

Introducing Socio-Scientific Issues to Students Through Digital Comics in Stem Learning

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Abstract: Introducing socio-scientific issues to students in STEM learning is an important activity to improve students' abilities in analyzing and evaluating socio-scientific issues in society. However, the introduction of issues has encountered many obstacles, such as problems from teachers and learning media. This study aims to assess students' knowledge related to socio-scientific issues at each level of education and develop media designs in the form of digital comics to be implemented to introduce socio-scientific issues. This research will investigate and analyze the application of socio-scientific issues in schools in Indonesia. Furthermore, it will evaluate the impact of digital comics based on socio-scientific issues to student learning outcomes. This research is expected to reveal improvements in learning practices, especially in the learning design-based on socio-scientific issues in Indonesia.

Keywords: Socio-scientific issues, digital comics, STEM learning

A Distributed Item Calibration Approach for Computerized Adaptive Testing in Math Education

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Abstract: Developing mathematical skills requires the opportunity to practice and receive immediate, individualized feedback on the misconceptions or mistakes made in the problem-solving process. Huge progress has been made in the last years in the design of feedback systems for fundamental math education. Applied mathematics education for engineering disciplines, however, lacks a large body of examples with pre-worked solution paths and known difficulty, which are necessary for providing learners with (semi-)automated feedback. This is mostly due to the need for domain-specific and situated tasks, which are not that widely deployable as generic items. The effort required for designing appropriate items, validating them in terms of the appropriateness for specific learning outcomes, and calibrating their difficulty cannot be borne by individual teachers and is also hardly justifiable for commercial providers of item pools. In this presentation, we strive to show how these challenges can be addressed via a community approach to item design and calibration, supported by the methods from the computerized adaptive testing field.

Keywords: mathematics, computerized adaptive testing, item pool calibration, crowdsourcing, technology-enhanced learning

GeoGebra contributions to Transnumeration: a study involving graphical analysis of data

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Abstract: The proposition of this thesis is to investigate the development of Transnumeration with high school students through graphical data analysis using GeoGebra. The objectives are to identify and analyze possible contributions of GeoGebra to promote Transnumeration and the respective attributes of this technological resource, which can be considered for the promotion of Statistical Thinking. Based on the methodology of the implementation of an investigative cycle, based on a context of remote classes, whose participants are high school graduates of a public school in the State of São Paulo.

Keywords: Graphical Data Analysis, Transnumeration, GeoGebra

Experiments and VR as Physics' Communication and Motivation Tools!

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Abstract: As a physicist and a former high school teacher, I encountered myself with challenging problems while teaching such as lack of motivation to try to understand a perceived as a difficult subject such as physics. Due to the pandemic's distance I found challenging to maintain a young student's attention during the evolution of experiments. Such situation lead me to find a space for my students to feel listened and share what they've learned during the experiments. Such space was developed through VR tools such as Algodoo, Phypox, Crocodile Physics; games like Minecraft, Angrybirds, etc. Tools which worked as a playground; as motivational tools and a communication space at the same time. This is what I am working at during my PhD research, how to make an hybrid space for online physics courses, with both, VR and experiments to develop the concepts together, through their playing and perception.

Keywords: Physics, VR, Experiments, Games, Perception

Teacher`s Attitudes towards Teaching mathematics and ITS applications in other disciplines

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Abstract: The attitudes of mathematics teachers towards teaching mathematics is very important and greatly affects the quality of teaching mathematics, affects the student and his attitudes towards mathematics. So teacher's positive attitudes towards mathematics lead to student's positive attitudes towards mathematics and vice versa.

This means that there is a strong connection between teachers' attitudes towards teaching mathematics and the quality of mathematics teaching.

The positive attitudes of students towards mathematics are low and faint because of the attitudes of mathematics teachers towards the teaching of the profession.

Therefore, there is a strong belief among many teachers that positive attitudes need to be fostered among new teachers in order for this to positively affect students and their attitudes towards mathematics.

The research was conducted in 2021 in Israel. The participants are 221 mathematics teachers from post primary schools. The research instrument was a questionnaire developed for this study based on the scientific literature and aimed to find out teachers' attitudes towards teaching mathematics and applications of Mathematics in other disciplines.

The results of the study show that there are positive attitudes and negative attitudes of teachers towards teaching mathematics and according to the factor analysis we can summarized the attitudes of the teachers according to the following seven categories: Mathematics teaching anxiety, Satisfaction of teaching mathematics, Bad Feelings, Confidence in teaching mathematics, Confident in teaching mathematics, Worries in teaching mathematics and Feeling support.

Keywords: Teachers` attitudes, anxiety, satisfaction, bad feeling, confidence, confident, worries, support in teaching math, satisfaction

Comprehension of mathematical text in primary school

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Abstract: One of the biggest role of primary education is to teach children not only to read but also to do it with thinking, learning and expanding their horizons. For these mental processes adequate reading comprehension is essential. The importance of reading comprehension is evident in all subjects, so without solid comprehension skills, even children who are otherwise strong in maths can underperform. This is why PISA test is based on reading comprehension. Even though its importance, Romania is among the last ones in Europe both in reading and mathematics. To identify the student's difficulties in reading comprehension, an innovative, technology based method can be used: eye-tracking. Using this sensor technology it is possible to know where a person is looking by detecting the presence, attention and focus, so it observes manifestations of internal processes. Nowadays eye-tracking is known as a method for identifying the strategy used in mathematical tasks, especially at students with mathematical difficulties. The main objectives of the presented research are to identify primary school pupils' mathematical text comprehension competency level and their difficulties; teachers' attitude towards developing competency of mathematical text comprehension and their methods used in the classroom; to find new solutions to develop the children's comprehension; and to find out other contributed factors. In addition, this research focuses on the most frequent difficulties on reading comprehension of mathematical texts and the differences between children with or without mathematical difficulties. The results of this research would help teachers in primary education to understand children's difficulties in mathematical text comprehension and it provides an opportunity for them to try out good practices in their own classes.

Keywords: Mathematical education, mathematical text comprehension, eye-tracking

Using Gamification in Teacher Training: Collaborating to Design GeoGebra Activities for Teaching Mathematics

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Abstract: Most of the teacher training programs in the Philippines in integrating technology in teaching mathematics are lecture and workshop type where the discussion is mainly on the use of application software and the methods of using it. These teacher training programs are one-shot and have no follow-through in the classroom. In addition, the designs of these training programs are most of the time one-size fits all and do not consider the technology-challenged classrooms that are present in many schools in the Philippines. This study will explore gamification of activities using GeoGebra in teacher training programs and the scaffolding of its implementation in actual classes. It will focus on (1) how teachers create and adapt gamified activities, (2) how teachers implement gamified activities in the technology-challenged classrooms and (3) how gamified activities affect student achievement and attitudes towards mathematics. In addition, special attention will be given to the difference between the effects of the gamified activities on students with abundant access and those with limited access to technology.

Keywords: Gamification, teacher training, geogebra

Showtime – the positive effects of home schooling

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Abstract: Teachers often must deal with the lack of interest and motivation. Hence many educators turn to alternative methods. Sometimes even minor changes prove to be beneficial: changing the learning environment for instance. Being allowed to leave the class and still be part of it. The method of flipped classrooms has been used and studied in the last years. The current pandemy turned teachers into youtubers. Pupils given the task to make short videos explaining a topic get not only a thorough understanding of these issues, but also the experience that they can have the role of the teacher, the roles are flipped. Given the opportunity to show what they can, for instance by exhibiting their drawings made by Geogebra just as in an art exhibition, they are happy to spend hours on drawing. A positive experience, spending a night with friends in the school building and solving exercises can change pupils' attitude. It is known that one's stereotypes influence one's achievements. Children with positive experiences are more likely to be successful in mathematics. In my presentation I will go into more details and raise the question if popular online games and computer programs such as Kahoot!, Quizlet or Geogebra have a positive impact on children's achievement in the long run or they just create a positive learning environment. Feedback from the audience in this regard would be helpful and most appreciated.

Keywords: Motivation, flipped roles, learning environments

Use of multimedia language lab SmartClass at primary and secondary schools in the Czech Republic

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Abstract: The aim of this short presentation is to share results from a survey which is going to end in 4 days. This survey focuses on the use, methods, and forms of work with a multimedia language laboratory at 80-100 schools, which are using this system. The survey is part of a longer-term research that monitors the use of this classroom in foreign language teaching.

Keywords: SmartClass, Robotel, foreign language didactics, multimedia language lab

The Zone of Proximal Development and Teaching Expertise in Classroom Settings

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Abstract: The study aims to investigate the relations between the zone of proximal development, comprising “prior knowledge activation” and “perceptions of task difficulty”, and pre-university teachers’ training and experience or seniority in the education system. The sample was composed of one hundred and twenty Romanian pre-university teachers from randomly selected educational institutions from the national school network. The teachers were asked to answer online, and they were assured their answers would remain anonymous. The questionnaire consisted of two sections. The first section asked the respondents to provide data about demographics, educational background, didactic certification and degrees. In the second section, the teacher version of the “Self-Regulated Learning Opportunities Questionnaire” (SRLOQ) was used to measure self-regulated learning. The supra-ordinate subscale of the zone of proximal development assessed both perceptions about concepts like “prior knowledge activation” and “perceptions of task difficulty”, participants were asked to rate each item on a five-point Likert scale (from 1= Strongly Disagree to 5= Strongly Agree). The present study provides valuable evidence for developing effective intervention programs for teachers and indicates that the zone of proximal development is an essential variable that should be taken into account when developing and providing teacher training programs.

Keywords: zone of proximal development, teaching expertise, teacher training, knowledge activation, task difficulty

Challenges in the Mathematical Modelling Analysis in STEAM practices

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Abstract: In this presentation we will be discussing the approach of integrating architecture, culture, history to mathematics education in a STEAM practice. We will display the challenges that meet us in analyzing such practices and our approaches in overcoming them. We will show the progress and the upcoming phases of the research project.

Keywords: Architectural Modelling, Augmented Reality, 3D Printing

Research on improvisation in teaching

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Abstract: With the rise of the constructivist learning theory paradigm, the role of teachers has changed. Quick reflection, professional problem-solving, resourcefulness in dealing with unplanned situations, stepping out of routines and comfort zones have become key elements of teachers' professional activities.

The topic of improvisation and its role in pedagogical work is a poorly researched area in international and Hungarian teacher education research. In this sense, the research area is novel, since the concepts, contents, and interpretations of improvisation in teacher work and their interrelationships are not sufficiently known or elaborated.

The aim of this research is to explore the improvisational nature of complex, socially interactive pedagogical work by revealing the views of different actors in teacher education, and to construct a typology of concepts and activities related to this phenomenon.

This ongoing doctoral research uses a qualitative methodology, following an exploratory, sequential research design. It uses grounded theory methodology to explore the specific, hidden, and situational elements of teacher improvisation.

Through cognitive mapping, metaphor research and focus group interviews with teacher candidates, practicing teachers and teacher educators, we seek to answer the following research questions: 1) How do participants understand the concepts of improvisational teaching, pedagogical improvisation, and teacher improvisational knowledge? 2) What differences can be observed in the way respondents interpret these concepts? 3) What teaching tasks and activities are related to the phenomenon of improvisation?

Keywords: Improvisational teaching, Pedagogical improvisation, Teachers' improvisational competence

Personalized learning effectiveness in the digital era in high schools

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Abstract: For decades, the concept of personalized learning has been associated with students with learning difficulties in the special education system. With the onset of Covid, many learning processes in the digital era led to the use of diverse distance learning tools later implemented in regular classes. This enables the integration and implementation of personalized learning tracks into the traditional system. It even enables a transformation in the learning process in comparison to the traditional individual or differential learning that schools have been accustomed to for over a century. Personalized learning tracks in the digital era, especially even during Covid, provide the opportunity to take into account the students' profile, the diagnosis of learning difficulties and other limitations and to strengthen their capabilities, enabling improvement and breakthrough in their academic achievements by creating personal motivation. This concept changes the teachers' role and responsibility. Also the students' role changes from passive to active leading of the learning process. Their personality and uniqueness are manifested in the chosen path. This presentation analyzes the concept of personalized learning and the changes it introduces in the teaching process,

highlighting the advantages and limitations involved in achieving this learning format compared to traditional learning.

Keywords: Digital era, Online learning, personalized learning, Learner profile, Skills, Learning path.

Opportunities for strengthening certain professional competences in Hungarian higher education through ICT

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Abstract: What does today's labour market expect from the education system or from recent graduates who have completed certain courses? Two English terms are typically heard in this context: "hard skills" and "soft skills". Although the two areas are markedly different, higher education develops both the skills background and the so-called human attitude of the individual and the future socialisation skills of the individual at work. The current Hungarian higher education system places a very strong emphasis on practice-oriented tertiary education, as a proportion of those leaving secondary education and entering tertiary education already have a profession. This is an advantage in the admission procedure, as applicants receive "extra points" if they can prove their qualifications. Higher education institutions do their utmost to ensure that the model curricula for each degree programme include not only the content of the relevant disciplines, but also some additional knowledge that broadens the professional horizon and supports labour market competences, which they offer to their students as an optional subject.

The Hungarian Vocational Education and Training 4.0 strategy also responds to the needs of the labour market, which is to provide current students with knowledge that meets the expectations of a more modern 21st century. Naturally, the modernisation of education is supported to the maximum extent possible by the use of available information and communication technologies.

But what are the opportunities in relation to the already limited number of face-to-face or online lessons?

As a practising college and university lecturer, I am looking for answers to this question, to what extent the currently available ICT-based BYOD tools can effectively support this in the most cost-effective way for both students and teachers. Of course, while this is a very labour-intensive task for the teacher, it is also a much more enjoyable and effective learning technique for the student.

Keywords: BYOD tools, ICT in Higher education

Computational thinking with analog tool

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Abstract: We will discuss about the meaning of computational thinking. We will discuss that it is not a new concept in human history, it has existed in human activities since ancient times. Through the work of the 9 years old student, we tried to find traces of computational thinking and also educational meanings.

Keywords: Computational thinking, abacus, number, numeric, gifted learner

How AI is used in (Higher) Education: A Review

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Abstract: The term AI (artificial intelligence) still provokes thoughts of mighty robots gaining consciousness and thriving to overtake the world; however, many people are not aware of the fact they are facing AI on a daily basis. It is an umbrella term for many technologies and are used in many fields from media to economics. Also, it is already used in a higher education setting; for example, learning analytics take advantage of machine learning and data mining in order to predict students' success. In order to keep pace with this rapidly advancing technology, it is especially important for educators to understand the key principles and technologies as well as to be able to teach these basics to students.

Keywords: AI in HE, Artificial Intelligence, Machine Learning, Higher Education

Digging the Potential of STEAM Hybrid Learning Environment

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Abstract: STEAM (Science, Technology, Engineering, Art, and Mathematics) learning is reported to have many benefits for students, particularly in improving students' performance in all four subjects. STEAM implementation in Indonesian schools has increased in recent years, so it is important to find better insights and appropriate recommendations to improve the implementation. Meanwhile, the Covid-19 pandemic situation has impacted education which forces schools to shift from face-to-face learning to online learning. This situation might give challenges for some teachers who have not ready yet. Teachers inevitably need an appropriate approach to support the implementation during the pandemic as well as the post-pandemic situation. Hybrid learning could be utilized to create a learning environment that incorporates technology both to enhance students' learning and to respond to the pandemic situation. This study will employ Design-based Research. By conducting research in this proposed programme, the expected outcome is to assess and develop the design principle of the STEAM hybrid learning environment, which is applicable and adaptable.

Keywords: STEAM, hybrid learning, mathematics learning, learning environment.

Art your math

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Abstract: An intervention program in mathematics that includes teaching and learning the content and practices of mathematics and interdisciplinary knowledge among low Achieving Students in mathematics aged 15-16. The program combines mathematics with science, art, design, and technology. Various activities appropriate to the nature of the learner while combining critical thinking, solving open problems, working in groups, creative and original thinking. The program also offers teachers customized teaching strategies for each learner

Keywords: Scientific capital, interdisciplinary knowledge, creativity, originality in the mathematics profession. personalization, technologically evolving world evolving world.

Utilising Mathematical Modelling and 3D Printing Activities to Explore and Impact Prospective Teachers' Mathematical Affect, Identities and Competence Through a Communities of Practice Lens

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Abstract: This research project observes Post Graduate Certificate in Education (PGCE) preservice teachers' engagement in a mathematical modelling and 3D printing activities in order to explore and impact their mathematical affect, identity and competence through a Communities of Practice (CoP) lens. The 3D mathematical modelling activity employs a 3D modelling software called Tinkercad and a 3D printer. The activity is designed using mathematical content from key stages 1 and 2 of the English National Curriculum. This research draws on mathematics education theoretical constructs on affect and identity and endorses CoP as its overarching theoretical framework. Data to be collected in this study include approximately 40 preservice teachers' pre-and-post interviews, audio and video recordings of mathematical modelling activity, field notes and preservice teachers' journal entries. The diaries entries are designed to capture preservice teachers' stories of their experiences with Tinkercad, the mathematical modelling activities and 3D printing. All research activities can be conducted via Microsoft Teams if in-person interaction is not allowed. Data will be analysed using qualitative methods. These include analysis of interview transcripts and audio-visual recordings, as well as journals using a narrative inquiry approach, wherein preservice teachers' written experiences are analysed through the re-telling of their stories from the researcher's perspective. I envisage that this research will provide useful resources for teachers and teacher educators who wish to use 3D printing and mathematical modelling in their practice.

Keywords: Mathematical Affect, Mathematical Identities, 3D printing, 3D Modelling, Mathematics Teacher Education

Block model approach and its effect on word problem solving, a case study

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Abstract: Word problem solving is an important part of school mathematics, yet pupils often fail in it. In this case study, we investigated whether an introduction of the block model approach would help two 4th grade pupils in Kosovo to solve word problems. Think-aloud interviews were conducted, and their transcripts were analyzed in a qualitative way. The results show that even a short introduction to the block model approach enabled the pupils to connect successfully the verbal, visual, and symbolic representations of the word problem. This is an encouraging result showing that the block model approach can be introduced more widely.

Keywords: Word problems, block model approach, visual representation, symbolic representation.

Students' opinions about solving problems individually and in groups

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Abstract: The online teaching of mathematics courses at university level required a rethinking of methods for solving mathematics problems, and cooperative group work is gaining ground in mathematics classes, which has many advantages, but also limitations. The research studied Primary and Preschool Pedagogy specialization students' opinion about advantages, disadvantages, and efficiency of gamified worksheets in individual and group work. In the academic year 2020-2021, two games were implemented, one was played individually and one in groups. The research involved 38 students who completed an online questionnaire after playing the two Seppo games. The results showed that more than half of the students preferred group play and only one student preferred individual play. In the team game, over 85% of the students felt the collaboration between the team members, worked together without problems. Except for one team, everyone solved the tasks together. Based on students' responses, more students are more motivated to solve tasks during group play. During the individual work, the students made more efforts to solve the tasks correctly, they were able to think better about solving the tasks, so that the competitive spirit was even greater.

Keywords: Gaming, individual play, group play, problem solving

Evaluating the STEAM project-based learning instruction from a mathematical perspective

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Abstract: Official documents in several educational systems advocate for integrating Science, Technology, Engineering, Arts, and Mathematics (STEAM). A promising learning methodology to integrate disciplines is project-based learning (PBL). Although STEAM-PBL has been characterized and evaluated in different ways, its impact on school mathematics teaching remains unclear. In this conference, we present recent investigations of the Open STEAM Group (Diego-Mantecón et al., 2021a, 2021b; <https://www.opensteamgroup.unican.es/>). In particular, we analyze STEAM-PBL classroom implementation from a school mathematics standpoint, considering the instruction of 11 Spanish high school teachers that implemented 41 STEAM projects following the KIKS format for more than 4 years. Five teachers had previous specialization in mathematics (in-field), while the remaining ones were not qualified to teach mathematics (out-of-field). To characterize the projects and the mathematical instruction, Thibaut et al. (2018) and Schoenfeld's (2014) frameworks were used. The results showed that in-field mathematics teachers eluded transdisciplinary projects in which mathematics is complicated to address, while out-of-field teachers tended to overlook the mathematics. In contrast to out-of-field teachers, in-field teachers often avoided design-based learning for focusing on the mathematics discipline. The latter teachers were able to promote high cognitive demands and positive perceptions about mathematics. This indicates that teachers' specialization is crucial for offering a high-quality mathematical instruction. Consequently, future professional development programs should protect the idea that knowledge for teaching mathematics is specialized. This aspect is being considered within the STEAMTeach project (Erasmus+, 2020-1-ES01-KA201-082102, <https://www.steamteach.unican.es/>).

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Keywords: Integrated education, Project-based learning, STEAM education

How to motivate more teachers to apply for the position as a principal in compulsory schools

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Abstract: A principal is the head of a school and the manager of all the teachers and other employees who work at the school. The tasks are regulated by the school law. This includes the school management, the development of the school, the classes and staff, external relationship and the implementation of educational policy. The findings of the international research show that teachers apply for the position as a principal because they want to improve school, as well as to look for personal, professional and intellectual challenges. They also want to exert influence on the other teachers and on the school climate. Inhibiting factors are for example high workload and the effects on the work-life-balance and the relatively low salary for the position. The aim of my dissertation is to find out and analyse reasons and background of the career choice to become school principal. The research will pivot around problem centred interviews. A questionnaire for teachers should determine how attractive the work of a principal is for them and should also find out reasons for or against the application as a principal. Because of this, interviews with principals and teachers are necessary to find out more about the factors which motivate and hinder career choices and to find out more about the opportunities for the public system to support teachers to apply for such positions.

Keywords:

Mental representations of students of the Department of Education and Preschool Education for the rainbow

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Abstract: The present research is an exploratory qualitative approach that is part of the qualitative example and investigates the mental representations of third-year students of the Department of Educational Sciences and Early Childhood Education of the University of Patras. The semi-structured interview was used as a data collection technique to investigate the mental representations of the 30 female students who took part in the research. As a tool for data analysis, the classification into "answers compatible with the scientific model", "intermediate answers to the scientific model" and "incompatible answers with the scientific model" was used. The analysis of the interviews showed that their mental representations with which they interpret the rainbow phenomenon are some distance from the scientific model.

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Keywords: Mental representations, rainbow

The 2D and 3D Motion: Learning through the best mix of Pedagogy & Technology

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Abstract: Motion is the most ill-understood concept. Uniform Circular Motion is present in the galactic as well as atomic levels. Projectile motion is studied extensively in high school, college, and in the first course of calculus in the university. There are many examples given in textbooks and available on the world wide web illustrating the 2-dimensional motion of a projectile. There are many colorful simulations available that were designed to reinforce the concepts. The transition from one-dimensional motion to a higher dimension is not smooth because of many complicating factors. When we talk about motion it is assumed that the independent variable is time, and the dependent variable is the displacement, velocity, or acceleration of a moving body. In the case of one dimension, the displacement (magnitude as well direction), the velocity, and the acceleration is plotted against time after deriving appropriate formulas for these vector quantities. In the case of a single dimension, this is quite straightforward, but in 2D the meaningful understanding is hampered by the fact that a y versus x graph does not capture the whole picture as time is the third variable. This research work investigates and explores the potential solution.

Keywords: Motion, Projectile Motion, Uniform Circular Motion, Teaching, Learning, Education, Mathematics, Calculus, GeoGebra.

Polynomial-exponential Diophantine equations

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Abstract: Examples of Diophantine equations have appeared in international mathematical competitions in recent years. However, many talented students skip these types of tasks because they have no experience in solving these tasks. The issue of Diophantine equations and number theory in general is not given much attention in primary and secondary schools. So how do you work with gifted students as their teacher? At this conference, I would like to present a sample of research during my doctoral studies, where my goal is to present and create materials that could be used to teach mathematically gifted students in an understandable form using only the basic means of mathematics. In this paper, I will present polynomial-exponential Diophantine equations, which we solve mainly using the so-called factorization method, which is often used in solving equations in high schools. This type of equations is suitable for preparing students, as they are very similar in type to the equations that appear in mathematical competitions. You can also find the article with the same name as a publication at: http://mfi.upol.cz/files/29/2901/mfi_2901_001_006.pdf

Keywords: Polynomial, exponential, Diophantus, Diophantine equations, factorization method

Vocabulary Acquisition through Modeling: a Comparative Study on Visual and Textual Vocabulary Instruction

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Abstract: Computational thinking for everyone! Since Jeanette Wing's proposal in 2006 of computational thinking (CT) as a fundamental skill such as reading or arithmetics, CT has gained popularity all over the world. CT is a strategy that is needed to tackle problems in the field of computer science and includes elements such as pattern recognition, decomposition, abstraction, generalization and algorithmic thinking. To be able to systematically tackle linguistic tasks, the language learner needs a set of problem-solving skills, too. In foreign language acquisition, the learner faces different linguistic learning problems and thus, learning and mastering different problem-solving skills could reduce linguistic complexity and facilitate the learning process. The authors especially focus on the field of language learning and investigate the use of computer science models as a teaching and learning strategy for students of all age groups. The purpose of the research is to assess the effectiveness of static and dynamic computer science models as a teaching and learning tool in different areas of language learning. The authors will present the most important experiences and first results of the latest study, which focuses on vocabulary acquisition. More precisely, it examines whether the acquisition of a set of Russian vocabulary is facilitated when it is categorized and visualized with class diagrams. The participants of this study are pupils and university students and none of them had previous knowledge of the Russian language. This provides an innovative method, which allows us to interpret and support students' vocabulary acquisition by linking it to class diagrams.

Keywords: Computational thinking, language learning, modeling, digital education, UML

The effects of the use of technology and exercise in the school environment

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Abstract: The aim of this study is to find out what changes can happen among students and the whole school staff when they have possibility to integrate and combine technology and activities through out the school days. The research is based on the idea that the teacher can see his or her students in different physical and social environments which allows them to see and understand children and young people better. It is paramount that students and teachers can work together in different environments. Such a practices provides much more understanding to work more efficiently. As a result all can benefit with broader opportunities and learning is evitable.

Keywords: Technology, activity, fun, learning, school environment, positive transformation

Did Brexit change your university plans?

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Abstract: In 2020, about 12,800 Hungarian students studied at foreign universities. Among them, there are about 2020 Hungarian students currently studying full-time in Great Britain. Brexit affected the number of new applicants from the EU and from Hungary as well in 2021. The aim of my research is to analyse the social phenomenon of young Hungarian students studying in the British higher education through the following research questions: what motivates them to study abroad, if Brexit has changed their university choice plans and what kind of secondary schools they come from. In my research, I would examine if there is a correlation between the top places of a popular national secondary school ranking list ("HVG rangsor 2021") and the schools with the highest ratio of foreign higher education applicants. Afterwards, I would interview senior students about their aspirations, their motivations, Brexit and effective preparation for the application process. The significance of my research is to gather and disseminate information on the motivation of Hungarian students' for choosing a foreign university. From a societal point of view, the results could be of great importance to high school students, to their parents and to their teachers as well as on high school career or orientation days. Students and their parents should be aware of their possibilities, and the costs and risks of this so-called long term financial investment.

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Keywords: internationalization of higher education, international student mobility, degree mobility, brain drain, brain circulation

The relationship of metacognition with science misconceptions in prospective teachers

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Abstract: Both metacognition and science understanding have an essential role in today's society if we consider the large amount of information an individual has to deal with on a daily basis. Beside the large amount of information, the importance of lifelong learning cannot be denied today. The role of metacognition in science understanding has been well documented within the literature, although little emphasis has been put on science misconceptions and conceptual change. Beside the relatively small number of such studies found in the literature, those that are focused on prospective teachers are quite limited. Thereby, we considered essential to introduce this group in the research on the relationship between metacognition and science misconceptions and we invited 102 prospective teachers to participate in the study. Data were gathered from a public well-known university in Romania, through a single online survey. As data collection tools we have used the Metacognitive Awareness Inventory (Schraw & Dennison, 1994) and a sample of 10 items to assess science misconceptions in prospective teachers. Both descriptive and inferential statistical techniques were used. The results points out that there is no relevant relationship between various metacognitive dimensions and science misunderstanding in prospective teachers. The results are presented and discussed in the light of previous research.

Keywords: Metacognition, science, science misconceptions, prospective teachers

Tell, Draw & Code - Investigating Teacher Perceptions of Supporting Computational Thinking through Robotics-based Storytelling Activities in Primary Education

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Abstract: The introduction of computer science education is becoming increasingly important and necessary in primary education. However, innovations can only find their way into the classroom if teachers see them as viable and meaningful. This presentation reports on an investigation of teachers' professional development in robotics programming by integrating the storytelling method into their teaching. It draws on the Technology Usage Inventory (TUI) model to examine how an interdisciplinary intervention with programmable robots combined with the Tell, Draw & Code storytelling method can influence the intention to use them in the classroom. Comparison of the pre- and posttest and an analysis of the qualitative data show a significant increase in positive attitudes toward the use of robots. The quasi-experimental study demonstrates that this problem-based and cross-curricular didactic setting is particularly well received by teachers because it promotes computational thinking, storytelling, and literacy skills in primary school students in equal measure and it can be easily taught. The findings highlight the need for teachers to explore, reflect on, and experience the potential of new technologies as part of their teacher training to implement innovations sustainably.

Keywords: Educational robotics, primary school, storytelling

How do we design arts-integrated and technology supported learning tasks that can impact on students' metacognitive skills in mathematics?

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Abstract: My study is a design-based research in which I am designing arts-integrated tasks for students to learn mathematical concepts through authentic problem tasks. Metacognitive skills will be taught when the students are engaged in the process of solving a problem task as the researcher believed that with heightened awareness of their learning process, students will improve their control over their own learning. The design principles in designing the tasks will incorporate the elements of music and visual art. Also, GeoGebra is the platform for students to explore and construct their mathematical knowledge. The researcher is proposing a research model that will be refined at each research cycle in this design-based research. The data collected in this mixed-method study is expected to provide the researcher some useful insights to refine the model.

Keywords: Mathematics, Arts-integration, Metacognitive skills, GeoGebra, Design-Based Research

Options and Obstacles of 3DMP for STEAM teachers

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Abstract: Emerging technologies such as 3D modelling and 3D printing (3DMP) are estimated to gain more and more importance in our daily lives and thus also gain importance in education. The technology 3D printing has the potential to help develop and train skills in students as well as teachers and can help in integrated lessons in the teaching process. Personal experiences show that understanding visualisations in 3D can be tricky for even mathematics teachers sometimes. Especially spatial reasoning, problem solving skills and modelling skills can be trained. However, teachers still rarely use 3DMP to support their lessons. My goal is therefore, to identify possible obstacles and benefits teachers might have in using this technology in their lessons and to find possible ways to support them. I looked at previous experiences gained from a case with one teacher that resulted in workshops in Montenegro with 200 teachers. We found that workshops had benefits for both teachers and their students and improved the STEAM lessons of these teachers as well as held benefits for the students. Reflecting the experiences and feedback, we developed a concept for a course for mathematics teachers. This course will be refined in a design-based manner and results will be analysed and added to the set of collected experiences. Comparisons between teachers in Austria and teachers in Montenegro are planned.

Keywords: 3D modelling, 3D printing, course framework, teacher education

Out-Of-Field-Teaching

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Abstract: A number of reasons are given for the widespread phenomenon of Out-Of-Field Teaching in school systems all over the world. These include budget cuts, poor school management and teacher turnover. In addition, several studies have shown that the impact of Out-Of-Field Teaching on the teachers involved is overwhelmingly negative. While there is a considerable amount of literature on both the reasons for Out-Of-Field Teaching and the consequences for teachers, there is a gap regarding the impact of Out-Of-Field Teaching on students. Although the issue remains unresolved, as it is clearly a complex one, the international comparative literature argues that Out-Of-Field Teaching has a negative impact on student learning. This study focuses on Austrian students in secondary education level 1 and discusses the consequences of Out-Of-Field-Teaching on quality education. Three questions are explored in this paper. 1) Does Out-Of-Field-Teaching have a negative impact on student achievement? 2) To what extent does Out-Of-Field Teaching influence students' perception of education? 3) Are there differences in teaching practices between Out-Of-Field and In-Field teachers? The results will be obtained from national data and qualitative interviews.

Keywords: Teacher training, achievement, didactics

A GeoGebra Classroom Case Study in a Technical Drawing Lesson

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Abstract: GeoGebra Classroom is a virtual platform on the GeoGebra website, where teachers can assign interactive and engaging tasks for students and can monitor the progress of their students live. I conducted a case study in a Technical Drawing lesson, where 7th-grade secondary school students were working with GeoGebra Classroom. During this lesson, the students worked on several tasks, that focus on the interconnections of tangible and digital tools as well as on tasks that offer whole-class activities and student interactions. The whole lesson was video and audio recorded with cameras and the teacher's device was screen recorded. Moreover, we automatically collected student products in GeoGebra Classroom and additionally, the teacher's reflective notes that were made after the lesson. In this presentation, I will share some examples of the data and how I analyzed the data.

Keywords: Class Activities. Connected Classroom Technology. Digital Tools.