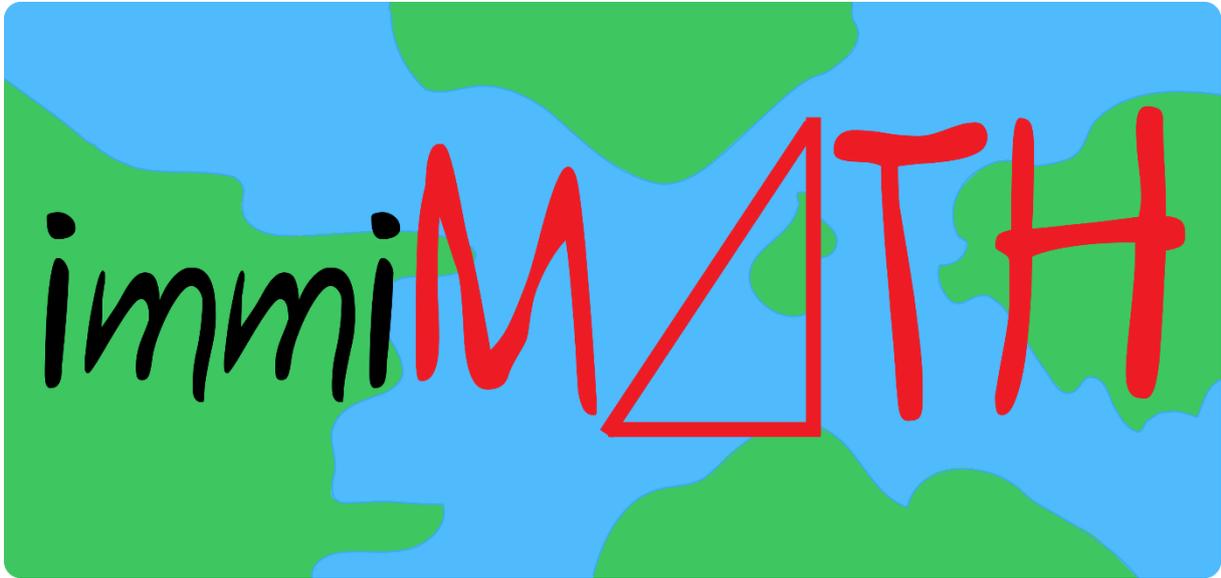




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Analysis of Existing ICT

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1. Background

The partner institutions formed three national university-school-pairs and analyzed the existing ICT usage at schools in the particular project-partner country with the focus to software for education mathematics analysis. Taking into consideration the immigrant students are integral parts of standard classes in Austria, Italy and Slovakia, the software for teaching and learning mathematics should fulfil some specific needs. The essential need is non-verbal communication based on easy understandable graphic layout, which uses intuitively readable graphical elements and natural navigation of the expected action for learning or understanding a specific mathematics topic knowledge. This report has been produced at the first period of the project life and collects the set of findings of the partner institution in Austria, Italy, and Slovakia relating to the software for mathematics education available and used at schools or for individual study. The report shows necessity of a new freeware software for mathematics education development. The new software will be a product of international cooperation of experts in mathematics education, experienced teachers at schools and professional software producers and its implementation to school practice fulfils the specific intercultural situation in classes in which immigrant students are educated as well as the inclusive pedagogy principles.

2. National reports

2.1 Austria

The Austrian school project partner provides the essential overview of the existing software for mathematics education with focus to four characteristics: name of the software and link, where it is available; language version(s); description and short assessment and opinion whether it is suitable for using in immigrants' pupils' education. The results are available on the Table1.

Table 1 Existing Software for Mathematics Education, Austria

Existing software	language	Description and Assessment	Especially for immigrants?
SCOYO https://www-de.scoyo.com/	German	Instructions partly not clear and therefore difficult to understand	no
Lernsoftware Mathematik http://www.lernsoftware-mathematik.de/	German	Virtual platform dealing with elementary school topics	Due to the frequent use of visualizations possibly suitable for immigrants; However, topics do not meet the requirements of higher secondary education.
Ewvo.de http://www.ewvo.de/	German	„Learning and therapy software Also for non-native German speakers Fee required	Rather not
Learnattack.de	German	Nice instructional videos which precede	no

https://learnattack.de/		exercises (well phrased and valuable tasks)	
aufgabenfuchs.de https://www.aufgabenfuchs.de/mathematik/bruch/bruchteile.shtml	German	Adequate scope of lower secondary mathematics Overly text based	no
phet.colorado.edu https://phet.colorado.edu/en/simulations/category/math	several	Nice animations, comprehensible outcome partly task based, partly playful	yes
www.mathe-online.at/ http://www.mathe-online.at/	German	Satisfactory interactive test, comprehensible outcome	no

2.2 Italy

Both project partners in Italy provide other project partners with a huge list of software for mathematics education on different school levels and of variable quality of mathematics knowledge required and trained. The report could be considered as a complex overview of professional free as well as non-free software products. The survey starts with mathematics for pre-school education and kids and continue with items for exercising specific mathematical competences. The language of the list of software below is dominantly English. Some of the software is available for smartphones and iPad. Despite of this quite large number of available mathematics games and activities for kids, pupils and students, the straightforward usage at lessons and in intercultural classes requires time consuming analysis by teacher, who would like to use it during his/her lessons. Moreover, teacher should take into consideration the technical conditions of particular student and an economical status of the family of the student (Can a family allow to buy smartphone or iPad for their kids?). Anticipating all above mentioned facts it is clear that the project idea of developing the special software for immigrant students is reasonable and offers high quality mathematics activities for direct implementation in the mathematics lessons.

Math Training for Kids

Three difficulty levels and the four basic concepts (addition, subtraction, multiplication, and division) in this simple app that teaches solid math fundamentals will help your child become more skilled. (Ages 3 and up; Free; Android) [Download Math Training for Kids on Google Play](#)

Kids Math

The main task here is to pass all eight levels within a certain time frame by answering 10 math questions at each level (including ones about fractions and greater than/smaller than numbers.). Each question allows 30 seconds of answering time; for correct answers, players are rewarded with an additional four seconds. Dynamically generated questioning means that kids get new questions every time they play. (Ages 3 to 5; Free; Android) [Download Kids Math on Google Play](#)

Preschool Math Games for Kids

Young kids will get experience counting, tracing and reading numbers in a fun, interactive way. And don't let the name fool you! This app also features math exercises (addition, subtraction, sequence patterns, and more) for elementary schoolers—up to the 3rd grade level. (Ages 2 to 8; Free, Android) [Download Preschool Math Games for Kids on Google Play](#)

Counting Caterpillar

Gorgeous colors and stunning visuals (plus cute caterpillars and butterflies!) on the display is enough to keep kids engaged. Feed the caterpillars by counting and catching aphids in the correct number sequence and earn butterflies (displayed in a gallery) to progress through more than 45 levels. (Ages 4 to 5; \$1.99; iPhone, iPad) [Download Counting Caterpillar on iTunes](#)

Peter Pig's Money Coin Counter

Developed by Visa, this app helps kids practice sorting, counting, and identifying the value of U.S. coins to earn virtual money. Along the way, Peter Pig (a virtual piggy bank) helps kids learn facts about U.S. currency that are read aloud in a child's voice. (Ages 4 to 7; Free; Android) [Download Peter Pig's Money Counter on Google Play](#)

Marble Math Junior

Solve a variety of math problems by collecting numbers and bonuses as you navigate a marble maze. With three difficulty levels and 16 marble styles, this app can be personalized to fit your kid's skills and personality. It also lets you customize games to concentrate on the areas in which your child needs the most help. (Ages 6 to 8; \$3.99; iPhone, iPad) [Download Marble Math Junior on iTunes](#)

Crazy Times Tables

Your child will love this app because of its fun, games, and photo features, but you'll love it too. The app takes a personalized approach by identifying his learning stage to help him master his times tables. (Ages 5 to 10; \$2.99; iPhone, iPad) [Download Crazy Times Tables on iTunes](#)

Let's Do the Math

Keep kids busy for hours with 15 different types of exercises in three categories and 50 word problems that focus on addition and subtraction. The app can be used either as flash cards or as a series of puzzles to teach basic concepts. (Ages 6 and up; Free; Android) [Download Let's Do the Math on Google Play](#)

Thinking Blocks Multiplication

Use number blocks to solve multiplication word problems, a strategy supported by Common Core standards. This app introduces kids to six problem solving models, which helps them organize information and visualize number relationships. (Ages 7 to 10; Free; iPhone, iPad) [Download Thinking Blocks Multiplication on iTunes](#)

Mathmateer

Mathmateer, voted one of the top 10 best apps for [elementary school](#) kids by Appolicious (the app directory), appeals to kids' creative side. To build a rocket ship to launch into space, kids must earn money by completing basic math challenges while recognizing patterns and shapes, telling time, and working on fractions and square roots. (Ages 9 to 11; \$1.99; iPhone, iPad) [Download Mathmateer on iTunes](#)

[Team Umizoomi: Math Racer](#) - (\$4.99)

Based on the Nickelodeon show, this app takes a fun approach to number identification, sequencing and early operations for young learners.

[Laugh & Learn Let's Count Animals](#) - (Free)

For the youngest child in your family, this great free app teaches first numbers and words.

[Mickey's Super Rocket Shapes](#) - (\$4.99)

With this app, your child helps Mickey Mouse navigate through space while exploring shapes.

[Kindergarten Kids Math](#) - (\$1.99)

If your child prefers a game that's interactive, this app requires kids to do more manipulation than just tapping their answers.

[Math BINGO](#) - (\$0.99)

This app uses the familiar game of Bingo to teach the different operations in three different levels to accommodate emerging learners.

[ABC Mouse](#) - (Free)

This free app offers activities in a variety of subjects, including math, and can be tailored specifically to your child. This app also follows many school curriculum standards.

[Math Planet](#) - (Free)

Geared for kids in grades 1 through 8, this free game supports more than 50 Common Core State Standards, teaching concepts like fractions, measurement and number sense.

[Math Practice Flash Cards](#) - (Free)

With numerous options to customize your flash card experience, this free app is great math practice for all levels.

[Grade Math by EduPad](#) - (Free)

Great free apps specific to each grade level teach mathematical concepts found in a typical curriculum.

[Math vs Zombies](#) - (Free)

This free app calls for kids to use addition, subtraction, multiplication and division to solve problems to keep zombies away.

[King of Math](#) - (\$1.99)

This app teaches fractions, powers and statistics to achieve the game's different goals and objectives .

[Doodle Math](#) - (Free)

This free app is designed to help your children learn and practice math concepts with a personalized curriculum.

[Complete Mathematics](#) - (Free)

For advanced learners, these free tutorials and activities take kids through learning progressive math concepts, such as trigonometry, statistics and geometry.

[Math Duel](#) - (\$2.99)

This app geared to kids ages 7 and up engages two players in a fast-paced game, allowing for socializing while testing skills.

Operation Math ([iOS](#) \$2.99, [Android](#) \$1.99) This app turns your students into spies who travel around the world on different missions. Kids can choose which operations they want to practice as they make their way through the app.

Number Frames (free for [iOS](#), [Chrome](#), and [other web browsers](#)) The Math Learning Center has lots of great resources for students, including interactive math tools to help students practice skills. With this tool, students explore the relationships between numbers as they represent each operation with virtual manipulatives. This free app gives kids the space to build a foundation that makes math fluency practice most meaningful.

Sushi Monster ([iOS](#) free) Scholastic's app offers children multiplication and addition problems. They have to reach a target number by picking the correct factors and addends listed on different pieces of sushi.

Quick Math - Arithmetic & Times Tables ([iOS](#) \$1.99) With this app, kids answer traditional skill-and-drill questions—but they don't have to enter answers using a keypad. Instead, they can write the answer anywhere on the screen of their device, and the app reads their handwriting and records their response.

Number Line (free for [iOS](#), [Chrome](#), and [other web browsers](#)) This mobile and web app is perfect for helping students model their thinking as they explore different operations.

Pet Bingo by Duck Duck Moose ([iOS](#) \$1.99, [Android](#) \$1.99) In this game, children answer addition, subtraction, multiplication, or division questions and place their answers on a bingo board. The app is full of colourful cartoon characters and offers visual models to help students understand each problem.

Meerkat Math HD ([iOS](#) \$1.99) This adventure app asks students to complete different races using math facts. In order to make their meerkat avatar run and jump fast enough to be a winner, they have to answer each question quickly and correctly.

10monkeys Multiplication ([iOS](#) \$1.99, [Android](#) free) Kids can practice multiplication facts with this animated app. The goal is to help monkeys trapped in a tree escape by answering a set of questions correctly. This app is broken down into different times tables and includes a reference chart so kids can review facts.

YodelOh Math Mountain ([iOS](#) \$2.99, [Android](#) \$1.99) A virtual take on a traditional carnival game, this app helps children practice all four operations. They have to work quickly so that the yodeler doesn't fall from the top of the mountain.

2.3 Slovakia

After taking a survey of existing ICT in teaching mathematics, available on the Internet, the findings can be summarised as follows:

There is a great variety of different programs, applications and software that can be used for teaching and learning mathematics.

Some of them are free and have no requirements for users; some are free but require at least registration of a user (a teacher or a school); and others must be purchased.

No special focus on immigrants found.

This overview covers primarily ICT in English and Slovak language.

The ICT differ in many aspects but can be put into two basic categories:

The applications that are available online

The programs/software that has to be downloaded and then used in teaching and learning

APPLICATIONS AVAILABLE ONLINE

Users of all ages and levels easily find suitable applications that can help them learning Maths. They deal with variety of topics and can be further divided into the following subcategories:

The applications that only practise some maths topics/problems.

The application gives users questions and tasks that are immediately evaluated, so they get instant feedback. They can continue practising the skills as long as they need. For example

<https://eu.ixl.com/>

<https://www.mangahigh.com/en/>

<https://www.khanacademy.org/math/k-8-grades>

They also help students explore and understand problems and might be accompanied by explanations. For example:

<https://www.geogebra.org/>

<http://www.webmath.com/>

<https://www.mathplanet.com/>

The applications that practise some maths topics/problems but have special playful, engaging setting or they are in the form of games that should make children/students interested.

Often they provide supporting materials for both teachers and parents. For example:

<http://www.dreambox.com/why-dreambox>

http://go.dreambox.com/rs/715-ORW-647/images/SL-curriculum_guide.pdf

<http://www.k5learning.com/math>

<https://www.mathplayground.com/>

The applications that also provide brief theoretical background.

The theory is explained as well, sometimes accompanied by explanatory videos, and followed by problems to solve.

They are often set in some background story to motivate users to study and practise mathematical problems

<http://studyjams.scholastic.com/studyjams/jams/math/index.htm>

<http://www.learnalberta.ca/content/mesg/html/math6web/index.html?page=home>

<http://www.learnalberta.ca/content/me5l/html/math5.html>

<http://www.learntolovemaths.com/>

<https://www.prodigygame.com/>

SOFTWARE TO BE INSTALLED IN COMPUTERS

This is mostly more difficult to check and try because it requires registration or must be purchased. Based on the descriptions, it falls into similar categories as the applications available online.

http://datacomp.sk/vyucbove-programy-alik-vesela-matematika_d77807.html

Focused on elementary school, first grades when children how to add, subtract, multiply etc. numbers

There is a main hero, a companion – it is a dog called Alík who experiences different problems and children help him (and he helps them) by solving mathematical problems

<http://www.interaktivnaskola.sk/jml/interaktivne-technologie/vyucbove-programy/matematika/331-matematika-pre-5-ronik-z-cesta-do-praveku-.html>

5th grade of elementary school

To practise natural and decimal numbers

Includes an interactive game

<http://www.silcom-multimedia.sk/tituly/vesela-matematika/>

<http://www.silcom-multimedia.sk/tituly/geometria-pre-najmensich-1/>

For first grades of elementary school

<https://www.mattimath.com/>

3. Summary

ICT is natural part of education at 21st century schools. Number of educational studies describe, analyze and give direct or indirect instructions when and how to use educational software. The only one correct answer or the only one proper direction does not exist. And it is obvious, will not exist in future. But teacher still plays the most important role in educational process in the classroom. The software, which can help teacher directly and intuitively involve all pupils, also those, whose origin and language are not native in the particular country, will strengthen the friendship to mathematics and cover the intercultural spirit of the classes with immigrant pupils.

The existing software and ICT usage at schools makes one think of a jungle of different technical (hardware) and intellectual (software) requirements, principles, ways of usage and implementations

