www.excellenceinmath.eu)

## **Motivation and detected problems**

The process of adaptation of students from on-line to physical education process and their impact in math learning process was regarded and discussed.

Can we achieved better math result in this period?

What about using digital devices?

Can we create attractive learning environment and open math questions in STEAM context which will lead to better understanding of society?

Can we change learning process to be more democratic?

Can we are ready to listen the voice of students and change educational paradigm?

What we are doing now?

- Developing the methodology for **searching excellence in math education in inclusive classroom** in school settings and aims to create a bridge between theory and practice/real life.
- Developing of new teaching method named  $E=MD^2$  as a math teaching method in STEAM context, **peer to peer guided/supported** by teacher education in inclusive classroom, diversity concept in math , through:

a) developing an interactive e-MATHDEBATE platform as a part of new methodology for teaching mathematics for students between age 11-15, based on using ICT. The most important part, will be address **to learners with math disabilities**, supporting peer to peer guided process of learning.

b) Preparing tutorial for using the e-platform. This tutorial will guide teachers, parents and students how to use e-debate platform.

## **Motivation and detected problems**

Although there are changes in the approach in the process of teaching mathematics, the pupils in the primary and secondary schools have aversion for this school subject? Why?

How the students imagine the math studying and its application?

Students need mathematics. Where and when? (For example: Debate with students – Can you imagine one day in your life without numbers and arithmetical operations?)

Is there need more integration of the mathematics in other areas? (For example: including mathematics in real life problems.)

How students can help each others and with ICT tools in the process of teaching mathematics?

How can we convince students that mathematics is so important in their lives?

# Digitalization process in Macedonia, needs, challenges or...

- The need for digitization in education, especially in the field of mathematics with the help of digital tools



**Monitoring of the technical-technological development**



**Following up on the challenges of the new age**



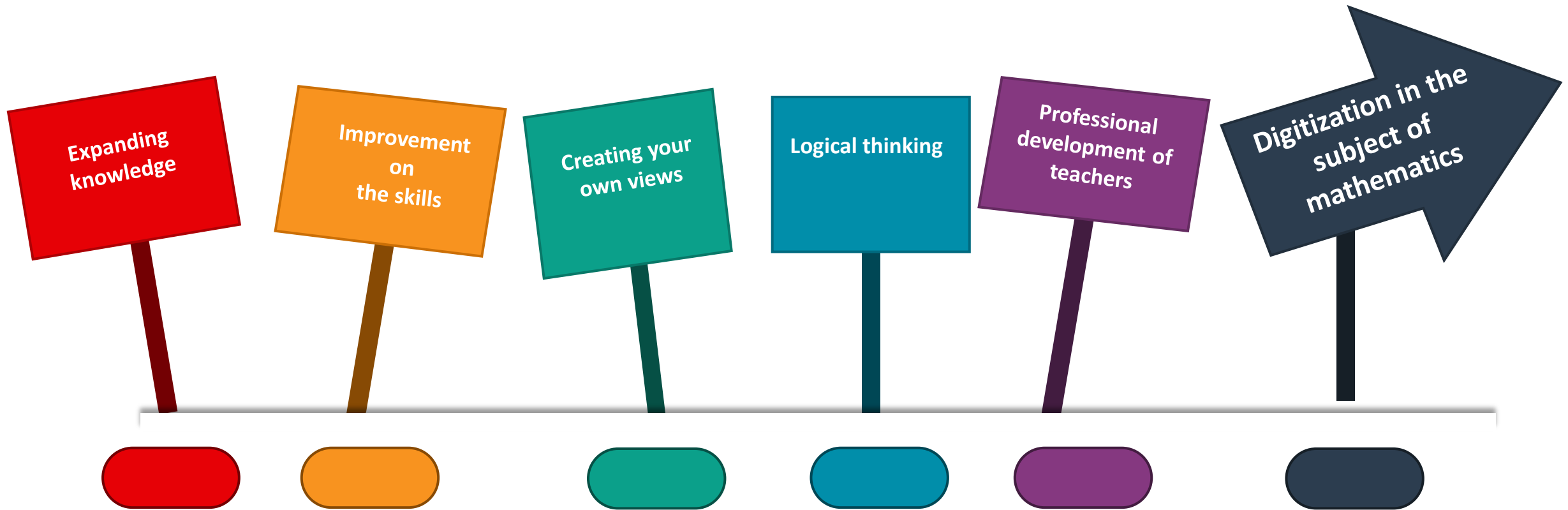
**Analysis of the situation in relation to news in education**



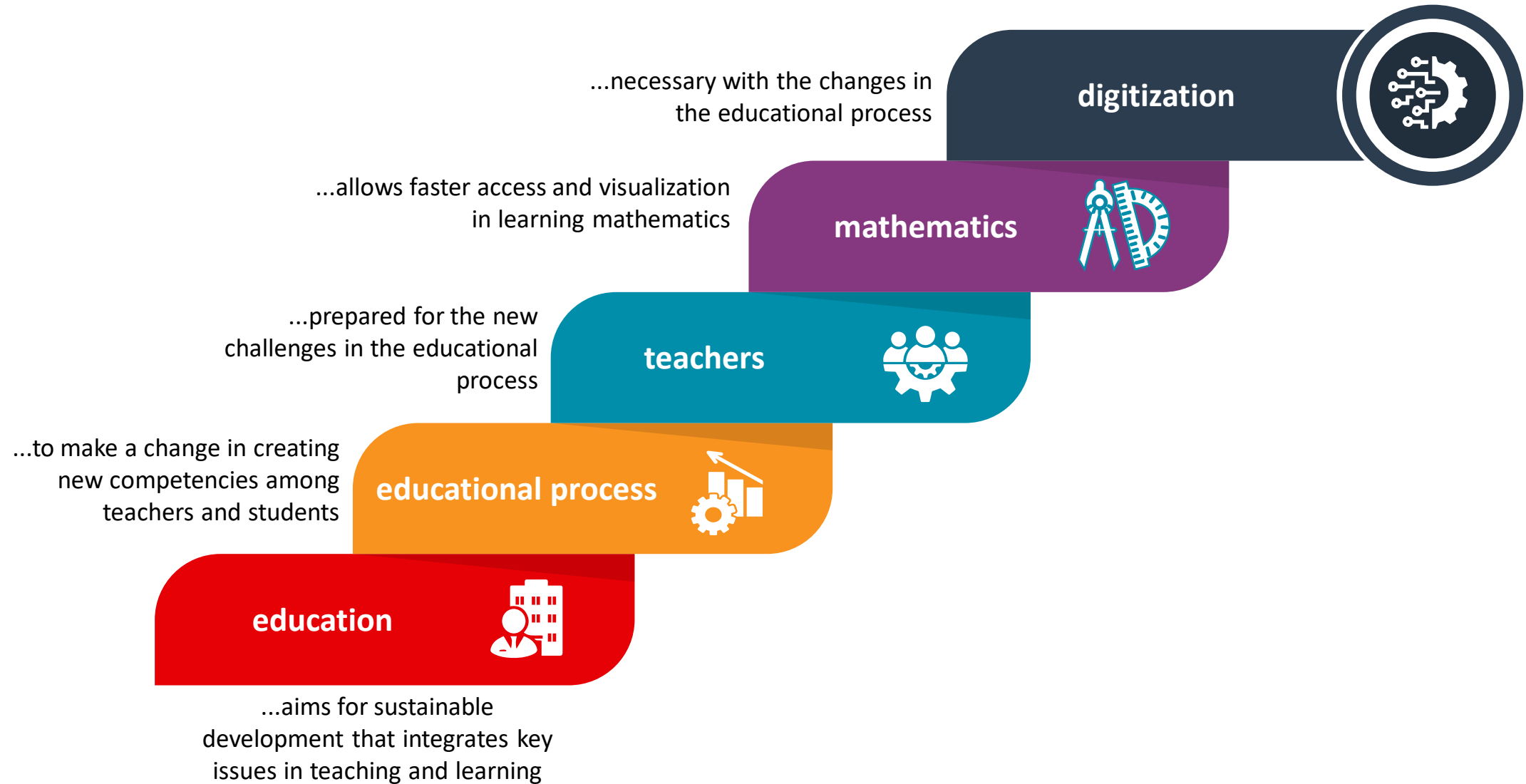
**The needs of digitization in the field of mathematics**



# Digitization of mathematics learning materials enables



# KEY DOMAINS





# New approach in learning mathematics

## -First digital math e-book, IV grade -



All daily routines are connected with math skills, so, math knowledge is a need

#### ЗА ТЕМАТА

### ДОЛЖИНА, МАСА, ЗАФАТНИНА, ВРЕМЕ, ПЕРИМЕТАР И ПЛОШТИНА НА 2Д-ФОРМИ

Во оваа тема ќе ги продлабочите знаењата за мерките и мерењата. Ќе научите различни мерни единици за мерење: должина, маса, зафатнина, време, периметар и плоштина на 2Д-форми. Исто така, ќе можете да истражувате како да измерите: должина, маса, зафатнина, време, периметар и плоштина на 2Д-форми со користење соодветни мерни инструменти.



#### МОЖНИ ПРЕДИЗВИЦИ



Често се случува учениците да ја забораваат еквивалентноста на мерните единици (на пример: колку милилитри има во еден литар). Мерењето е тема која не се учи толку често. Повторувајте ги овие факти почесто и на нив ќе се навраќаме во текот на целата година. Некои ученици можат да ги помешаат поимите маса и тежина. Ние ќе ги следиме соодветните дефиниции, збогатени со примери.



Mathematics creates insightful individuals with a high degree of self-confidence, fair, responsible but also very creative...

# Working method in the e-book

- Investigative – revealing
- It arouses curiosity among students
- Creates a stimulating learning environment

We are building the way  
to creating future,  
responsible, numerically  
and digitally competent  
individuals...



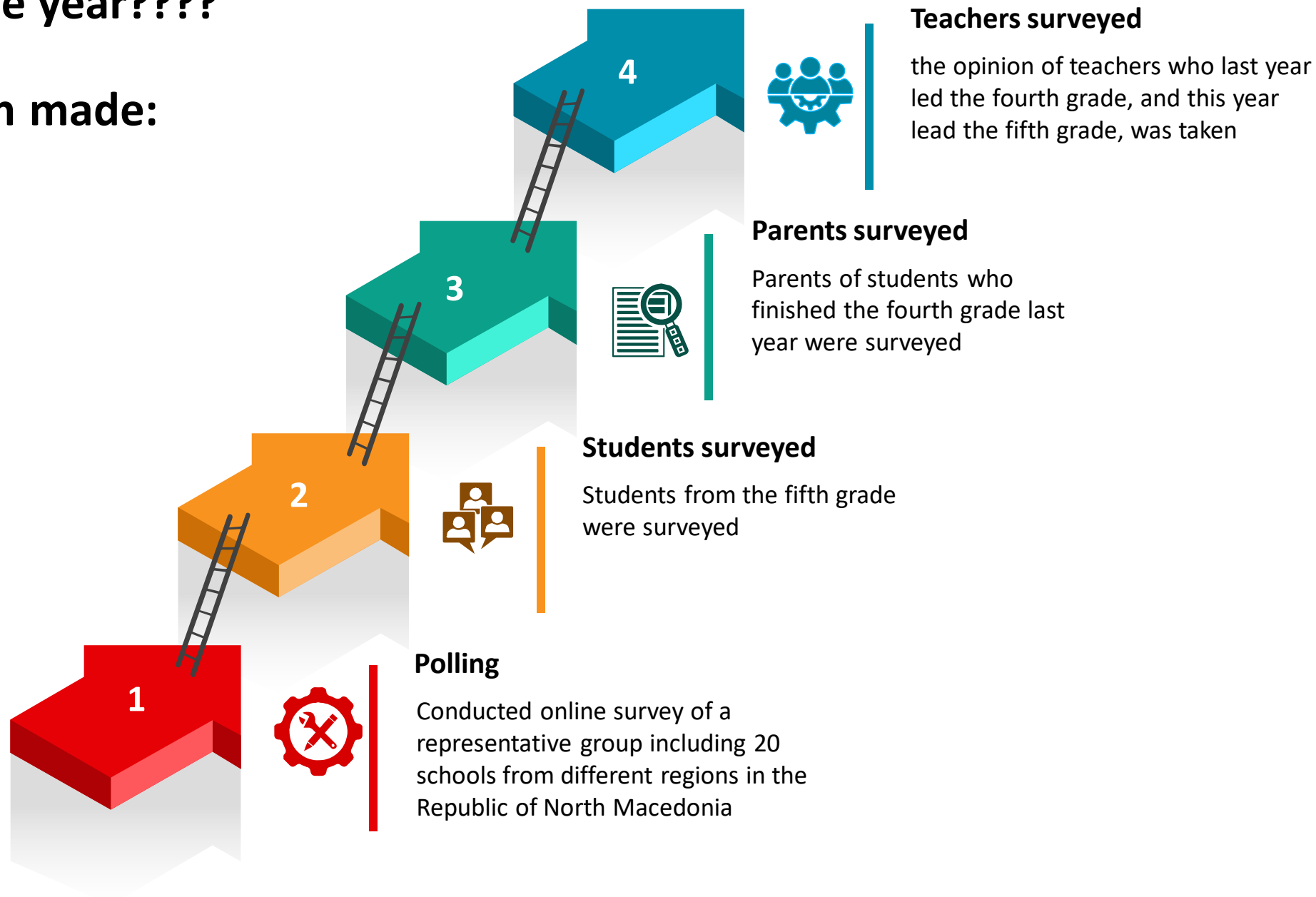
Many digital tools which support learning and teaching process





# After one year????

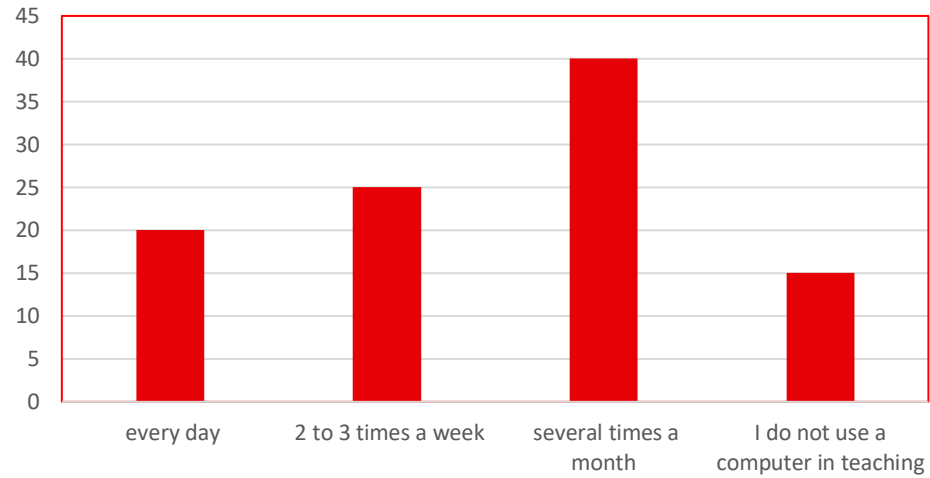
## Research made:



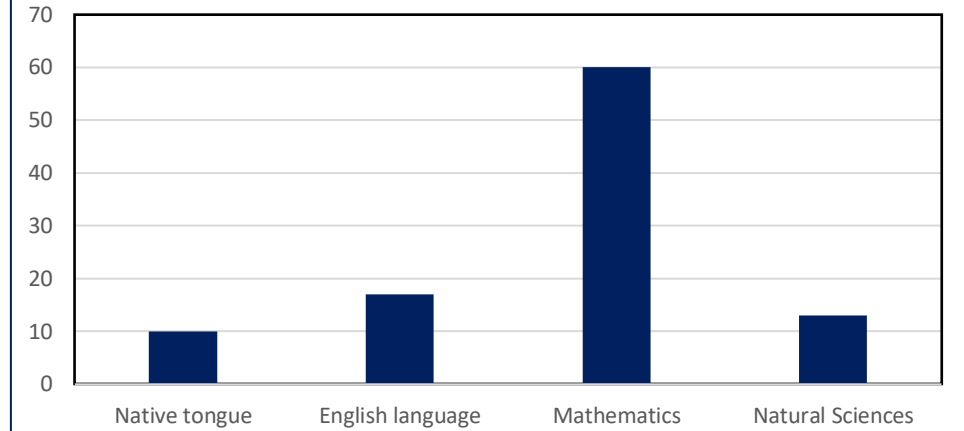


# RESULTS OF TEACHER SURVEY

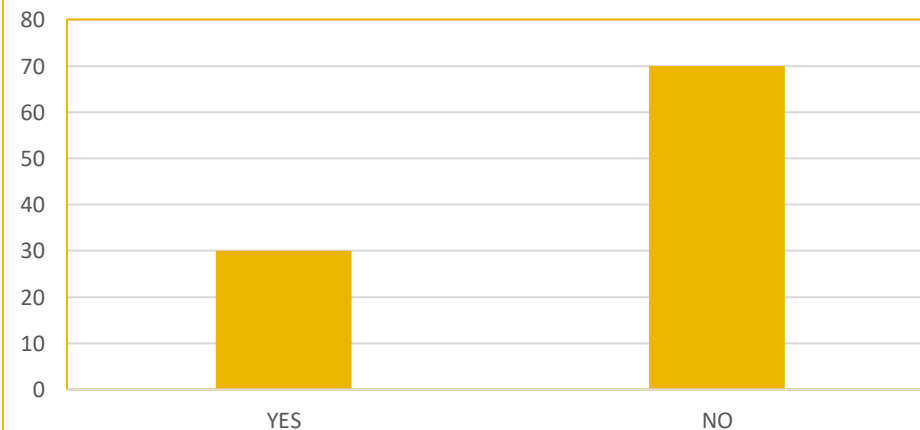
How often do you use a computer in teaching?



In which subject do you most often use a smart board and a computer?

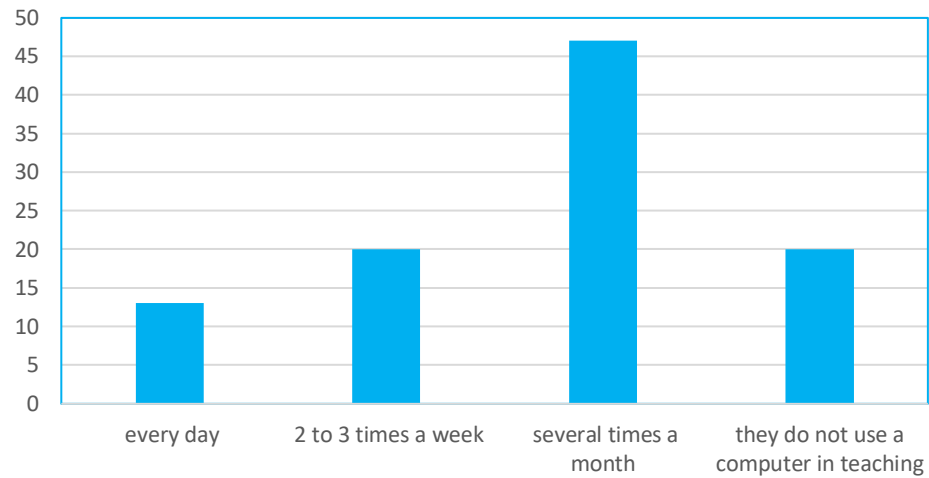


Do you use digital platforms in mathematics in your native tongue?

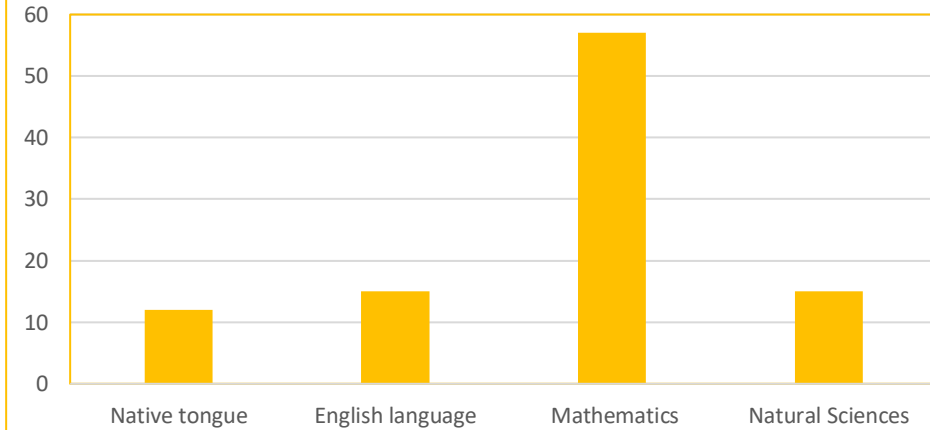


# RESULTS OF A SURVEY WITH STUDENTS

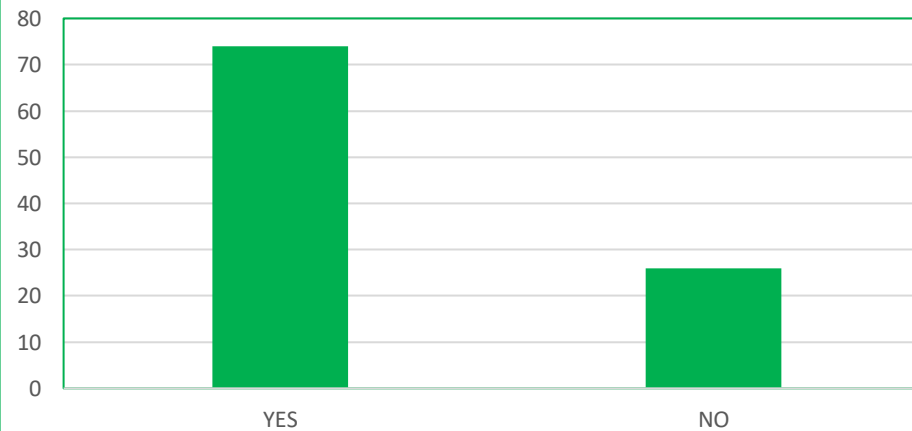
How often do teachers use computers in class?



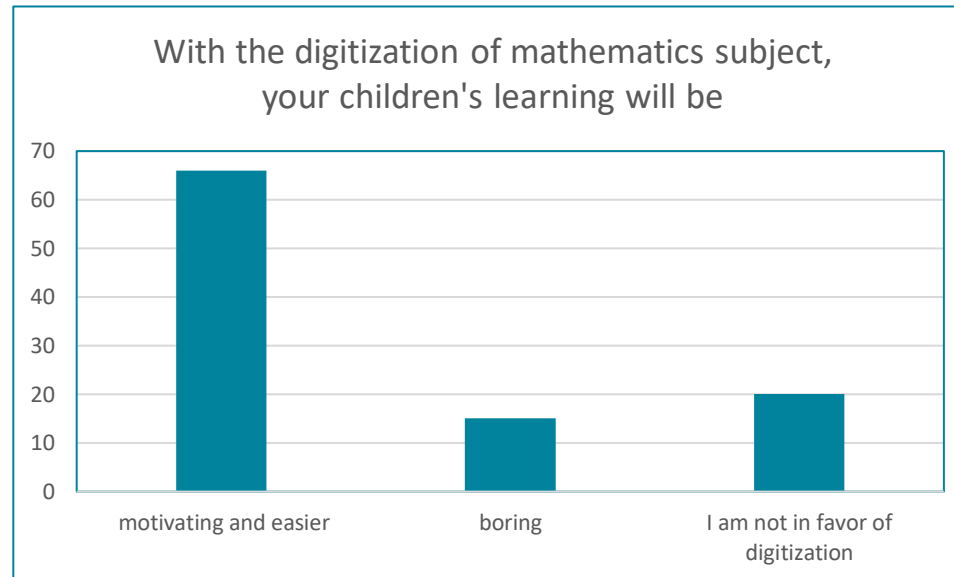
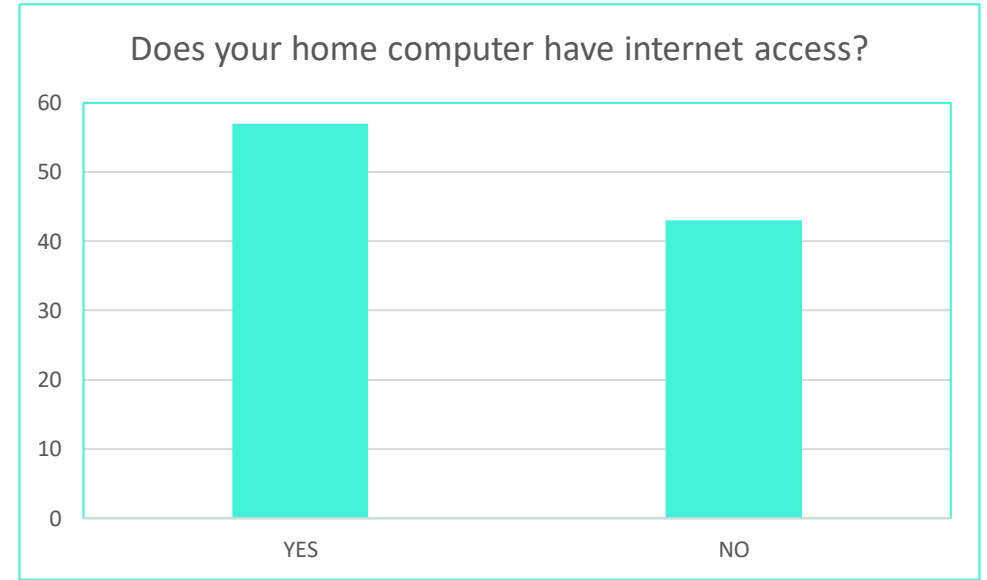
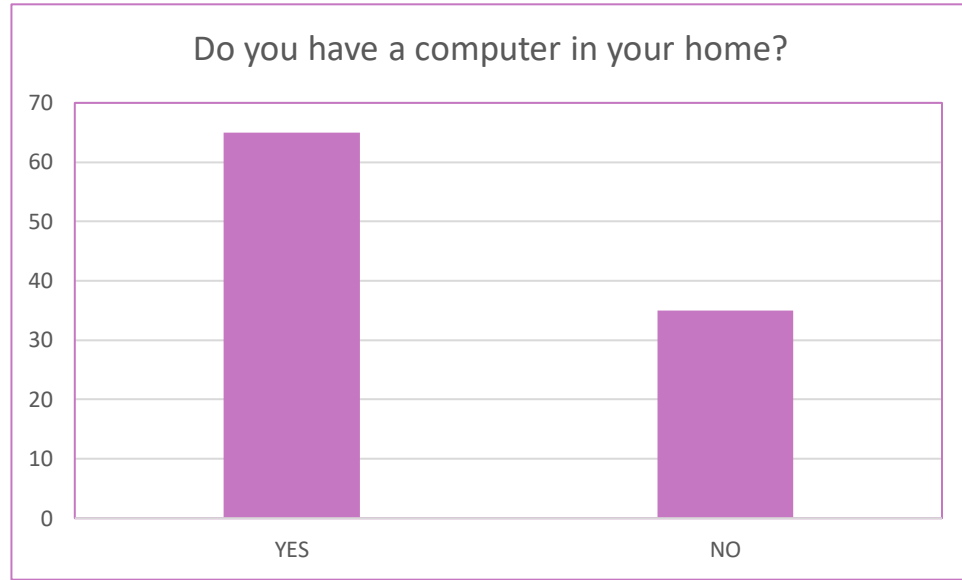
In which subject do teachers most often use a smart board and a computer?



Would you like to have more digital tools for math?

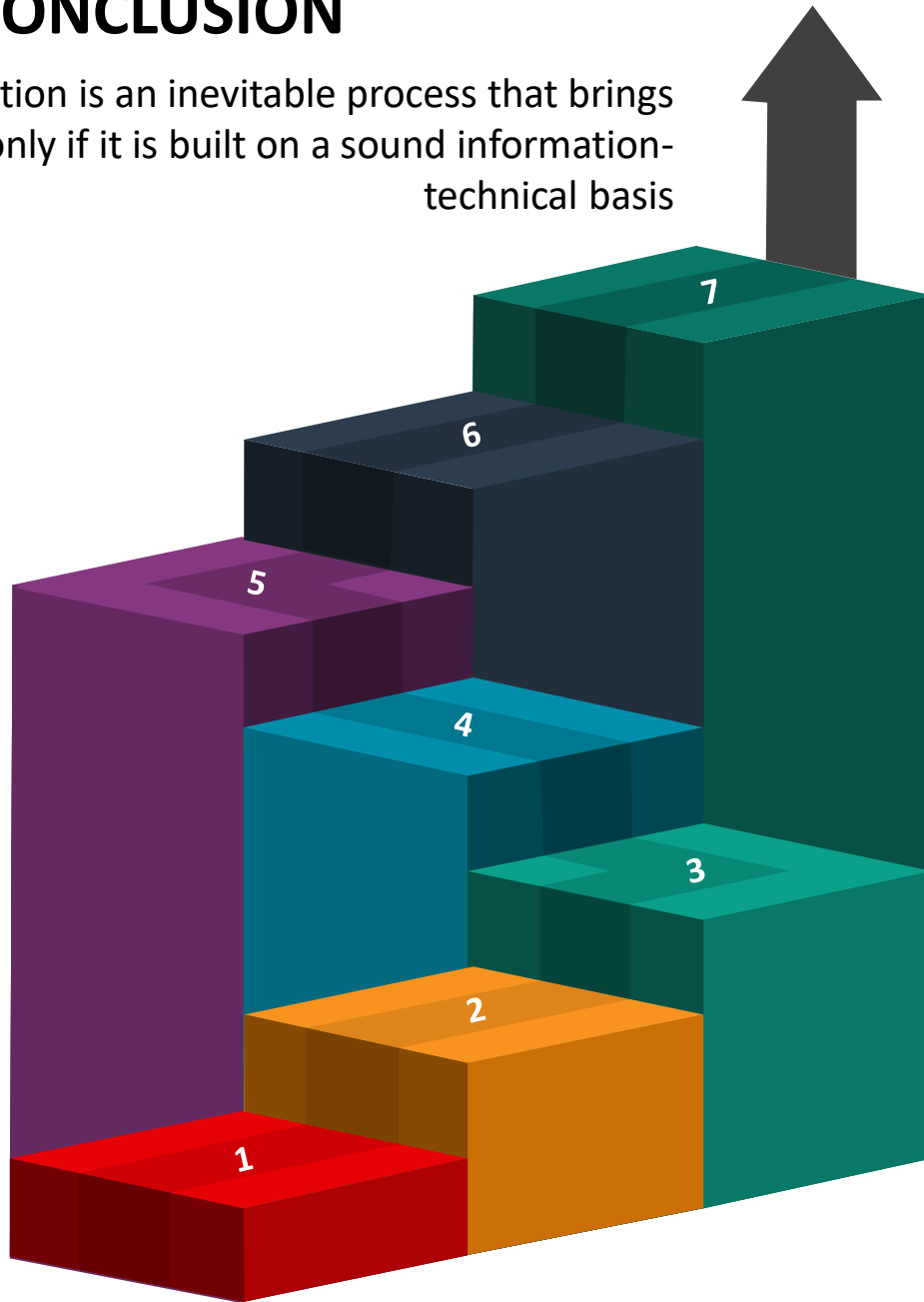


# RESULTS OF A SURVEY WITH PARENTS



# RESEARCH CONCLUSION

Digitization in education is an inevitable process that brings great benefits, but only if it is built on a sound information-technical basis



Initial phase for digitalization of education in Republic of North Macedonia

Creation of equal conditions in all schools in Republic of North Macedonia for digitization of education

Adaptation of already existing tools and software for learning mathematics

Creating math learning worksheets in the native language

Creating an interactive platform for learning mathematics

Digitization of mathematics teaching .....

Digitization of learning materials will answer the challenges in the educational process



After one year of digitalization process ...

Are our expectations met?

What is happen - Digitalization or  
Improvisation?

# AUTHORS



**Dobri Jovevski**

Primary school teacher

[dobri.jovevski@gmail.com](mailto:dobri.jovevski@gmail.com)



**Tatiana Atanasova  
Pachemska**

Professor - GDU

[tatjana.pacemska@ugd.edu.mk](mailto:tatjana.pacemska@ugd.edu.mk)



**Violeta Popovska**

Primary school teacher

[popovskaviki@yahoo.com](mailto:popovskaviki@yahoo.com)



**Zoran Trifunov**

Professor-UMT

[zoran.trifunov@unt.edu.mk](mailto:zoran.trifunov@unt.edu.mk)