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ABSTRACT BOOK

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USING EDUCATIONAL GAMES TO AID THE TEACH OF MATHEMATICS

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Mathematics is a discipline considered difficult to learn by a large part of the Brazilian population, so it is very important to introduce this to children from an early age. One of the ways is through the use of educational games that involve it. Based on this, one workshop on mathematical games was applied to students from 7 to 16 years of age at the EDHUCCA, an organization that it aims to reduce income inequality and violence through a project of child socialization. The project was divided into two stages, the first reserved for the development and construction of games, with simple materials and easy access. Followed by its application for 6 months. Taking into account the age of the students and the level of schooling, games were developed that allowed for more reasoning and stimulated the rapid thinking, such as: Tangram, Tower of Hanoi, Memory Game, Sudoku, Einstein Test, Naval Battle, Mathematical Bingo, Game of the Dice, among others. At the beginning, there were some difficulties presented by most of the participants, so the workshops were started with simpler games, so that according to the sympathy with the matter and willingness to participate increased the level of difficulty of the games. Despite the difficulty, they always looked for a way to adapt and overcome to complete, even after it has not succeeding, they were willing to continue trying to achieve goals, a situation that usually does not happen in a conventional class. Due the success, increasing the children's taste for mathematics, showing that their learning is not so difficult and stimulating the students' reasoning, it is intended to continue the project and broaden it to reduce the repulsion that many people have for this discipline.

Keywords: education, mathematic, games

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USE OF TEACHING TECHNIQUES TO CAPACITATE 8TH AND 9TH GRADE ELEMENTARY SCHOOL STUDENTS FOR OBMEP

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The mathematic is seen that an unattractive discipline. For this, some strategies are being created to motivate and to improve their teaching. This project studies one new methodology of teaching that is based on the development of logical reasoning for the realization of the Brazilian Olympiad of Mathematics of Public Schools (OBMEP), which is a national multiple-choice test. It is applied by the Ministry of Education to Elementary School students in order to encourage the research and discovering new talents. Students of the Federal University of Technology – Paraná, after 4 months by training with teachers of mathematics, they ministered classes to 8th and 9th grade students. It addresses the topics: Arithmetic, Combinatorial Analysis and Geometry. With the encouragement of parents, the students of public and private schools of the Apucarana city participated in meetings that happened on Saturdays, at the University. It was done with material, that it was prepared by the teachers, and it was provided free of charge. It was also performed a statistical analysis by means of Descriptive Statistics, where we analyzed some factors such as: public or private school, family income, highest level of education of the family, monitoring of the child in the homework, and the influence of these factors on the performance of the students in the OBMEP. The results showed that this project has a great social implication, as well as help in the improvement of the grades obtained in the national test. It also promotes a growing interest in school in the subjects that require logical reasoning. Another positive factor is the fact of it giving greater prominence to the city. Thus, it receives more incentives from the Federal Government, it having the opportunity to improve the education in order to increase the capacity of the professional development of students.

Keywords: mathematical education, obmep, elementary school

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LOGICAL REASONING AS A SOCIALIZATION TOOL

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Logical reasoning is an important skill for the making decisions. Through it, it is possible to organize and solve problems in an easier and more practical way. In addition, it is one of the most recurring topics used in public exam in Brazil. The introduce of this in tool of the basis youth's education improves the quality of the education in the country and it contributes to form more critical and argumentative's people, that they will be capacible of creating, interpreting, explaining and assimilating risk situations. For this reason, one project was designed with the objective of showing and arousing interest in the logical reasoning in some children and adolescents. The public that it was attended by this work was a philanthropic institution in the Apucarana city, in Paraná, that it is known as "Human Development School". In this place, the aim is to reduce violence and social inequality in the municipaly through the socialization of children, with workshops in several areas of learning. With the help of the collection of books by Ataíde (2017), in the beginning, tests were applied to measure the level of knowledge of the participants. The result showed that the students didn't reach a minimum of 50% accuracy. This is the demonstrated of the great difficulty, by them, to solve the questions. Faced with such a diagnosis, the logical reasoning workshop was implemented. Already in the first month of the course, a new test was carried out and the students presented an expressive evolution in relation to the first test. This is the indication that, both the approach of the material used and the explanations made during the lessons produced positive effects. We can see the change in students' motivation and the consequent professional and personal growth. This has fundamental importance for every human being.

Keywords: logical reasoning, learning, socialization

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CHARACTERIZATION OF MATHEMATICS EDUCATION IN BRAZILIAN HIGH SCHOOLS

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In this survey we present a comparative of the quality of mathematics education in Brazil for different strata, e.g. stages, public private education and others. The data set used in this survey refers to the national high school exam (ENEM) applied in 2017, which the result is used to guarantee a position in a public university in Brazil. The total of students of the last year of high school who took the exam to try a position in a university was 1,256,822, classified as: 79.5% studied their whole life in public; 40.1% white, 11% black, 44.3% brown and 4.6% others skin color; 30% come from families earning less than a minimum wage; crossing the factors type of school and skin color, we note that almost 50% of the students are black or brown from public schools; looking the regions we have that 14.8% are from Midwest, 33.3% Northeast, 25.9% North, 14.8% Southeast and 11.1% South. Associating the scores obtained on math test, which assumes a range of 0 to 1000, with income per family, type of education (public or private) and skin color using a linear regression model, we can conclude that: for each R$1000.00 increased in family income, the average score increases in 3.75; students from a public school has in average 81.87 points less than private school students; students with black and brown skin has, in average, 27.42 and 23.09 points lass when compared with white students. Comparing the students that got more than 500 points by regions, we may note that, for all regions, the performance of public education was approximately half of the performance of private education. The results obtained in this paper shows that the Brazilian government should concentrate resources in public school to reduce the inequality of education of the Brazilian students.

Keywords: enem, mathematics education, public private education

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CRITICAL REFLECTION IN TEACHING AND LEARNING MATHEMATICS TOWARDS PERSPECTIVE TRANSFORMATION: PRACTICES IN PUBLIC AND PRIVATE SCHOOLS

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The study investigated the practices in critical reflection being employed in teaching and learning mathematics in public and private schools for students to achieve perspective transformation in psychological, convictional and behavioral dimensions. There were 1,969 senior high school and college student-respondents selected at random from 33 schools. Process reflection is most commonly practiced in both public and private schools. Convictional dimension of perspective transformation is most frequently achieved. There is no significant difference in practices of process reflection between senior high school and college students. However, there is significant difference in perspective transformation in behavioral dimension achieved by students from public and private schools. Also, there are significant differences in psychological, convictional and behavioral dimensions of perspective transformation achieved by senior high school and college students. There is high and significant relationship between critical reflection practices and perspective transformation of students. The researcher concludes that there are teaching strategies like discovery learning and peer teaching that facilitate critical thinking, and that there are learning activities like technology-based problem solving that alter their perspective of mathematics as an abstract field. The researcher further concludes that consistent use of appropriate teaching and learning activities could bring about perspective transformation among students with success.

Keywords: critical reflection, perspective transformation, process reflection, convictional dimension, teaching and learning mathematics

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PROJECT TO TRAIN 6TH AND 7TH GRADE STUDENTS IN MATH OLYMPIADS

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In Brazil, the teaching of mathematics present itself in a decontextualized, inflexible and immutable way, it being the product of privileged minds. The Brazilian Mathematical Olympiad (OBMEP) is a national project directed to the public and private schools, it carried out by the National Institute of Pure and Applied Mathematics, with the support of the Brazilian Society of Mathematics and it is promoting by the Ministry of Education and the Ministry of Science, Technology, Innovation and Communications. This project came about in order to improve the interest of mathematics in children and adolescents, and also, to solve difficulties that for many people turn out to be something frustrating. In addition, it contributes to a higher classification of them in OBMEP, which it's an important competition to discovery of new talents. Voluntarily, students from various engineering courses were instructed and trained to teach classes to 99 students enrolled in the 6th and 7th years, with 52% belonging to public schools and the other 48% of private schools. Contents in the areas of Arithmetic, Combinatorial Analysis and Geometry were addressed, on Saturdays, at the Federal University of Technology, Parana, for free and didactic. The approximation of the academic community to society, together with the constant participation of the family and the encouragement of the teachers, it contributed significantly to the success of the project. Besides to presenting a greater number of classified in relation to previous editions, statistics point to satisfactory results, not only in the educational area, but also in the social context, once the students have come into contact with children of the same age, but different realities. Students dropout rates were lower for public school (42%), it be confirming the need for more attention in education and it be reinforcing the relevance of this work.

Keywords: elementary school, mathematics, obmep

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CONCEPTUAL METAPHOR FOR TEACHING AND LEARNING OF PRIME AND COMPOSITE NUMBERS AT PRIMARY GRADE

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Mathematics encompasses abstract concepts. Many concepts and ideas of mathematics are generally found difficult to perceive. Metaphor is a conceptual mapping from one domain to another. It helps student to understand abstract and unfamiliar mathematical content knowledge through their everyday experiences, familiar and concrete objects. The subject of prime and composite number is a very important part of school mathematics curriculum at basic level and it symbolizes a move from concrete to abstract thinking. Different teachers use several metaphors to assist students' learning and encourage them to understand abstract ideas and concepts of numbers. The main objective of this paper is to provide a glimpse of teaching abstract mathematical content of prime and composite numbers through different conceptual metaphor based on constructivist approaches for teaching and learning. Action research was adopted with three level of interventions, followed and corrected depending on observations and reflections. Different interventions regarding the student experiences and everyday activities were used to communicate the concepts of prime and composite numbers. Lessons were designed with the view of conceptual metaphor based on constructivist framework. The color metaphor was applied as the first intervention. Then the area metaphor was applied as the second intervention and finally the teacher used "I and Me factor is prime number" and "I, Me and My factor is composite number" as another metaphor to analyze the change and improvement in classroom practice of teachers in the process of teaching and learning of prime and composite numbers. The pre-class and post class interview with teachers and students were taken. From the classroom observation and interview, it was found that conceptual metaphors used by the teachers in the mathematics classroom really contributed for the improvement of students' understanding of the concepts.

Keywords: action research, area metaphor, color metaphor, conceptual metaphor, cultural artefacts, school mathematics

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INTEGRATING EDUCATION WITH TECHNOLOGY: A STUDY WITH AN EMPHASIS ON BUSINESS EDUCATION

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Ultimately technology may transfer the education content and motivate students towards lifelong learning. The word 'computer' comes from the word 'compute' which means to calculate. So a computer is normally considered to be calculating device but now-a-days more than 90% work done by the computers is non-numerical in nature. The computer is used to assist personnel in business enterprises, scientific research and many other walks of life. The computers improve the versatility of personnel by reducing complex problem to the package of simple logically connected problems and solve them by using implicational software. Of the great changes that business education has undergone and is still progressing and integrating towards new technology are a good interrelation between business education institutions and industry. Technical up gradation in curriculum is required to meet the needs of industry and business houses. There is dire need for seeing business education as one of the professional education and understanding the vital role of commerce in trade and industry. To understand the value and impact of technology in education including business education, it must recognize that there have been three distinct phases in evolution of its uses and expectations. They are: Print automation, Expansion of Learning Opportunities, Data Driven Virtual Learning.

Keywords: technology, software, device, personnel, versatility

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THE IMPORTANCE OF EDUCATIONAL TECHNOLOGY IN TEACHING

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Today, more than ever, the role of educational technology in teaching is of great importance because of the use of information and communication technologies. With the help of various applications for distance education, the Internet, teachers, and students themselves, they see the advantage of educational technology. The question is whether schools and teachers themselves are ready for the use of technology in education and whether they are aware of its benefits? In this paper, we try to give an overview of the importance and use of educational technology in the classroom. Terminological differences mostly occur on the grounds of the approach to the technical characteristics and the use of modern appliances, and not their actual application in teaching i.e. their actual pedagogical application. For this reason, there are different opinions among teachers in the field of social and technical sciences. Therefore, the application of educational technology requires knowledge from several areas: pedagogy, psychology, didactics, computer sciences, informatics... Because of this diversity, there are also different perceptions of educational technology, where every author defines the concept of educational technology, according to their needs. Educational technology is still not being applied sufficiently, mostly for reasons of lack of school equipment necessary resources and insufficient qualification of teachers for the implementation of these funds. Teachers have been using new technologies in the classroom. However, the development and application of new technologies grows as a measure that is the question of whether teachers are trained to keep up with them. Here we have two problems. Are the teachers have the ability to use educational technology and whether the school is sufficiently equipped with all modern technical means? Numerous studies were carried out, some are still ongoing, but we have to find the right strategies to apply educational technology in teaching.

Keywords: keywords: educational technology, technology and learning, school, teachers, the impact of technology on learning.

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DEVELOPMENT OF PRE-SERVICE TEACHERS' PERCEPTIONS OF USING METACOGNITIVE SKILLS IN TEACHING AND LEARNING MATHEMATICS

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In the present research, we educated mathematics pre-service teachers in using metacognition in their teaching of mathematics. This education was performed in one-year and was part of the participants' practical training in the training schools and in the frame of a reflection-based course related to the practical training. We studied the development of pre-service teachers' perceptions of using metacognition in teaching and learning mathematics. Twenty four pre-service teachers participated in the preparation. They were in their third academic year majoring in teaching mathematics and computer science in middle schools. We held interviews with the participating pre-service teachers twice, once at the beginning of the preparation and once at the end of it. To analyze the interview transcripts, we used inductive and deductive content analysis. The research results indicate that the participants developed their perceptions regarding metacognition and its use in students' learning, but at the same time, due to the time pressure, they intend to use mainly the 'planning skill' in their teaching of mathematics.

Keywords: metacognition, metacognitive skills, mathematics teachers, pre-service teachers

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SPECIAL RESEARCH METHODS IN THE DYNAMIC SYSTEMS THEORY

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Dynamic systems are interesting as mathematical models of phenomena where fluctuations we may disregard. They are divided into the so-called cascades and flows - the dynamic systems with discrete and continuous time correspondingly, and have been studied in the topological and symbolic dynamics. All types of dynamic systems are commonly described with an autonomous system of differential equations. In such an approach singular points of differential equations correspond to equilibrium positions of dynamic systems. The same time periodical solutions of differential equations correspond to closed phase curves of a dynamic system. A global task of dynamic systems theory is to study curves defined by those differential equations. The whole phase space of a system we must split into trajectories, and their limit behavior has to be revealed. That means to find out namely equilibrium positions and make their classification, reveal repulsive and attracting manifolds (sinks and sources, or attractors and repellers). Also researcher must investigate a question of the stability of equilibrium states as well as a question of a roughness of a dynamic system. In the presented work a broad special family of dynamic systems with polynomial right parts have been fully studied usind Poincare methods of serial mappings, the Poincare sphere and the Poincare circle. Their phase portraits in a Poincare circle were constructed and criteria of their appearance outlined.

Keywords: dynamic system, phase space, phase portrait, singular points, trajectories, poincare circle

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THE IMPACT OF IMMERSIVE ARGUMENT-BASED LEARNING ENVIRONMENTS ONSTUDENTS' REASONING SKILL DEVELOPMENT AND PERCEPTIONAL CHANGES

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The Next Generation Science Standards (NGSS) assert to replace traditional lecture-based learning with authentic learning environments such as immersive argument-based learning environments for students' multiple competence development. Unlike traditional lecture-based learning, immersive argument-based learning emphasizes students' engagement in dialogical interaction. This interaction enables learners to utilize multiple cognitive skills through argumentation (e.g., inductive and deductive reasoning skills). Immersive learning environments also impact students' perceptional development about learning environments. It affects students' decisions about whether they will continue learning experiences for future problem-solving situations. Although many research studies assert the importance of authentic learning environments, there is little evidence on their effectiveness. Hence, this study displays how the immersive learning impact students' cognitive and perceptional development. We collected data from two different types of classrooms, high- and low-level immersive learning environments, and utilized hierarchical linear modeling (HLM) to analyze the impact of different types of learning environments. The data include students' performance on the critical thinking test, which measures reasoning skills, and responses to the epistemic climate survey, which captures students' perceptions about the dialogical interaction through two dimensions: learning experience and value-making. The preliminary results showed that there is no statistically significant difference in reasoning skills between two types of learning environments. However, the high-level group perceived that they have better epistemic climate than the other in both dimensions (differences in the epistemic climate survey responses are statistically significant). Further analysis will include how both groups of students' critical thinking test scores have been changed across two years. The preliminary and future analysis results will support the argument that students develop reasoning skills and their perceptions about learning environments as they experience immersive argument-based learning approaches.

Keywords: learning environments, reasoning skills, epistemic climate

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DESCRIBING STUDENTS' REASONING IN AN IMMERSIVE ARGUMENT BASED SCIENCE INQUIRY

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The Next Generation Science Standards place emphasis on the role of dialogic interactions in science as a means to better engage with science practices, crosscutting concepts, and core ideas of science. Given these dialogues require reasoning, the quality of argumentation in the classroom discussions can be used as a tool that evaluates students' science learning. The purpose of this study is to describe how students' reasoning evolves in an immersive science learning environment. This study employed secondary analysis on an existing data set of transcriptions of 6-week ecosystems and 5-week force and motion units of fifth graders' whole-class discussions. Constant comparison analytic analysis was used to explore the patterns in students' reasoning skills from their classroom discussions. To describe students' reasoning progression from whole-class discussions, the enumerative approach was employed to obtain the frequency of each code by each class. Walton's presumptive reasoning schemes were used to analyze students' discourse for each whole classroom discussion session. Moreover, the codebook was divided into three argumentation components (premise, justification, and evaluation) and the frequencies of each category were obtained with respect to contents of argumentation chains in each class. Argument components' ratios were calculated for each class of ecosystems and force and motion unit. The results show students expand higher level reasoning such as critique and causal argumentation throughout the courses. The average argument components' ratios show that students' usage of justification and evaluation is higher in force and motion class. However, as the fifth-grade students might not be familiar with the force and motion concepts, the total frequency of presumptive reasoning is lower in force and motion class. In the long term, we anticipate that this study contributes to describe the quality of argumentation by describing students' reasoning and the understanding of chaining of arguments in science classrooms.

Keywords: argumentation, physics education

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MATHEMATICS ANXIETY AMONG SECONDARY LEVEL STUDENTS IN NEPAL

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This paper explores the association between the perceived classroom environment and mathematics learning and test anxiety among secondary level students in Nepal. Categorizing the students in three dominant variables- gender, ethnicity and previous schooling, and selecting sample students with respect to higher mathematics anxiety from five heterogeneous classes, the research explores disparities in student's mathematics cognition and reveals the nexus between classroom environment and mathematics learning and test anxiety. This research incorporates social learning theory and social development theory as interpretive tools for analyzing themes through qualitative data. Focusing on interviews with highly anxious students learning mathematics, the study sheds light on how mathematics anxiety among the targeted students is interlinked with multiple factors. The research basically exposes the students' lack of mathematical passion, their association with other students and participation in classroom learning, asymmetrical content and their lack of preparedness for tests, as the caustic factors behind such anxieties. The study further reveals that students' lack of foundational knowledge and the complexity of the mathematical content have jointly contributed to mathematics anxiety. Admitting learning as a reciprocal experience, the study points out that the students' gender, ethnicity and disparities in previous schooling in the context of Nepal has very insignificant impact on students' mathematics anxiety. It finally recommends that those students who get trapped into the vicious cycle of mathematics anxiety require a positive and supportive classroom environment along with inspiring comments/compliments and symmetrical course contents.

Keywords: anxiety, asymmetry, cognition, habitus, pedagogy, preparedness

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ANALYSIS OF SCIENTIFIC PROCESS SKILLS AND RELEVANT PERCEPTIONS AMONG SCIENCE TEACHERS AND PRE-SERVICE SCIENCE TEACHERS

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In this study, the aim was to determine perceptions of using scientific process skills among teachers who worked in departments related to science in primary schools and high schools, and among students who studies in science teaching departments at university. In relation to use of scientific process skills, identifying the perceptions of teachers and students and whether there were differences between two groups was the most important in terms of revealing the status of primary actors in teaching of scientific process skills to students. The research was designed in descriptive survey model. The research was carried out with 260 students who studies in science teaching departments at university and a total of 150 teachers serving as biology, science, physics and chemistry teachers in schools affiliated to the Ministry of Education in different provinces. To measure teachers and students' perceptions of scientific process skills, Scientific Process Skills Perception Scale was used. Data obtained from the study were analyzed with the SPSS 23.0 software. According to results of independent sample t-test, there were no significant differences between teachers and students' perceptions of scientific process skills, however students' scientific process skills were higher compared to those of teachers. Higher level of perceptions of scientific process skills among students is considered as a result of some revisions in teacher training. For this reason, it is suggested that teachers who serve for their profession should also be supported through various channels and contents regarding this subject.

Keywords: science teachers, pre-service science teachers, scientific process skills

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MISO-MOTION IN THE SCIENCE OCEAN.PROJECT BASED LEARNING USING MOBILE DEVICES - SYNTHESIS OF BIODIESEL BY HOMOGENEOUS OR HETEROGENEOUS CATALYSIS

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Six European schools from very different parts of Europe (Agrupamento de Escolas da Maia - Portugal, Anne-Frank-Schule Bargteheide – Germany, Özel Bilkent Lisesi – Turkey, Sandsli VGS – Norway, Institut Pau Vila – Spain and Liceul Teoretic Iancu C. Vissarion – Romenia), have developed an Erasmus + project for Exchange of Good Practices, MISO, in order to increase student interest in science, foster the use of ICT with different applications for experiments, share experiences between teachers and students and collaboratively examined new approaches to teaching and learning of science (E-learning Tools). In the last years the automobile industry has been looking for alternatives to reduce the consumption of fossil fuels. One solution can be vehicles containing a normal internal combustion engine that uses as combustion the Biodiesel. This research study used Project Based Learning as pedagogical methodology, through the use of mobile devices, was made by students of Chemistry of 12th

grade. Students aimed to synthesize Biodiesel by transesterification of refined soybean oil using, in a comparative way, homogeneous (basic) or heterogeneous catalysis using standard laboratory materials. They also studied the effect of the amount of catalyst in the synthesis of biodiesel and evaluated the effect of transesterification time. Mobile devices were used during the project to take photos and record videos in the course of the laboratory procedure. Different type of APPS (Magisto, Animoto, Popplet and Scapple) were used to report the results. This study concluded that the students involved in this project deepened and applied their previous and new learning, developed their critical thinking, their creativity and communication, increased their autonomy, their organizational management of work, their interpersonal relations and motivation for the learning.

Keywords: project based learning, mobile devices, biodiesel

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USING BLOGS AS ASSESSMENT TOOLS FOR- AND OF LEARNING IN HIGHER EDUCATION

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There is a growing interest in the use of Web 2.0 technologies in higher education. Blogging is an example of publishing and commenting Web 2.0 technology that has the potential to shift university learning and teaching toward more student-centered and meaningful learning. Within a newly developed course in master program in education at Birzeit University in Palestine, students' blogs have been used as assessment tools for- and of students' learning. The aim of this study was to explore benefits, challenges and pedagogical opportunities of this use of blogs within the context of this course. In order to achieve the aim of the research qualitative exploratory approach was applied. 24 Students' blogs were thematically analyzed and evaluated and semi-structured interviews were conducted with eight students. Results revealed that although students expressed their initial skepticism on developing and using their own blogs in the beginning of the course, blogs helped them to document, share and understand the content of the course. They used the blogs to communicate knowledge and feelings among themselves and as a study material for the tests and other evaluative tasks. As the lecturer asked students to write a short paragraph/ sentence to describe their feelings about what and how they learned in lecture, blogs helped him to follow up students' learning, deal with emerging misconceptions, and modify his pedagogical practices accordingly. Study findings strongly recommend the integration of blogging in higher education as both self-learning environments and an authentic assessment tool of students' learning.

Keywords: higher education, ict in education, assessment for and of learning

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PRACTICAL SKILLS IN PROGRAMMING LANGUAGE R FOR EDUCATION OF HEALTHCARE STUDENTS ON BIOSTATISTICS

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In the era of digital economy the big data processing comes to the foreground, therefore specialists who have gained knowledge and practical skills in the field of analytical methods for data processing are demanded. Digital medicine is based on many disciplines including medical informatics and telematics. Students receive practical skills in the field of information and communication technologies and are ready to participate in a paperless production process. To help future specialists to become more familiar with data analysis the module «Biostatistics» is included to the curriculum of medical students. On the second year they study basics of biostatistics, and then use the acquired practical skills in such disciplines as health organization and epidemiology, as well as in student research papers to substantiate their findings for their observations and experiments. The practical part of the training is related to the implementation of laboratory work on the processing and statistical analysis of biomedical problems. Traditionally for biostatistics course application packages STATGRAPH, STATISTICA and SAS were used. However, the economic conditions of the educational process require the search for alternatives to expensive software and licenses for it. As an alternative, we have chosen «R» - a programming language and free software environment for statistical computing and graphics. In addition, we compiled a textbook with the solution of applied examples using R. Acquired skills will allow graduates to be in demand in the conditions of a growing digital economy.

Keywords: biostatistics, digital medicine

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THE EFFICACY OF THE LANGUAGE COURSES ON THE PREPARATION OF ELEMENTARY SCIENCE AND MATHEMATICS PROSPECTIVE TEACHERS AT THE FACULTY OF EDUCATION, LEBANESE UNIVERSITY

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The present study aims to determine the efficacy of the two foreign language courses required for preparing elementary prospective teachers to teach Science and Mathematics in English or French. The study is a mixed one relying on quantitative data collected from the 5-point Likert-type scale questionnaires and the qualitative data is collected from the open-ended questions. Data was collected from: a) a questionnaire addressed to professors who teach the two language courses, “Language of Teaching” and “Techniques of Expression”, b) a questionnaire addressed to Science and Mathematics trainer, c) a questionnaire addressed to students in the 2nd and 3rd semesters majoring in Science and Mathematics Education. The objective of the questionnaires is to learn about the participants’ conceptions of the efficacy of the foreign language courses. Results indicate that students had acquired the basic foreign language concepts, but students were not satisfied with the language courses since they are irrelevant to their future careers. Recommendations for teaching foreign languages to Science and Mathematics students are also highlighted.

Keywords: language of teaching, techniques of expression, lmd courses, prospective teachers, fce

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MENTAL REPRESENTATIONS OF LEBANESE PRE-SERVICE SCIENCE AND MATHEMATICS TEACHERS' CONCEPTIONS ABOUT ENVIRONMENTAL ISSUES: A COMPARATIVE CASE STUDY

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The present study explored Lebanese pre-service science and mathematics teachers' conceptions about the environment in Lebanon and in the world. It also depicted the changes of the preservice teachers' views of the environment that have taken place over a decade. To do so, a case study was used and mainly qualitative data had emerged. The sample was formed of two science and two mathematics classes with a time interval of 10 years. The first sample had been enrolled during the academic year 2007-2008 at the Faculty of Education, Lebanese University, while the second sample was enrolled during 2017-2018. Pre- and post-drawings as well as, the projects displayed in class were collected from pre-service teachers, in their 4th semester, at the beginning and at the end of the Environmental Education course. Data validity was assured through pre-service' drawings interpretations by the science and mathematics teachers of the course and analysis of pre-service teachers' pictured projects. Results showed that the global issues such as acid rain and global warming were represented frequently in pre-service teachers' drawings of the 2007- 2008 classes, while the dramatic and alarming situation of the environment in Lebanon, such as wastes dispersed everywhere and sea pollution, is greatly represented in pre-service teachers of the 2017-2018 illustrations. Moreover, both pre-service teachers' conceptions about the environment have significantly improved.

Keywords: environmental education, mental drawings, pre-service teachers

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TEACHERS' KNOWLEDGE AND THEIR PERCEIVED COMPETENCY IN INTEGRATED STEM CONCEPTS IN GUSAU LOCAL GOVERNMENT: IMPLICATIONS ON NATIONAL AND GLOBAL TRENDS

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This study was carried out to investigate science teachers' perceived competency and their knowledge in the implementation of Integrated STEM in Gusau, Zamfara State. Descriptive survey design was adopted for the study. Three research questions were raised and answered using frequency, mean and standard deviation, while the Analysis of Covariance (ANCOVA) was adopted in testing the hypotheses at $p < 0.05$ probability level. Two research instruments; Knowledge on Integrated STEM Concepts (KISC) and Perception of Competency Questionnaire (PCQ) were developed, validated by experts and used for data collection. Both were administered to 37 science and technical teachers who were purposively sampled from the Science and Technical Schools in Gusau. The findings of this study revealed that, the perception held by science teachers about their competence in STEM concepts when integrated was very high. But, it was also observed that differences exist between their perceived competency and their actual performance in STEM concepts when integrated as a discipline. It was recommended that, government should look into the possibility of introducing Integrated STEM curriculum in Nigerian schools and also train science teachers in that regard so as to align with global trends in STEM education.

Keywords: stem, integration, knowledge, competency

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SURVEY OF MATHEMATICS TEACHERS CLASSROOM MANAGEMENT AND ITS IMPLICATION ON THE QUALITY OF TEACHING AND LEARNING AT LOWER BASIC EDUCATION LEVEL IN ZAMFARA STATE, NIGERIA

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Effective learning takes place in the classroom where there is an effective classroom management. In other to have effective management of the classroom, there are some actions, activities and personality trait that the teacher must process or do. Therefore this study is investigating mathematics teacher's classroom management as it influences the teaching and learning of the subject at lower basic education level. The researchers sampled three treatment basic schools, and three non-treatment basic schools. Researchers developed questionnaire for teachers on classroom management was used to collect data from the teachers on classroom management. Also pupils of the sampled schools will be subjected to researchers developed mathematics test in which the achievement will be compared. The view of the teachers of treatment and non-treatment schools shall be correlated while the pupils scores on the mathematics test shall be tested using the t-test statistics. Recommendation shall be advanced based on the findings from the paper.

Keywords: classroom, management, teacher, learning, lower basic education

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WHAT ARE TRAINEE TEACHERS' ATTITUDES TO PROBLEM SOLVING IN MATHEMATICS AND WHAT ARE THE POSSIBLE INFLUENCES ON THESE ATTITUDES?

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The study originates from an enquiry into the attitudes of trainee teacher towards problem solving so that I might improve my practice in the core mathematics module in the Y 2 BA Initial Teacher Training (BAITT) programme at St Mary's University. The study developed from the researcher's uncertainty about how students perceive problem solving in mathematics and the desire to find out more in order to improve student experience on the module. The study involves the responses of a little less than 100 students of the 148 enrolled for the academic year 2016 -17. The data was accumulated through the analysis of module evaluations, pre and post module questionnaires, a small sample of lesson observations of the relevant cohort during school experience and a post–school experience reflection. The school experience took place over eight weeks in the middle of the ten week module. This is an action research study based on a mixed methods approach through the collection and analysis of both quantitative and qualitative data. The study is immediately relevant to the researcher, students and the undergraduate mathematics teaching team but may be of interest and of potential use in other institutions. The findings will be shared as an article in a peer reviewed journal and at St Mary's University it will be shared with the students and staff in a summary on mymodules (the university e-learning platform) as well as during one of the research seminars held regularly and which are open to everyone to attend.

Keywords: confidence, attitudes, problem solving, primary school mathematics, perception, collaboration, perseverance, conceptual understanding

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AEROSPACE SYSTEMS SCIENCE AND ENGINEERING PROGRAM:A NOVEL INTEGRATED APPROACH

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A recent report on the global road map for 2015-2025 commissioned by COSPAR and ILWS emphasized the growing appreciation that the environmental conditions that we call space weather impact the technological infrastructure that powers the coupled economies around the world (Carolus, 2015). Since spaceborne theoretical and practical problems are complicated enough, an up to date science and engineering curricula may need to be considered to cope with such cases. The program/curricula are meant to combine basic sciences, space sciences and technology under a system engineering umbrella. In short, the objective of this program is to produce graduates who will be capable of tackling space programs with deep confidence in an integrated and interdisciplinary manner. In other words, the graduates will be able to take care of these problems from a broad-wide spectrum including, for example, space sciences, such as space weather on one side, and very specific technological problems, such as space debris on the other side. So, in this paper, we propose an engineering education program. In this overview, the first version of a novel program that we propose the title to be “Aerospace Systems Science and Engineering” (ASSE) is introduced. In establishing such a program for the Turkish educational system, we have studied similar programs of the American and European Universities. In this novel, comprehensive Aerospace System Science and Engineering Program, we have combined two approaches: (i) the space systems engineering programs of well-known American Universities (e.g. MIT) and (ii) as our original contribution, the dimension of the science and engineering of the Near-Earth Space

Keywords: engineering education, space science, system engineering, curriculum

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AN AEROSPACE ENGINEERING STUDENT TRAINING FRAMEWORK: APSCO SSS-2BCUBESAT PROJECT

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Initiated in early 2015 and officially started by the end of 2016, Asia Pacific Space Cooperation Organization (APSCO) Student Small Satellite (SSS) program aims to train students and faculties from Member States (Bangladesh, China, Iran, Mongolia, Pakistan, Peru, Thailand and Turkey) by involving them in a real project where they can experience the whole life cycle of a space mission. With this, the program also targets capacity building and human resource development. Within the scope of the program, three satellites, one micro satellite (SSS-1) and two 3U cube satellites (SSS-2A and SSS-2B), will be designed, manufactured and operated. In this paper, educational and technical activities of the APSCO SSS project will be presented from the perspective of SSS-2B cube satellite. The framework for an effective education program will be discussed considering the dynamics and common interests between the international actors ranging from governmental and public institutions to universities and non-governmental organizations. In the first part, the education approach and programs such as three-week long summer camps will be presented. In the second part, the preliminary design outputs of SSS-2B satellite including mission and system specifications will be summarized.

Keywords: student training, satellite design

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A SURVEY OF GRADE 10 STUDENTS' ATTITUDES TOWARDS MATHEMATICS

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The ways in which mathematics teachers can plan instruction and assess learning in the 21st century are endless. One's teaching is now subject to the influence of various elements such as technological tools that are available in the market and the use of new and up-to-date pedagogies in mathematics education. Planning for instruction can sometimes be overwhelming that the teacher tends to pay less attention to the context of the learners, particularly their attitudes towards mathematics. Mata, et al, (2012) state that attitudes explain student performance in mathematics, and students' emotional dispositions impact student achievement. This study aims to describe four attitudes of students towards mathematics: willingness to learn, interest in the subject, confidence in solving math problems, and the relevance of mathematics to their lives. Moreover, the study will also identify relationships between these attitudes with their performance in Mathematics. The research instrument is a questionnaire consisting of 24 questions. The respondents were Grade 10 students who underwent a semi-honors program for mathematics. The respondents were to choose how often each statement applies to them using a 5-point Likert scale. The instrument was administered online through a Google form. The mean scores suggest that the respondents in general are often interested in the subject and are often confident when they solve math problems, and to a greater extent, are willing to learn the subject and find it relevant to everyday life. On the other hand, the correlation coefficients (r = 0.18 to 0.38) reveal that the correlation between attitudes and performance ranges from very weak to almost moderate. Such information is valuable as it can help a teacher fine-tunehis or her teaching strategies and assessment techniques to cater to their needs.

Keywords: mathematics education, attitudes, psychology

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THE EFFECT OF TECHNOLOGY INTEGRATED INQUIRY-BASED LEARNING APPROACH TO THE CONCEPTUAL UNDERSTANDING OF THE MIDDLE SCHOOL STUDENTS ABOUT LUNAR ECLIPSE

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In this study, it is aimed to investigate the effect of technology integrated inquiry based learning and teaching based on science program on the change in students' conceptual understanding about lunar eclipse. The sample of this study consisted of 33 students in the experimental group studying in 6th grade in a state secondary school and 29 students in the control group in another class. The experimental and control groups were randomly assigned. In the experimental group, technology-based inquiry based learning was applied to the students of the experimental group, and the inquiry-based learning approach in accordance with the science curriculum was applied to the control group students. "Conceptual Understanding Test" was applied to students before and after instruction as pre-test and post-test. At the same time, semi-structured interviews were conducted with 9 students from each group. In the conceptual understanding test prepared as data collection tool, 5 open-ended questions related to the concept of lunar eclipse were analyzed. The questions were prepared in accordance with the "Estimates how the lunar eclipse occurs" "The lunar eclipse refers to the stage of the Moon" and "Every month, it is mentioned that there is no Moon eclipse". A rubric consists of 5 categories was used for analysis. These categories are "fully correct", "partial correct", "scientifically unacceptable response", "non-encoded" and "do not respond". For the data analysis, total points were calculated as 4 points for the fully correct category, 3 points for the partial correct category, 2 points for the scientifically unacceptable response category, 1 point for the non-encoded category and 0 for the no respond category. Independent samples t-test was used in data analysis. According to the results obtained from the data analysis, there was no significant difference between the technology integrated inquiry-based instruction and the inquiry-based instruction related to the lunar eclipse.

Keywords: technology integrated inquiry-based learning, lunar eclipse, middle school students

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STEM BASED ASTRONOMY ACTIVITIES

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STEM education implementations are carried out for many different disciplines in schools. However, astronomy activities are limited in STEM education implementations. While thinking about teaching astronomy through STEM education, the thoughts that come to mind are that teaching astronomy is difficult, a telescope is required to teach astronomy and therefore astronomy cannot be effectively thought via STEM education. However, STEM education has a unique structure which is based on knowledge and skill development and this structure is very suitable for astronomy activities. In this context, four modules have been introduced on astronomy education which developed with the scientific inquiry and within the framework of hands-on and minds-on activities in the present study. These modules have been implemented on 67 Pre-Service Science Teachers and 23 gifted middle school students in 2016-2017 academic year. Some of the activities and aims of the modules are as follows: 1) Curiosity arousing activities: Observing the night skies, using a telescope and visiting the Research Laboratories are some of the activities of this module. The module aims to support participants' interest in STEM areas. 2) Encouraging and skill-building activities: The relevant module deals with the design of the basic observations and measurement tools used in astronomy. These tools designed using engineering design processes which is suitable for short-term activities. The purpose of this module is to develop participants' STEM skills. 3) Research and design projects: The objective of the module is to solve a problem such as how can we measure time in alternative ways or how can we reach the space? Through an artifact based solution with using the basic STEM skills acquired by the participants in the previous modules. 4) Science fairs: The module focuses on the interactive presentation of the projects and artifacts that conducted in the previous modules.

Keywords: stem education, astronomy education, scientific inquiry, activity development

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MATHEMATICS EDUCATION STUDENTS' SKILLS REGARDING MATHEMATICAL DEFINITIONS IN SETS

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The purpose of this study is to reveal the skills of mathematics education students studying in the department of elementary mathematics teacher training regarding mathematical definitions in sets. In this context, students' mathematical definitions, personal definitions and examples in sets were investigated. Concept of equal sets, subsets, union of sets, intersection of sets, compliment of a set, and difference of sets were considered in this study. The participants of the study consisted of 79 freshmen studying in the department of elementary mathematics teacher training at a state university located in Eastern Anatolian Region of Turkey. The study adopted qualitative research approach and is a sample of a case study. The data of the study was collected from students writing responses in the form developed by the researchers, and interviews were carried out with 10 students selected from the participants. The results of the study indicated that most of the students made verbal definitions, giving examples, presenting operational properties, demonstrating symbols of operations rather than notational mathematical definitions as mathematical definitions of related concepts. Similarly, most of students made verbal explanations as personal definitions. Some students had personal definitions inconsistent with mathematical definitions of related concepts. It was found that along with the daily life examples, students gave examples with mathematical objects.

Keywords: sets, concept definition, mathematics education

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MATHEMATICS TEACHERS' VIEWS AND SUGGESTIONS REGARDING STUDENTS' DIFFICULTIES IN RATIONAL NUMBERS

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The purpose of the study is to reveal the views and suggestions regarding students' difficulties in teaching of rational numbers. Qualitative research approach was adopted in the study. The method of the study is a case study. This study was carried out in the spring semester of the 2017-2018 academic year. The participants of the study consisted of six mathematics teachers at state middle schools of Eastern Anatolia Region of Turkey. Maximum diversity sampling from purposive sampling methods was used while selecting the participants. The data of the study were collected through semi-structured interviews developed by the researcher. The data collected from the interviews were analyzed using content analysis technique. According to the results, teachers drew attention to the difficulties experienced in comprehension of rational numbers, equalizing the denominators, comparing rational numbers and determining rational numbers on number line. The teachers stated that students especially have many difficulties in comparing rational numbers and the four operations in rational numbers. These difficulties are; considering the nominator and denominator as two separate numbers, confusing the operations rules, not understanding logic of operations and not equalizing denominators. The teachers made student-centered evaluations for the source of these difficulties. Most of the teachers suggested the use of visual materials and direct instruction method to overcome the difficulties related to rational numbers.

Keywords: rational numbers, learning difficulties, mathematics teacher

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INVESTIGATION OF NATURE OF SCIENCE CONCEPTS IN MIDDLE SCHOOL SCIENCE TEXTBOOKS

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The purpose of this study was to analyze representation of nature of science aspects in 6th, 7th and 8th grade middle school science textbooks from 1926 to 2019 in order to assess changes during the past 8 decades. Data obtained from eight different science curricula prepared in 1926, 1948, 1977, 1992, 2000, 2004, 2013 and 2018. A total twenty-four science textbooks were analyzed based on nine different nature of science aspects including on the empirical, tentative, inferential, creative, theory-laden, social and cultural embeddedness of science, myth of scientific method, differences between observation and inferences, the nature of theory and law. Data were analyzed based on scoring rubric prepared by Abd-El-Khalik et al. (2008). Result of the study showed that nature of science aspects changes in science textbooks according to grade levels and science programs. Science textbooks prepared according to 2013 and 2018 programs had more nature of science aspects than other programs.

Keywords: science education, textbooks, the nature of science

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DEVELOPING PROSPECTIVE SCIENCE TEACHERS' PEDAGOGY THROUGH EVIDENCE-BASED EXPLANATIONS: EXPLORING ARGUMENTATION IN THE CLASSROOM

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Research indicates that learning how to engage in productive scientific argumentation to propose and justify an explanation through argument is difficult for students (Sampson & Clark, 2008). It has also been reported that there is limited research on how teachers, in-service or preservice, construct and learn to teach arguments on scientific issues (Ozdem, Ertepinar, Cakiroglu, Erduran, 2013). In the domain of current electricity Kelly, Druker and Chen (1998) studied how, and under what conditions, students justified their claims while attempting to solve a performance assessment task. Three cohorts of students (n=63; n=60; n=47), enrolled in 4-year Bachelor of Education programme at university, participated in the study from 2015 to 2017 respectively. They built and presented a model that depicts the principles of direct-current electricity at the end of a 6-week unit on the topic. The presentation was video-recorded and subsequently transcribed for thematic analysis according to certain categories. The results show that on average across the three years, approximately 66% of the students presented evidence and reasoning that has moderate to good relevance. The 2015 cohort had the highest percentage of appropriateness at 86% whereas the 2016 cohort had the lowest at 45%. This means that more than half of the 2016 class are unable to articulate a correct scientific understanding in terms of the evidence that they present. The levels of complexity of the evidence and reasoning for the three cohorts shows the same patterns as the relevance of the evidence. The results would suggest that there is a need to focus on the qualitative reasoning of students by affording them more opportunities during classroom activities. The results also support the argument by Sampson and Clark that learning how to engage in argumentation is difficult for students.

Keywords: argumentation, science teachers, direct-current electricity, scientific reasoning

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THE EFFICACY OF MATHEMATICS TEACHER PROFESSIONAL DEVELOPMENT MODEL BASED ON PEDAGOGICAL CONTENT KNOWLEDGE

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The training program aimed at developing the professional knowledge of Math teachers in order to improve their classroom teaching practices. It focused on developing deep understanding for teachers about the content of Geometry unit and discussing objectives of teaching Math in general, objectives of teaching Geometry, challenges students may face in learning Geometry, alternative concepts students may have about Geometry in addition to recognizing models from strategies of teaching Geometry and new strategies used in evaluating students. The training program could be considered a successful one as the performance of most of teachers who enrolled in the program have developed in all elements of specialization teaching knowledge. For instance, all teachers' performance (except two teachers) have developed in content knowledge after the program. Regarding the knowledge of objectives, students characteristics, teaching strategies, curriculum, resources and context), it was apparent from the classes that have been observed and through the reflections that were done by teachers at the end of every meeting session. On the level the students, results of the pre-test of students whose teachers were in the control group showed a real progress on the students whose teachers were in the control group in spite of the similarities between them. Yet, students' performance in the control group exceeded the other group before the program.

Keywords: pck, mathematics education

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THE EFFECT OF AUGMENTED REALITY APPLICATIONS ON THE ATTITUDES OF MIDDLE SCHOOL STUDENTS TOWARDS ASTRONOMY

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In this study, the effect of augmented reality applications on students ' attitudes towards astronomy was investigated. In this study, seventh grade students studying in two different classes in a public school were used. One of the classes was determined as a control group and the other class was determined as an experimental group. Astronomy Attitude Scale was used as data collection tools. For 4 weeks, the Solar System and Beyond Unit were processed in the control group in accordance with the curriculum, while the experimental group was supported with augmented reality applications. The Astronomy Attitude Scale was applied as a pre-test to both groups before the application started. After the application, the same test was applied as a post-test to both groups. The obtained data were analyzed with SPSS 22 statistical package program and t-test was used in the evaluation of the obtained data. According to the results of the post-test scores of Astronomy Attitude Scale, a statistically significant relationship was found in favor of the experimental group. Accordingly, it has been shown that augmented reality applications improve the attitudes of middle school students towards astronomy.

Keywords: augmented reality, astronomy education, attitude, solar system unit

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EXAMINATION OF SOCIAL MEDIA USAGE DISORDERS OF MIDDLE SCHOOL STUDENTS IN TERMS OF DIFFERENT VARIABLES

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Depending on the developments in technology, students' use of social media is increasing. In this study, it is aimed to examine the social media usage disorders of middle school students in terms of different variables. In the study, middle school students who were educated in 7 different state schools in Konya province were used. Social Media Disorder Scale was used to detect social media disorders of the students. The purpose of this study was to investigate whether social media usage disorders were related to variables such as gender, class level, certificate of achievement and settlement. The obtained data were analyzed with SPSS 22 statistical package program and One-way ANOVA test was used in the evaluation of the obtained data. As a result of data analysis, it was observed that social media use disorders of middle school students were at an average level. It has been observed that social media use disorders do not differ according to gender. Social media use disorder at class level was mostly at 7th grade level. Students studying in rural areas as a residential area were found to have fewer levels of social media use disorders. In addition, students who did not receive any success certificates in the previous year had more social media use disorders than other students.

Keywords: technology education, social media, social media usage disorders, middle school

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THE RELATION BETWEEN THE APPLICATION OF HANDS-ON EXPERIMENTS AND THE KNOWLEDGE AND OPINION OF STUDENTS IN PHYSICS

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The application of hands-on experiments in primary school is very important because it contributes to pupils' success by encouraging them to pursue activity through manipulation of objects and materials (learning by doing) in order to acquire knowledge and understanding of the concept studied. The research was conducted to examine the relationship between the application of hands-on experiments in initial science teaching from the first to the fourth grade of primary school and the knowledge of pupils in physics and their opinion on the subject. The research included N = 263 pupils of the 6thand 7thgrade from the three primary schools in the Republic of Serbia (Autonomous Province of Vojvodina). Pupils' knowledge of physics was examined through a test, while the pupils' opinion on the subject was determined through a questionnaire. The results of the research showed that pupils who performed hands-on experiments in classroom teaching achieved better knowledge of physics and a more positive opinion of this subject than those who did not perform hands-on experiments. Hands-on experiments should be included in the initial teaching of science, as its application affects better knowledge acquisition and positive opinion about these subjects in later grades. Acknowledgement: The research was carried out within the project of the Ministry of Education, Science and Technological Development of the Republic of Serbia, entitled: Quality of the Educational System of the Republic of Serbia in a European Perspective [Grant no. 179010]

Keywords: hands-on experiments, knowledge, opinion, teaching physics, primary school

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REFLECTIONS OF CHANGES IN SCIENCE AND TECHNOLOGY TO EDUCATION

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Throughout history, the diversity of the tools and equipment that human beings use in line with their needs has affected human life in many different ways. The invention of these tools and materials that affect human life is one of the main characteristics that distinguish human from other living things. We can say that these tools-tools that are invented affect the human life in a way that affects the life negatively. These negative impacts sometimes caused serious criticism. These materials that affect human life have an effect on many aspects of life and also reflected on educational life. In this study, the perceptions of education experts about the reflections of science and technological changes in education will be determined. Random and criterion sampling techniques were used to determine the study group. Qualitative research method will be used in the study and content and descriptive analysis techniques will be used in the analysis of data. The data obtained in the study will be presented as tables and quotations will be made directly from the opinions. The data obtained as a result of the study will be presented as sub-themes and these themes will be discussed by the researcher with the help of literature and suggestions will be presented.

Keywords: science, technology, education, reflection

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THE EFFECT OF TECHNOLOGY BASED LEARNING ENVIRONMENTS ON LEARNING

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In our age, technology is moving at great speed. The advancement of technology influences education as well as science and scientific studies. This effect can be negative as well as positive. The provision of teacher-centered education in traditional learning environments caused the student to remain passive in the process. Therefore, all kinds of strategies, methods, techniques and materials in the learning environment which underpin the active participation of students in the learning-teaching process are very important. Nowadays, it can be said that more technology supported materials are used in organizing learning environments. This study, which examined the effect of using these materials on learning, was carried out by qualitative research method. In the study, the study group was used to obtain the data. and Class 3 consists of 50 people. Random sampling technique was used to determine the study group. The data obtained as a result of the study will be presented as sub-themes and these themes will be discussed by the researcher with the help of literature and suggestions will be presented.

Keywords: technology, learning, learning environment

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THE EFFECTS OF FORMATIVE ASSESSMENT IN INQUIRY-BASED LEARNING ON HIGH SCHOOL STUDENTS' CONCEPTUAL LEARNING OF OPTICS

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This research study aimed to investigate the effect of formative assessment used in inquiry-based learning on 10th grade students' attitudes towards physics course and conceptual learning. For the study, a quasi-experimental with matching only pretest-posttest control group research design was adopted. An answer was searched for the question "Is there a significant difference between the experimental group students who are exposed to formative assessment in inquiry-based learning and the control group who are not exposed to formative assessment in inquiry-based learning in terms of their conceptual learning?". The participants of the study consisted of 41 students in the 10th grade of a public high school in the spring semester of 2017-2018 academic year. In this study, "Light and Optics Concept Test" was used as a quantitative data collection tool. The test was applied twice as pre-test and after a five-week treatment period as a post-test to both groups to assess and compare the effectiveness of formative assessment utilized in physics course. The students were also required to write their justifications for their choices in the test. The test was found having high reliability. The effect size of the application (Cohen's d) was large according to the calculations. When the quantitative data were analyzed, a significant difference was found between the experimental group and the control group in favor of the experimental group in the post-test. The statistical results of the study show that formative assessment in inquiry-based learning has a positive effect on students' conceptual learning.

Keywords: inquiry-based learning, formative assessment, optics, conceptual learning

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EXAMINTION OF INTEGRATED STEM EDUCATION IN PHYSICS: STUDENTS' ATTITUDE TOWARDS STEM AND THEIR PROBLEM SOLVING SKILLS

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Although STEM education has an increasing popularity, there is still a need to investigate its impacts on students' outcomes. The purpose of this research was to examination of effects of integrated STEM education in the middle school physics subject on students' attitudes towards STEM and their problem solving skills. Quasi experimental design was carried out for this research. The instructional treatment in the experimental group lasted eight weeks during the teaching of force and energy concepts in a middle school science course in the fall semester of 2018-2019 academic year. Four STEM activities were integrated throughout the instruction and two class hours were allocated for each activity. Curriculum-based instruction was followed in the control group. The participants were 60 seventh grade students in two groups. Data were collected by using STEM Attitude Scale (SAS) and Problem Solving Skills Scale (PSSS). Both data collection tools were valid and reliable. These scales were administered before and after the instruction. While the PSSS was administered in both groups to compare the students' problem solving skills who were exposed to STEM education and who were exposed to national science teaching program, the SAS was only administered to the experimental group. Quantitative data analyses and effect size calculations showed that integrated STEM education increased the students' problem solving skills and attitudes towards STEM. This research study has implications to present positive effects of STEM education.

Keywords: integrated stem education, problem solving skills, physics, attitudes

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ANALYSIS OF SELF-ASSESMENT ACTIVITIES OF PROSPECTIVE TEACHERS

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In this study, it is aimed to examine mathematics teacher candidates' self-evaluations related to their classroom practices and professional development. For this purpose, a self-evaluation form made of open-ended questions was prepared in order to allow teacher candidates to reflect on their teaching. This form was filled by seven pre-service teachers immediately after their in-class practice during eight weeks. Items of the self-evaluation forms were analyzed by classifying them into three categories based on the studies of Schön (1987): -Which parts of this course did I succeed? Why do I think so? (Reflection on action), -What kind of unexpected circumstances did I encounter during the course? How did I manage to overcome them? (Reflection in action), -What implications did I have for use in following lessons? (Reflection for action). The analysis of the self-evaluation forms revealed that teacher candidates made quality assessments in the reflection on action and reflection in action categories, but lacked in the reflection for action category.

Keywords: self-assessment, prospective teachers

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ANALYSIS OF TEACHER CANDIDATES PERCEPTION OF LEARNING THEORIES IN THE LIGHT OF ANTHROPOLOGICAL THEORY OF DIDACTIC

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This research aims to determine the perceptions of prospective teachers of learning theories and the factors affecting the development of these perceptions. For this purpose, institutional and individual recognition (in terms of Antopological Theory of Didactic) related to university-level learning theories of prospective teachers were determined based on anthropological theory and the relationship between them was investigated. In this context, firstly, the sources belonging to the courses about the learning theories (lecturers' lecture notes, books, etc.) were analyzed using ecological and praxeological approaches. Then, in order to determine the knowledge level of the prospective teachers about learning theories, a success test consisting of open-ended questions developed by the researchers was applied. As a result of the study, it was determined that candidate teachers internalize behavioral learning theories but they have important difficulties related to other theories. According to this, the basic problems encountered in the individual definitions of these theories have been revealed and compared with the institutional definitions.

Keywords: learning theories, antopological theory of didactic

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IMPROVING STUDENT ACHIEVEMENT IN MATHEMATICS COURSES TAUGHT IN FOUNDATION YEAR AT UNIVERSITY

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The paper presents the improvement of student achievement in mathematics courses taught in foundation year by planning mathematics learning experiences which are responsive both to the students' learning needs and to the discipline of mathematics. The case study was about 372 students enrolled at Manchester Metropolitan University (MMU), United Kingdom who completed an initial test for the preliminary assessment of their mathematical knowledge. The results of the quantitative and qualitative analysis of their answers and the I-Cube model were used for the planning and delivery of the mathematics learning experiences included in the lectures, aiming to enable students to build on their existing interests, proficiencies, experiences and competencies. Then the students have completed a second test aiming to assess learners' conceptual development. The results of the quantitative and qualitative analysis of their answers showed the improvement of student achievement in the mathematics course. The paper also contains suggestions for the improvement of I-Cube model implementation by the design and application of online versions of the two tests aiming to personalize learning and assess students and give feedback in real-time, making the mathematics lectures more enjoyable and effective in developing students' knowledge and skills. Also developing online tutorials for students to study at home before going to face-to-face tutorials (blended learning approach) will enable the students to develop positive mathematical identities and become powerful mathematical learners.

Keywords: mathematics, fractions, teaching, foundation, mmu

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EXAMINATION OF SIXTH GRADE STUDENTS'PERFORMANCE IN GRAPHICAL LANGUAGES

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The increase in the number of graphics in everyday life make the people expose to information that requires to decode these graphics. Graphics including graphs, maps, diagrams, tables, number lines, and flow charts are defined as visual representations and they are used for sense-making information (Bertin, 1983). Although looking at and decoding these graphics are important, understanding what is given in the graphics and making decisions according to these understandings are also important (Tversky & Schiano, 1989). Graphical languages are helpful for students as they facilitate the understanding of the given data. Understanding these graphical languages are also important as students encounter assessment tasks containing graphics when compared to the assessment tasks in the past (Diezmann & Lowrie, 2008; Gagatsis & Elia, 2004). In this study, sixth grade students' performance in graphical languages was investigated. The participants were 97 6^{th} grade students who were being educated in three different of an elementary school in Ankara. To examine students' performance in graphical languages, a graphical languages test was prepared according to Mackinlay's (1999) model of graphical languages considering the 6^{th} grade objectives of the elementary mathematics curriculum of Turkey and experts' feedbacks. Results showed that the 6^{th} grade students are more successful in retinal list language and connection list language than the other remaining four graphical languages. While the mean scores of boys for retinal list, connection, and miscellaneous languages were higher than that of the girls, mean scores of girls for axis, map, and opposed languages were higher than that of the boys. When the correlations about different kind of graphical languages were examined, it was seen that all of them were weakly correlated.

Keywords: graphical languages, 6th students

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DEVELOPMENT OF PRE-SERVICE MIDDLE SCHOOL MATHEMATICS TEACHERS SKILLS IN INTERPRETATION OF STUDENT THINKING IN THE CONTEXT OF LESSON STUDY

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Mathematics teachers' knowledge of students' thinking has an important effect on the teaching-learning process (Cai, Ding & Wang, 2014; Clarkson & Presmeg, 2008). Teachers who understand student thinking sufficiently can interpret student thinking effectively and can anticipate student misconceptions, difficulties, and errors. Furthermore, they can overcome these challenges with appropriate explanations (An, Kulm & Wu, 2004; Ball, Thames & Phelps, 2008). The research revealed, however, that teachers/pre-service teachers have difficulty interpreting student thinking (Crepso, 2000; 2002). This led to the conclusion that pre-service teachers need to develop skills in understanding and interpreting the student perspective (Hiebert, Morris & Glass 2003). The scope of this study was to improve pre-service middle school mathematics teachers' knowledge and interpretation of student thinking through lesson study. Three senior pre-service teachers participated in this study. Pre-service teachers implemented three practice lesson study cycles in a real classroom. Data was obtained from documents, video recordings, observations, field notes, and reflective papers. In order to analyze data, content analysis was used. Results showed that the pre-service teachers had some challenges knowing and interpreting student thinking at the beginning of the study. As lesson study cycles proceeded, pre-service teachers began to take into account student thinking, design and implement lesson plans according to students' needs and difficulties.

Keywords: teachers' knowledge of students, discussion skills, lesson study

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GAME THEORY APPLIED TO PROBLEM SOLVING IN MATHEMATICAL EDUCATION

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The purpose of this work is to apply the Game Theory to solving strategy problems that contribute to the development of mathematical reasoning, acquisition and consolidation of transversal competences, namely critical and strategic thinking, creativity, initiative, cognitive flexibility and teamwork. In addition to the above, it was also intended to develop knowledge about how the teacher's actions can improve students' mathematical reasoning. (Ellis et al., 2018). The discussions unleashed by exploratory classroom tasks (Ruthven, 1989) are privileged moments to create opportunities to develop student mathematical reasoning, enhancing the discussion process (Lannin et al., 2011). Considering the problem under study and the aim intended to be achieved, a qualitative, interpretative and critical empirical approach was adopted. For that, a field work was carried out with students of basic education in Portugal. The applied methodology consisted in the approach of elementary concepts of the Game Theory (Matos & Ferreira, 2004) and the accomplishment of joint activities. The approach of the mentioned concepts, while motivational instrument for problems of strategy, proved to be proficient skills in what concerns solving problems and in what concerns the acquisition of reasoning and knowledge in the scope of mathematics. The analysis of the results showed the contribution of this work to the achievement of the proposed aim.

Keywords: game theory, learning, mathematics education

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INVESTIGATION OF CREATIVITY, PROBLEM SOLVING AND DIGITAL LITERACY LEVELS OF PRE-SERVICE SCIENCE TEACHERS ACOORDING TO THINKING STYLES

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It is impossible to think the teaching apart from digital developments of digital age. Especially it is very important to have the teacher in digital environments for producing and using digital sources. People have different thinking styles. So, the choices of pre-service teachers with different thinking styles will be different in planning and presenting lessons. Based on this reality, the aim of the study was determined as; to investigate the effect of the lessons with digital materials those all prepared by themselves, to the levels of problem solving, creativity and digital literacy of pre-service science teachers with different thinking styles. This study was carried out in the "material design in science teaching" course with the senior students of science teaching program of an university. For that, in the beginning of the study the thinking styles of the pre-service teachers was investigated and the levels of problem solving, creativity and digital literacy was determined. The study is designed with single group weak experimental model design. At the beginning of the study the "thinking styles inventory", "problem solving", "creativity" and "digital literacy" scales were applied. Afterwards, the education of preparation and presentation the digital course materials was given to the pre-service teachers. After that they were studied in groups and presented the sample lessons. In these sample lessons, pre-service teachers presented a chosen unit of science lesson which they were prepared with digital materials according to 5E model. The presentation of the lessons by pre-service science teachers had been continued four weeks. After presentation, the scales were re-applied as posttest excluding "thinking style inventory". The data will be analyzed with the SPSS program. With the help of the results obtained, it will be revealed whether there is a relationship between creativity, problem solving and digital literacy of students with different thinking styles.

Keywords: science teacher education, thinking literacy, digital literacy, problem solving, creativity

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INVESTIGATING THE VIEWS OF ICT TEACHERS ON UTILIZING ARDUINO IN STEM EDUCATION

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There is an increasing global trend to promote STEM education in K-12 education to encourage an educated workforce 20in these fields. STEM education plays a vital role in order to prepare students globally more competitive in the twenty-first century economy. STEM careers are the central of global competitiveness, technological innovation and economic development. High-quality STEM education requires robust and coherent STEM curriculum and experiences that are multidisciplinary, integrative problem-solving inquiries that foster critical and computationally driven thinking. As an open-source prototyping platform based on easy-to-use hardware and software, Arduino encompasses both the hardware and software. It is a tool to teach and apply basic electronics and robotics skills in STEM education. The purpose of this pilot study was to investigate views of ICT teachers on utilizing Arduino in STEM education. Qualitative research method was used in this descriptive study. The sample of the study included 10 ICT teachers from10 different middle schools. The data was collected by a semi-structured interview form. According to the results 70 percent of the ICT teachers reported that they employ Arduino in their teaching. According to ICT teachers, Arduino can be used to teach coding and science topics.

Keywords: Arduino, stem, ICT teacher, stem education, educational technology

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EXAMINING PRE-SERVICE TEACHERS' ICT COMPETENCIES TO SOLVE TECHNOLOGY RELATED ISSUES IN TEACHING ENVIRONMENTS

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Information and Communication Technology (ICT) are dramatically changing the way we live and interact. ICT is pervasive in our daily life. Educational institutions have recognized that there is a need to equip teachers with the necessary skills and experiences to empower them in classroom setting and to promote change and foster the development of the 21st century skills of students. Teachers' ICT competency is an important milestone on their profession. ICT integration in teaching is a complex and multifaceted process. Therefore, there is a need to investigate how ICT competencies gained by teacher at higher education can contribute their ICT related problem solving abilities in teaching environments. The purpose of this study is to investigate pre-service teachers' ICT competencies to solve technology related issues in teaching environments. Descriptive research, a quantitative research method that attempts to collect quantifiable information to be used for statistical analysis of the population sample, was utilized to collect the data. The data were collected using a 5-point Likert scale with 30 items were employed to collect the data. Results suggested that ICT competencies of pre-service teachers were at adequate level in general. Furthermore, pre-service teachers' reported that solving hardware and software of classroom Technologies such as projectors, computers and smartboard were their most challenged problems.

Keywords: ICT competency, pre-service teachers, technology use

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WHY CAN'T WE TEACH SOME SUBJECTS? A CASE FROM SCIENCE SUBJECTS

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Some subjects of biology are problematic to teach and to learn from primary level to higher education. There are many factors that cause this problem. One of them is the teacher candidates who are graduated from higher education with misconceptions and limited knowledge about science subjects. One of the problematic subjects for students is “cell”. The subject knowledge of the teachers is a necessary qualification for both the transfer of knowledge to the student and the effective planning of the teaching process. In this context, it is important to determine the subjects that are problematic for the students and reasons of them. The aim of this study is to determine the knowledge of science teacher candidates about cell related concepts and the reasons of the learning problems. A mixed research approach was used. A test and semi-structured interview were used to collect data. The sample of the study consisted of 73 students from two different classes from science department of a public university. The study was carried out in genetics course. The students are now third class and they learned these concepts in general biology course at second class. Student were asked to draw a cell; show the relation of gene, DNA and chromosome concept by drawing and draw the anaphase-2 phase of 2n = 6 chromosome reproductive cell. Student interviews were completed in a quiet environment approximately 30 minutes and their opinions were recorded by writing. The obtained data revealed that the students have serious problems about drawing cell, gene, DNA and chromosome relationship and meiosis. The students emphasized that teaching of these subjects are problematic and they are unwilling to learn these subjects. They also stated that drawing was not used in the teaching process and teachers only give theoretical information on the picture.

Keywords: prospective science teachers, cell, meiosis, learning problems.

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VIEWS OF PRIMARY SCHOOL TEACHERS ABOUT SMART BOARD: A SAMPLE FROM AĞRI

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Technological developments show the effect in all areas of society. One of the areas where technological developments show their influence is undoubtedly education. As a result of the integration of education with technology, many technological educational materials have emerged. One of them is Smart board. With the recognition of the contribution of smart boards to education, its use has started to increase in our country. When the related literature is examined, it is seen that the attitudes of teachers towards educational technologies and their use of educational technologies are investigated; however, there are a limited number of studies reflecting their views and experiences regarding the use of smart boards. The opinions of teachers using the smart board, how and for what purpose they use and the problems they have experienced will contribute to the literature in terms of effective use of smart boards. The aim of this study is to examine the views of classroom teachers on the use of smart boards. Descriptive research model was used in this study. The sample was selected from Doğubeyazıt in Ağrı and 30 primary school teachers participated in the study. Data were collected using a questionnaire. In the survey, 5 open-ended questions were asked to teachers. Teachers' answers to the questions were grouped according to similarities and differences. Findings from the study show that teachers adopt smart board positively. They stated that smart board is useful to increase the academic achievement of the students, to make the student active and also it provides visual learning and increase the positive attitude of the students. Teachers generally use the smart board in all courses, but mostly mathematics and Turkish lessons. On the other hand it was determined that the teachers' use of smart board skills was moderate.

Keywords: education, technology, smart board, primary school teachers

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PRESERVICE SCIENCE TEACHERS' VIEWS ON INTEGRATION OF STEM EDUCATIONAL KITS IN SCIENCE LESSONS AND THEIR INTEGRATIVE STEM TEACHING INTENTION

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In order to adapt the developing and changing world and to train scientific and technological literacy generations STEM studies in which the integration of Science, Mathematics, Technology and Engineering fields are taken into consideration in curriculums. One of the teaching models accepted within the scope of these studies is the engineering design process Revised Science Curriculum was implemented by MoNE also emphasized a new approach to science teaching by integrated engineering practices. In order to adapt to this curriculum teachers may need to integrate some educational kits in their science lessons. For this reason, the integration of these practices should be experienced first by the preservice teachers. In this respect, this study aimed to integrate STEM educational kits in preservice science teachers' science teaching course to investigate their views and to find their integrative STEM teaching intentions. 35 preservice science teachers, in their last year of teacher training program, participated to this study. The application of this study took 6 weeks, and participants were study in groups. In each week each groups applied an educational kit and integrate it to their science lesson plans. Data were collected through open ended questions, lesson plans and STEM Instruction Tendency Scale. Since the data of this study is in the analysis stage, the results will be evaluated and recommendations will be made related to the results.

Keywords: science education, preservice science teachers, stem education

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INFLUENCE OF INVESTIGATING SCIENTISTS' LIFE ON STUDENTS' VIEWS ABOUT EDUCATIONAL VALUE OF HISTORY OF SCIENCE

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History of science in science education include issues such as what science, how science works, characteristics of scientists, how scientists and under which conditions scientists carried out their studies and also how social, political, cultural, financial characteristics effect the development of scientific knowledge (Clough, 2017; Laçin, et al., 2016). However, researchers showed that merely used in science lessons and teachers ignore the characteristics of history of science (Abd-El-Khalick & Lederman, 2000; Laçin-Şimşek, 2011). It is important to make students understand how scientific knowledge generated and the process of scientific process The purpose of this study is to investigate preservive science teachers' views concerning the educational value of history of science. Fifty preservice science teachers were participated to the study. This study was administrated in Science Technology Society course at Educational Faculty and took eight weeks. During the course period student groups directed to searched Turkish Republican period of scientists who have very important attributions to science with their studies. Scientists were searched by students not only about their successes but also their personality characteristics (humor), family life, social life and educational life. After completing their searching students groups present their studies by preparing posters and power point slides. In this study, preservice science teachers' views about the educational value of the history of science were evaluated by "Educational Value of the History of Science Scale" developed by Şimsek and Çalışkan (2016) as pre and post test. In addition, their opinions about the course were evaluated by open ended questions. Data obtained from the scale was analyzed by SPSS.17 program after distribution of the data, Paired sample t test was done. Answers to the open ended questions were analyzed by content analysis which one of the qualitative data analysis. Suggestions will be submitted after the results are evaluated.

Keywords: history of science, science education, preservice science teachers' opinions

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DIGITALIZATION IN HIGHER EDUCATION: A QUALITATIVE APPROACH

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The increasing use of digital technology by young people has become a major concern in the 21st century. This access to technology has led to hot-button arguments surrounding the place of these technologies in our lives and the implications that they have for the future. The incorporation of multimodal and digital technologies in courses has been increasing, with documentaries, social media posts, and blogs host major spaces for learning and coursework. These forms of knowledge and communication have started to become legitimized in the classroom setting, in addition to the traditional educational technologies such as lectures and textbooks. This paper explores the assumptions by instructors and students concerning why and how multimodal and digital technologies are incorporated into undergraduate classes by qualitative approach. Also the actual experiences that students and instructors have in using these forms of media in an educational context are investigated via participant observation, in-depth review and open-ended questionnaire techniques along the research.

Keywords: digital literacy, web 2.0, in-depth review, observation, undergraduate

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SOCIAL SOFTWARE USAGE IN DISTANCE EDUCATION: EXPECTATIONS AND ANXIETIES

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The development in communication technologies and their reflections on daily life transformed routines, and the Internet emerged as one of the essential needs of human beings. Social software allows users to communicate and share data with each other, especially through the web. Recent studies indicate that social software - especially in distance education - decrease the loneliness of students and also increase the motivation by facilitating student-teacher and student-student interaction with active learning. The high potential of the educational use of social media software makes it necessary to reveal the factors affecting the acceptance behavior of the students. The main purpose of this study is to provide a comprehensive assessment of student perceptions regarding social software usage in distance education environments. This research was structured within the framework of a qualitative research approach, and in this context, the opinions of 574 distance education students studying at Athabasca University in Canada were included in the study. As a result of the study, factors affecting the use of social software tools in distance education programs were clustered under anxiety (perceived peer barrier, perceived tutor barrier, unfettered technology) and expectation (peer to peer interaction, peer to tutor interaction, technological contribution).

Keywords: distance education, technology acceptance, qualitative study, social media, higher education

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PISA (TURKEY) THE INVESTIGATION OF THE RELATIONSHIP BETWEEN MATHEMATICAL SUCCESS AND AFFECTIVE FEATURES

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In recent years, in both national and central exams, as well as PISA at international level, Turkish students are known to have very low mathematical means and are not below average and have not achieved good results. The average net point of students in the higher education entrance examination (YGS) at national level in 40 mathematics questions was 11.4 in 2010, while the average net point of students in 20 questions in the Higher Education Institutions Examination (YKS) in 2018 decreased to 2.8. When the 2015 PISA results of the international level are examined, Turkey ranked 50th in math achievement levels taking in a total of 70 countries and it remained below the average of OECD countries. When the average scores in the field of PISA mathematics literacy are examined by years, it is also meaningful to see that PISA 2015 performance of students in Turkey is lower than PISA 2012 and PISA 2009. This data reveals that the mathematics education in Turkey gives an alarm, and the mathematics education in Turkey is not realized in accordance with the standards both at national level and international level. As a result, students' failures in national and international exams led researchers and educators to focus on these issues and to understand the reasons for failure in exams. Working with reliable data, PISA data, it is important to describe the causes of low mathematics achievement in a multidimensional manner and to develop solutions. The aim of this study of Turkey's success in PISA exam/failure of the reasons is to examine in terms of the level of students that have affective features for math. For this purpose, using PISA 2015 data, it is aimed to examine the relationships between affective characteristics that affect students' mathematics achievement and mathematics achievement with structural equation modeling.

Keywords: Pisa, mathematics, student achievement, affective features.

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THE IMPORTANCE OF LABORATORY APPLICATION IN BIOLOGY EDUCATION

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It is known that experimental applications in science-science departments (physics, chemistry and biology) of science faculties are important in terms of understanding, keeping in mind and improving students' abilities related to scientific thinking. Biology within these sections; It has a higher rate in terms of the rate of employment in the field of medical laboratory compared to the departments of chemistry and physics. For this purpose, in this study, the educational curricula of biology students who study physically in the central laboratories of laboratories (such as biochemistry, microbiology), which provide medical diagnostic data, were evaluated. In the existing higher education system, the biology department of science faculties have their own practice in the curriculum of the curriculum. These practices are carried out in student laboratories which are available within the faculty's facilities. These students are only included in the working environment in hospitals with experience in limited laboratory laboratories. For this reason, in this study, a study has been done on the inclusion of hospital practical practices in the education in biology departments.

Keywords: biology, education, laboratory

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INSTRUCTOR OPINIONS ABOUT THE PROBLEMS THAT THE NEW GRADUATED GRAPHIC DESIGNERS EXPERIENCED IN SECTOR

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Graphic artists had an important place in the art world with their own efforts and later with the help of organized schools and institutions. William Morris pioneered the movement began, Arts and Crafts school in England was followed by the Bauhaus in Germany. Famous artists such as Gropuis, Moholy Nagy, Kandisky, Klee have found new ways of expression by utilizing the unlimited possibilities of all kinds of techniques in art education schools and workshops, and have served the graphic art by transferring it to their students. In our country, there are many Faculties and Schools affiliated to the State and Foundation Universities providing education in the field of graphics. In this study, the views of faculty and high school students who took graphic education at higher education level after the graduation were included in the lecturers about the problems they experienced in the sector. It has been examined whether the course gains in the courses of schools can produce sufficient solutions to the problems that students may experience in their sectoral adaptation. The aim of this course is to provide the students with the suggestions and suggestions of the graphic designer candidates on the issues of printing and printing technologies. The study was carried out with the help of designer academic staff from the state and foundation universities which provide education in Ankara. The participants were asked about the problems related to the new graduate graphic designer candidates, whether the courses in the curriculum programs are sufficient, whether there are new course proposals, graphic terminology, prepress printing and post-printing processes and printing technology. The answers were evaluated and the results were evaluated.

Keywords: graphic design, art education, graphic art

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THE EFFECTS OF INVENTION OF PHOTOGRAPHY ON ILLUSTRATION

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It is an undeniable element that technological developments bring about a rapid and dynamic change in all areas and the necessity of compulsory development. As in all kinds of art, technology has led to radical changes and innovations in plastic arts and has brought diversity and difference to art production techniques too. The birth of photographic technology has provided an invaluable opportunity to capture and document the moment. Many visual documents and visual evidence, which were previously made in cooperation with painters and printmakers, have now become available as subjective, without the need for mediation of these craftsmen. This visual revolution in photography has profoundly influenced many methods of visual art production, and the production of photographic images without photographs has now required the production of photographic technology. As it was the moment, and without any commentary by any illustrator, it directly replaced the traditional illustration production techniques and illustrative drawings in terms of photography, credibility, and reliability as the highest visual material, leading to a decrease in the demands on illustrators. The illustration, which is an indispensable communication and graphic material in terms of supporting the text, strengthening the expression and visualizing the subject, has become a kind of unfashionable art which has been disrupted in the early stages of the spread of photography. In this study, it has been examined that the negative effects of the photography's invention in its early period to on illustration art and it has been researched that illustration having its glory again by starting commonly apply collaborations of photography and illustration.

Keywords: illustration, photography, technology

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THE PLANNING OF INTEGRATED STEM EDUCATION BASED ON STANDARDS AND CONTEXTUAL ISSUES OF SUSTAINABLE DEVELOPMENT GOALS (SDG)

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Two important features in integrated STEM education are integration and solving real world problems. Despite of many efforts to promote STEM education awareness and interest among students and teachers here, documented studies on how to explicitly integrate the existing STEM subjects curriculum standards in solving real world problems seem to be quite limited. This paper describes the planning of an after-school STEM education program focusing on relevant global issues related to Sustainable Development Goals (SDG) by UNESCO (2017) that integrates the existing curriculum standards of three STEM subject in the lower secondary level. The data collection is mainly through document analysis of the three individual STEM subjects' standard documents and the planned curriculum map for the school, along with the document 'Education for Sustainable Development Goals Learning Objectives'. Four possible design challenges were formulated based on the theme in SDG incorporating selected standards from the three STEM subjects as well as addition of a few new related concepts and skills. The description offers a way to assist educators in planning similar STEM education lesson or programmes or activities through integration of the existing individual STEM disciplines curriculum standards for different level and context relevant to the students.

Keywords: stem education, integration, standard-based, sustainable development goals (sdg), content analysis

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NEEDS ASSESSMENT OF SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) EDUCATION: A CASE STUDY

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Science, Technology, Engineering and Mathematics (STEM) education is highlighted as one of the learning approaches in the new Secondary School Standard Curriculum (Kurikulum Standard Sekolah Menengah, KSSM) in Malaysia. Many efforts are carried out in promoting awareness and interest in STEM education in the primary and secondary schools here by various sectors. However, not many studies are done to assess the needs of integrated STEM education in the schools. Needs assessment identifies the gaps between the current and desired situations which guides the choice of any intervention programs to address to the actual needs of the situation and achieve the desired results. It generally involves identifying the gaps, analysing the causal factors and deciding on the intervention. This paper presents a qualitative case study of needs assessment of STEM education among the lower secondary school teachers in a local district here in order to formulate objectives of the integrated STEM program interventions. Three schools were selected through purposive sampling strategy to reveal some important shared patterns. Open ended interviews were conducted among lower secondary science, mathematics, basic computer science and design technology subject teachers. Data were also collected through the analysis of the individual STEM subjects' curriculum standards documents and yearly teaching plans. Thematic analysis of the triangulated data identified a gap in the implementation of integrated STEM education here. The data analysis also revealed four causal factors. These findings were used to guide and justify the decision and selection possible interventions in the implementation of integrated STEM education here. Two recommendations were suggested in hope to address the needs. This process can be replicated to assist educators in assessing the needs of integrated STEM education in their own context and selecting the best intervention programs.

Keywords: needs assessment, stem education, qualitative, gaps, case study

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EMPOWERING STEM EDUCATORS THROUGH PRINCIPAL FEATURES OF PROFESSIONAL DEVELOPMENT

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This pilot-study is focused on implementation of principal features of a conceptual framework for effective longitudinal professional development for science, technology, engineering, and mathematics (STEM) teacher candidates in Midwestern part of the United States. The five particular features coincide with the work of Desimone (2009) and other researchers which includes STEM content focus, active learning opportunities, coherence, sustained duration and collective teamwork (Johnson, Sondergeld, & Walton, 2017). All participants were enrolled in masters' in education in STEM areas. This multi-methods study explored the effect of educational technology anchored professional development. The initial findings indicate that sustained professional development positively influenced teacher candidates' attitudes and confidence in STEM pedagogical skills. The study aims to provide recommendations to teacher educators for STEM teacher candidates and properly supporting the educators who teach high school STEM content areas to address teacher quality and creating a culture of sustainability. The focus of presentation will be to provide in-depth information about grant planning and implementation of the professional development for high school STEM educators.

Keywords: teacher education, professional development, stem education

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LEGO – ARDUINO MODEL TO ILLUSTRATE THE BASIC PRINCIPLES OF ATOMIC FORCE MICROSCOPY IN HIGH SCHOOL STUDENTS

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Atomic Force Microscopy is the most important instrument used for imaging, measuring and manipulating matter as well as explore interactions in materials science at the nanoscale. Due to the increasing number of applications derived from materials and nanoscience in the last years focusing on understanding the basic principles of Atomic Force Microscopy play an important role in the learning process for high school students to inspiring the next generation of scientists and engineers and prepare a future workforce with competences in nanoscience. Most high school curricula programs are based on traditional disciplines such as chemistry, physics, and biology to learn the foundations of these disciplines. To resolve the lacking in nanoscience knowledge and introduce in the high school its basics concepts for this a macroscopic model of Atomic Force Microscope is developed by students in different stages from design concept to build a realistically and functional model. The model was developed using LEGO bricks and Arduino board development due to easily accessible for schools students

Keywords: atomic force microscopy, nanoscience education, physics

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IMPACT OF CONCEPTUAL CHANGE TEXTS ON HIGH SCHOOL STUDENTS' COMPREHENSION OF ELECTROCHEMISTRY IN GHANA

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This study investigated the impact of conceptual change texts on high school students' comprehension of electrochemistry in the Ga East District of the Greater Accra Region of Ghana. The design of the teaching strategy was to improve upon the teaching of the main topic of electrochemistry, specifically galvanic cells, electrolytic cells and electrode potentials. A sample of 64 grade 12 (SHS 3) general science students from two intact public schools was conveniently selected to participate in the study. A pre-test/post-test quasi-experimental design was used in this study. An electrochemistry concept test (ECT) made up of a two tier 20 objective questions was developed and administered to students as pretest and posttest. One-way between group analysis of covariance (ANCOVA) and post hoc analysis with a Bonferroni adjustment conducted on ECT showed that students taught with the conceptual change texts (CCTs) performed better than those taught using the Lecture method (LM) in relation to galvanic cells, electrolytic cells and electrode potentials. The results suggest that the CCTs helped to improve the conceptual achievement of students in the experimental group.

Keywords: conceptual change texts, electrochemistry, high school students

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UNDERGRADUATE STUDENTS' DIFFICULTIES WITH MOTION OF OBJECTS ON HORIZONTAL AND INCLINED SURFACESUNDERGRADUATE STUDENTS' DIFFICULTIES WITH MOTION OF OBJECTS ON HORIZONTAL AND INCLINED SURFACES

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The purpose of this study was to investigate the conceptual knowledge and skills of undergraduate physics students on the motion of two objects on a surface, inclined and or horizontal. The study was conducted with 103 introductory physics students in B.Ed. (FET) Natural Science programme at Central University of Technology, Free State (CUT), Bloemfontein campus. A pre-test was administered to test and investigate their pre-knowledge of concept. The test was on problem-solving on the concept. The results indicated that the majority (more than 80%) of students had huge difficulties with where and how to start in order solve these problems. They lacked basic knowledge of free-body diagram and vector analysis and as resulting, they could not apply or deduce equations to solve. A follow up remedial class was conducted to clear up the confusion and to assist them to acquire necessary and basic skills and knowledge of vector analysis, viz., free-body diagram, finding vertical and horizontal components of vectors, equilibrium conditions as well application of Newton's Second law of motion. With this skill, they were introduced to deriving equations to calculate the acceleration of the objects and the tension of the wire connecting them (mathematical skills). A post-test was thereafter administered and the results indicated a great improvement (more than 70%) in the vector analysis and mathematical application of vectors in problem solving. Follow-up interviews indicated deficiencies and confusion from their previous learning although some students (about 30% of the 70%) indicated they need to be taught the concept first before the test. Their reasoning was they forgot the concept

Keywords: conceptual knowledge, motion, horizontal and inclined plane, problem solving, free-body diagram, vectors

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EFFECTIVENESS OF CONVENTIONAL TEACHING METHODS FOR ENGINEERING MATHEMATICS IN ASIA: A DEBATE

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Mathematics is called mother of all sciences and it has special relevance to the engineering students who have to apply its various mathematical concepts, during their Engineering studies. On the other hand, teachers of mathematics have complete mastery over the subject but being nonqualified in teaching methodologies, they do not fully grasp student's individual learning style and continue teaching with one -size-fits-all approach and this creates gap in understanding of core concepts. In this article, we debate on the effectiveness of conventional methods of teaching Mathematics to Engineering students and suggestions for better outcome. The major aim is to address the difficulty faced by engineers due to insufficient mathematical knowledge and then discuss some of the methods and techniques that can be adopted by instructors to develop better understanding of core mathematical concepts which have a vast practical implementation in engineering, especially in the area of research. The discussion in this article is based on the results obtained through an online survey form filled by engineers from multiple disciplines and universities across Asia.

Keywords: education, teaching techniques engineering mathematics

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SAINSMATIKA FAIRY BOOK: CONNECTING OPEN-ENDED PROBLEMS TO FAIRY STORIES AS A TOOL TO DEVELOP STUDENTS' MATHEMATICAL CREATIVITY

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Stimulating mathematical creativity is very important for students'cognitive development. Unfortunately, conventional classroom approaches to stimulate students' mathematical creativity have not been satisfactorily effective. However, a prospective approach to stimulate mathematical creativity can be applied through a teaching tool that integrates open-ended problems with interesting things, such as engaging students in the atmosphere of reading fairy stories. In this study, the sainsmatika fairy tale book (SFB) was used as a science and mathematics teaching material to improve student mathematical creativity. A pretest-posttest control-group experimental design was used to investigate the effectiveness of SFB to develop fourth-grade students' mathematical creativity. The participants consisted of eighty fourth-grade students in one of the districts in Indonesia. Characteristically, this study employed quantitative data that were collected from observing students' activities. Based on the one-way ANOVA statpistical analysis, it was found that the comparison of mathematical creativity scores between $\mu 1$ and $\mu 2 = 0.961 > 0.05$, $\mu 2$ and $\mu 3 = 0.011 < 0.05$, and $\mu 1$ and $\mu 3 = 0.024 < 0.05$. Therefore, it can be concluded that the use of SFB is significantly effective to enhance students' mathematical creativity.

Keywords: sainsmatika, open ended problem, fairy story , mathematical creativity

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BUILDING TEACHER CAPACITY: INCLUDING ALL STUDENTS IN MATHEMATICS EXPERIENCES

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In almost all mathematics classrooms, students demonstrated discrepancies in their knowledge, skills, and understanding. OECD reports predicted that this continued to aggravate as not all teachers were sufficiently trained to handle this concentration. In response, the paper explored the potential of reSolve's professional learning module 3 (PLM3) as an affordable and accessible professional development (PD) resource. Participants' hands-on experience and exposure to PLM3 were audio recorded. After it was transcribed and examined and their work samples were analysed, there were four issues emerged: (1) criticality of conducting preliminary data collections and increasing the validity of inferences about what students can and cannot do by addressing the probabilistic nature of their performance; (2) criticality of the conclusion: and/or among students' algebraic reasoning; (3) enabling and extending prompts provided by reSolve were found useful; and (4) dynamic adaptation of reSolve PLM3 through developing transferable skills and collaboration among teachers. PLM3 provided valuable insights on assessment, teaching, and planning to include all students in mathematics experiences.

Keywords: algebraic reasoning, building teacher capacity, including all students in mathematics experiences, professional development

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INTERMITTENT ACADEMIC PROGRAMME DISCONTINUITY AND ITS EFFECTS ON STUDENTS' ACHIEVEMENT IN MATHEMATICS: SCENARIO OF CAMPUS STUDENTS' UNREST IN DEVELOPING COUNTRIES

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Intermittent Academic Programme Discontinuity (IAPD) is no doubt a major challenge in the operations of tertiary education programme in Nigeria and in most developing nations of the world. It has hampered and still hampers the duration, quality and quantity of education programme in Nigeria. These components define the effectiveness and capacity of tertiary education needed to guarantee the production of high level skills and trainings to drive the changing economy. Of particular worry, in developing countries, is the constant role of IAPD in deteriorating the efficiency of mathematics and mathematics education that has made it the immunity of science and technology. Using the survey design of purposive and random sampling techniques to draw a sample of 240 students from four-governmental tertiary institutions in Benue State, with Chi-square test statistic and Cronbach's alpha reliability test, this paper discusses the impart of campus students' unrest on students' achievement in mathematics. The study finds, amongst other things, that in the event of IAPD, the study habit of most students in developing countries diminishes. Consequently, the study further finds that when such students are recalled to continue the disrupted programme, the Quality of Achievement in Mathematics (QAM) is indirectly proportional to the Length of Academic Discontinuity (LAD) in the programme. In view of this, the study recommends that the school management-student relationship should be strengthened via the offices of student affairs and counseling to curb campus students' unrest capable of disrupting academic programme in developing countries.

Keywords: intermittent academic programme discontinuity, students' unrest, students' achievement in mathematics

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STIMULATING AND SUSTAINING INTEREST OF STUDENTS IN SECONDARY SCHOOL MATHEMATICS FOR IMPROVED ACHIEVEMENT THROUGH TEACHING-LEARNING SOFTWARE PACKAGES IN DEVELOPING COUNTRIES

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Stimulating and sustaining interest in the learning of a concept has become a key component of quality achievement in the concept. It is much gain saying that learning is meaningful with interest and the quality of learning is relative to the interest of individual learner. This fact is most evident in the fields of science and technology, especially mathematics where the rigors of learning activities require curiosity and commitment. Hence, very few individuals with fewer girls are seen in the field of science and technology (worse still, mathematics) for a career. Furthermore, the fact substantiates the ugly trend reported in the existing literature that, on the average, in the past ten years, results of secondary school students in mathematics, in both examinations in developing countries such as in the West African sub-region, showed that more than half of the students failed to obtain a credit level pass. This trend has been blamed on poor teaching strategy and lack of suitable teaching-learning materials capable of stimulating and sustaining student's interest in the learning of mathematics. It is therefore needful to introduce into the teaching and learning of mathematics a Mathematics-Interest-Based-Software-Packages (MIBSPs) for improved achievements in mathematics. This study adopts quasi-experimental design of a randomized pretest/posttest control group type consisting of 380 students sampled from six senior secondary schools in Oju local government area of Benue State. Using Circle Geometry Software Package (CiGOSPAC) and Likert scale questionnaire instrument, the study finds that the use of MIBSPs stimulates students' interest in the study of mathematics, which translates to higher achievement in mathematics. The study therefore recommends that different MIBSPs should be designed and employed in the teaching-learning of mathematics as it has ability to stimulate different levels of student's interest in the learning of mathematics.

Keywords: stimulating and sustaining interest, mathematics achievement, mibsp, cigospac

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COMPUTER COMPETENCY OF MATHEMATICS TEACHERS IN SAUDI SECONDARY SCHOOLS

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This study aimed to explore the competency of Saudi Mathematics teachers in using computers in the mathematics classroom, and to investigate whether the background characteristics of teachers have any impact on their computer competency levels. Data were gathered via. a questionnaire which was distributed to thirty-three participants, all of whom were female mathematics teachers from the Al-Qunfoudah province in the Kingdom of Saudi Arabia. The results reveal that the teachers' perceived their competency to be of an average level. Teachers who had master's degrees reported higher competency in the use of technology to assess students' progress than did those teachers who held only bachelor's degrees. In addition, the results indicate that those teachers who had received professional computer training reported higher competency levels in a number of key areas, such as implementing curriculum plans that increase students' use of technology in learning; adopting technology to enable effective assessment of students; and using technology to enhance productivity and professional practice. Those teachers also had a higher overall level of computer competency. The study concludes that the Saudi Ministry of Education needs to encourage teachers to achieve higher educational qualifications, and provide educators with adequate training to ensure that they have the skills necessary for the use of technology in teaching mathematics. The study also emphasises the importance of all teachers having the same opportunities to enrol in training programs, regardless of their educational degree or years of teaching experience.

Keywords: mathematics, education , technology

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THE USE OF FACTORIZATION TO EFFICIENTLY TEACH QUADRATIC EQUATIONS & EXPRESSIONS TO UNIVERSITY, POLYTECHNIC AND COLLEGE STUDENTS

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Many mathematical concepts and applications will result to quadratic equations & expression when solving them. Examples of such concepts are indices, logarithm, permutation and combination, financial models, projectiles, areas, integration by partial fractions, evaluating limits of functions and finding their existence. These resultants quadratic equations are invariably factorable and should be handled in an efficient way to make its teaching and learning simple to comprehend. The aim of this paper therefore, is to acquaint the students and mathematics instructors with efficient procedures of teaching quadratic equations by factorization method. We offer step by step approaches mathematics instructors could adopt in teaching and applying quadratic equations by factorization. This approaches, nevertheless will make teaching and learning of mathematics lively, interesting, enjoyable, and reduce if not remove completely the fear and anxiety students have in learning mathematics. We recommend among others that mathematics instructors be encourage to adopt this step-wise method while teaching mathematical concept that result to quadratic equations and expressions.

Keywords: quadratic equations, factorization, higher education, methodology of mathematics

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MODELLING OF STUDENT TEACHERS ON LEARNER CENTRED APPROACH IMPLICATION ON STUDENTS' ARCHIEVEMENT AND RETENTION IN GLOBAL DISTANCES IN ZAMFARA STATE, NIGERIA

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The ability of students to comprehend and remember a mathematical concepts or topics that were imparted have become a basic challenge in our secondary schools. This challenge may be as a result of ineffective teaching approaches adopted in the teaching of mathematics. The purpose of this study is to examine the effect of Modelling of Student teacher on learner Centred Approach and its Implication of Students' Achievement and Retention in latitude and longitude. Four research questions were posed and four hypotheses were formulated to guide the study.The study will be carried out on senior secondary I1 students in the three educational zone in Zamfara State, Nigeria. The sample to be used for the study comprised of male and female SS11 students. One intact class will selected from each of the four co-educational schools in Zamfara State through simple random technique. The instrument to be used for the study is the Mathematics Achievement Test (MAT). This Achievement Test will be used as Pre-test, Post-test and Retention test. Lesson plans and marking guide were developed for the study. The test items, lesson plan and marking guide will be all validated by experts in mathematics education and measurement and evaluation from Federal University Gusau. The reliability of the instrument will be determined using Kuder-Richardson formula. Mean and standard deviation will be used to answer research questions, while the Analysis of Covariance (ANCOVA) will be adopted in testing the hypotheses at $P < 0.05$ probability level. Recommendation will be advanced based on the outcome of the research findings.

Keywords: modelling, learner centred approach, achievement, retention and student teacher

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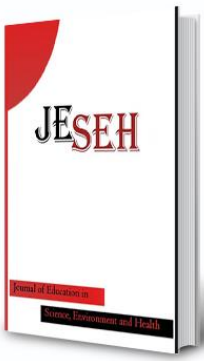

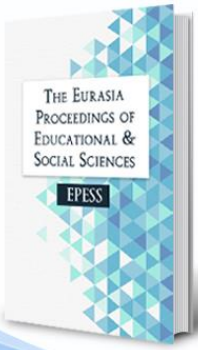

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