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International testing of students in STEM has demonstrated that students have difficulty reasoning through science problems across the world. There are many suggestions concerning how to improve students reasoning skills. One such suggestion that holds promise is to teach students using more authentic science methods. One authentic science practice allows students to construct from data scientific models and to use these models during modeling tasks to make predictions in different contexts. This suggestion makes sense since constructing models and using modeling is what scientists do. However, in order to bring these types of experiences to our students K12 teachers need to be prepared to teach using models and modeling. But we do not know if teachers internationally even understand what models and modeling in science are or whether there are any differences between countries. This study’s goal is to determine teachers’ perceptions about science models and modeling. Therefore, the aim of this pilot study is to examine pre and in-service teachers views about science models and modeling in Turkey and the United States (US). Specifically, the study was designed to determine teachers’ knowledge about the differences between models and modeling as well as to explore their usage of science models and modeling in classrooms. A total of 12 Turkish and 12 US preservice and in-service teachers were interviewed during semi-structured interviews between the summer of 2016 and May 2017. A coding scheme was pre-determined by the researchers based upon prior literature. The coding scheme was used to analyze the interview transcripts. Through the use of grounded theory and constant comparison changes were made in the coding scheme when new themes emerged. Interrater reliability was determined using Cohen’s Kappa on all of the transcripts. Commonalties and differences between the two countries will be analyzed. Based on the results of the aforementioned analyses a larger international study will be conducted via the construction of an online survey based on the findings of this study.

Keywords: science models, science modeling
BLEND LEARNING IN HIGHER EDUCATION: A PILOT STUDY IN THE SCIENCE INSTRUCTION UNDERGRADUATE LEVEL

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Technology is providing significant benefits to the learner and instructor. It permits the teacher and students to access vast libraries of information, offers teachers special tools to help students illustrate and understand difficult concepts through animations and other computer models, and allows the teacher and student to communicate with peers and experts anywhere on the globe. Powerful education software allows instructors and learners to explore science concepts in ways that develop students’ understanding of complex ideas in a short time. These examples provide a quick overview of what educational technology offers the learner and instructor. The technology has started to change learning environments. Instead of a special time, place and classroom, blended learning allows for a more flexible environment and has become more widespread. Blended learning is the new learning environment that is offering multiple learning areas in the context of higher education. Blended learning is also called "mixed learning" and "hybrid learning" in the international literature. It includes face-to-face learning in the classroom, as well as learning activities on the web. With this model, the goal is to combine the effective aspects of both face-to-face learning and distance learning environments. However, there is a need for additional research concerning its efficacy. The purpose of this study is to determine the effectiveness of a blended learning model on science instruction at the higher education undergraduate level. A pilot study was conducted in a science education course in the department of early childhood education in the faculty of education. Quantitative research approach was used in this study. A scale, reliability, and validity studies were made, used to measure the effectiveness of blended learning environments. The data analysis is in progress. The results will be presented after analysis.

Keywords: blended learning model, science instruction, learning environment
THE IMPACT OF FULL STUDIO MODEL ON THE SCIENTIFIC PROCESS SKILLS OF SCIENCE TEACHER CANDIDATES

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The purpose of this study was to examine the effects of the full studio model in which active learning techniques were used on the scientific process skills of prospective teachers. The sample of the study consists of 53 teacher candidates who are enrolled in the first year of Balıkesir University Necatibey Education Faculty Science Teacher Program in 2015-2016 academic year. This research is a mixed method study in which a combination of qualitative and quantitative data is collected using a single group pre-test post-test weak experimental pattern. Data were collected through the Scientific Process Skills Test and semi-structured interviews. The Test of Integrated Process Skills II (TIPS II), which was developed by Burns, Okey and Wise in 1982 and adapted to Turkish by Geban, Aşkar and Özkan (1992) for high school and university students, was used. Teacher candidates' scores from the pre-test and post-test were compared using the SPSS version 14.0. Qualitative data obtained from semi-structured interviews were analyzed by content analysis and used directly under the analysis table of the related scientific process skill. As a result of the analysis, it was determined that pre-test and post-test scores of teacher candidates were significantly different in favor of the post test (t=-10.99; p<.05). When sub-factors of the scale were considered, it was found that there was a significant difference in all the factors (identifying the variables, describing by doing, making and defining hypothesis, designing the research) except the interpretation of graph and data sub-factor. It was revealed that there was a lack of knowledge for the skills of identifying the variables and making and defining hypothesis before the teaching in the interviews. Most of the teacher candidates do not know what dependent, independent and control variables are and how the hypothesis statement should be written. It has been observed that these shortcomings have been removed considerably after the teaching. Results of the study show that prospective teachers are provided with both the development of scientific process skills and the basic content knowledge that they can use when graduated as teachers in the future.

Keywords: full studio, active learning, scientific process skills
THE POST-FAILURE THOUGHTS' IN MATHEMATICS PROBLEMS SOLVING AMONGST GIFTED AND NORMAL PUPILS

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This study aims at investigating the post-failure thoughts' in mathematics' problems solving amongst gifted and normal pupils in the Middle School in Ouargla- Algeria. The study adopted the data collection on the mathematics teacher's appointments, and the Raven intelligence test to identify the gifted and the normal pupils, also use the mathematical problems, and open questionnaire to determine the post-failure thoughts' in problem solving in mathematics. The sample consisted of (79) pupils in middle school. The outcomes showed: 1 - The post-failure thoughts are: the thoughts of challenging, and thoughts of stopping. 2. There are significant differences at 0.05 in the thoughts of challenging between gifted and normal pupils favor the gifted pupils.

Keywords: post-failure thoughts', mathematical problems, gifted
PRE-SERVICE MATHEMATICS TEACHERS’ PERCEPTIONS OF ENGINEERING AND ENGINEERS

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The purpose of this study is to determine pre-service mathematics teachers’ images and perceptions about engineering and what engineers do. Data were collected through semi-structured interviews and using the Draw an Engineer test. Knight’s et al. (2005)’s "Draw an engineer test" administered to 24 pre-service mathematics teachers (13 female, 11 male). Drawings and interviews were analyzed and the result of this study were as follows; First, the representative of engineers was mostly man who was constructing a house, using computers, and producing plants. Second, the engineers were illustrated as working with tools such as computer. Third, the students involved in this study perceived engineers as working outdoors. Forth, kids experience outside of the classroom affect their perception of engineering. Interviews supported main findings while helping researchers gain insight into individual reasoning behind the interviewed pre-service teachers’ drawings and answers.

Keywords: pre-service mathematics teachers, engineers-at-work drawings, perceptions, drawings, perceptions of engineering, images of engineering and engineers
EFFECT OF COLLABORATION BETWEEN MAKERSPACE, UNIVERSITY AND TITLE I ELEMENTARY SCHOOL ON STUDENT STEM ATTITUDES: BRINGING MAKER MOVEMENT TO ELEMENTARY SCHOOL

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This study examines the effect of technology-enhanced project developed in collaboration between MakerSpace, a non-profit community-based organization; public university, and title I elementary school, on student attitudes towards STEM and their interests in future STEM careers. There is limited research on Makers movement and practically no research on whether MakerSpace facilities and expertise can be effectively integrated into standards-based elementary school curriculum. As part of this study 5th grade students designed and built birdhouses making connections between mathematics and science learned in the classroom and the real world around them. The study was conducted in urban settings, in a school with large percentages of students at-risk. Pre- and post-surveys were administered to measure student attitudes towards STEM disciplines, perceptions of 21st century skills and interests in future STEM careers. Results of the study showed there was a significant increase in scores in all these areas after students completed STEM project. This study illustrates successful collaboration between MakerSpace and local educational organizations to enhance standards-based school curriculum.

**Keywords:** project-based learning, makerspace, stem attitudes, stem careers, 21st century skills, elementary school
PRIMARY 4TH GRADE STUDENTS MAKING MATHEMATICAL MODELING: THE FAMOUS BAFRA ICE CREAM PROBLEM

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This research is a qualitative study conducted by the 4th-grade students of the foundation primary school established in a university located in a large provincial center in the Black Sea region with the 2016-2017 academic year. The students who did not have modeling experience, was given to modeling training at the perspective of mathematical modeling in the means of model-eliciting activities for four weeks. In this training, the 20 students in the class worked with different modeling activities every week in five groups of four and developed their models and presented their models to other groups. The Famous Bafra Ice Cream Problem has been implemented as a main activity in the study. Students in the groups worked on this problem and were asked to develop a mathematical model and present their models. Attempts have been made to determine how the groups represent the assumptions they have made, the key variables are chosen, and the processes and models they apply. During the study, all groups were included in the video and audio recording and analyzed qualitatively with the working papers used by the students. The first findings of the study were that the groups were successful in verbal and mathematical operations. Three groups of the five determined the nutritional value of the ice cream while the other two groups identified the frequency of raw material and the most popular type of ice cream as a key variable. All groups created five different models based on these key variables.

Keywords: mathematical modeling, primary students, the famous bafra ice cream problem, model-eliciting activities
PROBLEMS WITH PRIMARY SCHOOL CHILDREN DURING GROUP WORK: MODELING ACTIVITIES?

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This study is a qualitative study carried out with the children of the 4th grade at the 2016-2017 academic year in a primary school in a university which is located in a large provincial center in the Black Sea region. As part of a larger study, a total of 60 children, who were studying in 3 different branches of the 4th-grade children who had no modeling experience in this study, were given appropriate modeling training in mathematical modeling perspective by means of modeling activities for ten weeks. The classes are made up of 20 children. Each class is required to work in groups of four, each week with a different modeling activity and to developed their models and presented their models to other groups. All group work was recorded with video and audio recorders. In order to find out a solution to the problem of not collectively working on the modeling activities, the researchers tried out different methods in the classrooms. During the study, the researchers made observational notes and these observational notes were qualitatively analyzed together with the audio and video recordings. The findings of the research indicated that while children who have the high academic achievement and who see each other as competitors showed difficulties to share and discuss problems during group work, children who do not have competitive problems with each other and socially agree with each other are more supportive and productive.

**Keywords:** primary school children, group work, modeling activities, mathematical modelling
CONTEXT-BASED LEARNING ON RATE OF CHEMICAL REACTION TO DEVELOPMENT OF CRITICAL THINKING OF GRADE-11 STUDENTS

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The purposes of action research were to compare students’ critical thinking before and after obtaining context-based learning on rate of chemical reaction and to investigate the effect of context-based learning on rate of chemical reaction to development of critical thinking of students among good, moderate and light ability levels. The target group of this study was 41 grade-11 students taking the Chemistry III (Sci. 30223) in the second semester of the 2017 academic year from Satree Phattalung School, Phatthalung Province. They were selected through purposive sampling technique. The experiment lasted for 8 fifty-minute periods. Research instruments included the lesson plan for context-based learning about rate of chemical reaction, the critical thinking test, activity sheet, learning log and video. The One Group Pretest-Posttest Design was used for this study. The data were statistically analyzed by using the Wilcoxon Matched Pairs Signed-Ranks Test for 2-Related Samples and the Kruskal-Wallis Test for K-Independent Samples. The findings were as follows: The critical thinking of students after obtaining context-based learning was statistically higher than before learning at the .05 level of significance. The critical thinking between good, moderate and light group was significantly different at the .05 level.

**Keywords:** context-based learning, critical thinking
EDUCATIONAL GAMES AND ACTIVITIES IN PRESCHOOL MATHEMATICS

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The core preschool curriculum currently binding in Poland sets forth the objective of preschool education, the preventive and educational tasks of kindergartens, preschool departments in primary schools and other forms of preschool education, and the results of their implementation, i.e. the goals which children attain on completion of their preschool education. The objective of preschool education is to support the full development of children. This assistance comes in the form of care, upbringing and teaching & learning processes, which allow the child to discover its potential, get to know the logic of actions, and to gain experience on its road to truth, goodness and beauty. As a consequence, the child becomes mature enough to enter the first level of education. Preschool education defines educational contents as the elements of culture that are intentionally selected and included in the process of education. Cultural contents are the most crucial means of educational activity in preschools, as thanks to them the child absorbs the social achievements of many generations and may develop as a human being. Hence, in practice, preschool educational contents are classified, according to the domain of culture producing various type values, into: mental education including speech and thinking development (Polish language education), introduction to the qualitative and quantitative relations and mathematical concept development (Mathematical education), discovering nature (Scientific education), aesthetics education, social and moral education, health education. Mathematical education is one of the most difficult areas of education. Maths is often not only non-supportive in terms of child’s intellectual development, but in some children, it can also impede or distort their personalities. As early as in preschool, children often experience failures, which may cause real drama. Consequently, many children are afraid of Maths and tend to avoid, by all means, any out-of-school situations associated with it. Research demonstrates that every fourth child at the end of the first grade/the beginning of the second-grade experiences difficulties with Maths; whereas, every third child in the third grade cannot meet the requirements of the class. The main causes of the fear of and aversion to Maths are preschool failures. Thus, how to organise Mathematics so that they bring the desired results? It seems that to help the child reach the level of curricular requirements, often a simple introduction of other exercises, suited to the child’s abilities and difficulties it experiences, would suffice. The article presents analyses regarding the influence of educational games and activities on the level of mathematical skills of 5-year-olds within the Siedlce city area (Poland). Research included 380 six-year-olds and 40 teachers. The first study was conducted in November and the second - in April, after a five-month mathematical education with the use of educational games and activities.

Keywords: educational games, educational activities, mathematical education, six-year-old, kindergarten, mathematical skills
THE IMPACT OF TECHNOLOGICAL INSTRUMENTS AND TECHNOLOGICAL QUALIFICATION LEVEL ON INDIVIDUAL EVALUATION

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From the existence of the human being to the day-to-day, the individual has always been influenced by technology-based innovative perspectives in the process of self-realization. These effects varied depending on the extent of coverage and the extent of use of the technological equipment used, as well as the extent to which the community had shown technological progress at the same time. We can say that the evaluation of the individual's place in the society without regard to the concept of time and space is related to the carrying and use of technological proficiency level and technological equipment, in our world where there is not an advertisement about the display of the talents of an individual without written and if necessary visual media technology, the dependency of the individual in the technology category is increasingly increasing. In this study which will be carried out with all these reasons, the opinions of individuals from various professions such as teaching staff, teachers, prospective teachers and tradesmen were consulted in order to determine the effect of technology and usage level on evaluating the sociological and psychological dimension of the individual. The opinions obtained in the study were analyzed by content analysis technique.

**Keywords:** digital literacy, field specialist, technology, learning
ANALYSIS OF DOMAIN EXPERT OPINION ARE IN LINE WITH THE HAREZMI EDUCATION MODEL PILOT PROCESS IN TURKEY

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In the field of industry 4.0, education of the field of education in the name of Turkey is aimed at increasing the contribution of computer science to primary and secondary education of our country, determining the principles of how to teach in various age groups and environments in different infrastructures and drawing a framework of how computer science can be integrated with other fields such as mathematics, science, and to contribute to our education system through the application of sample lessons and plans for the development of Computer Science course and Curriculum within the framework of the 65th Government's 2016 Year Action Plan No 130 (Actions and Reforms) title; The target of the implementation of the mosque education model in all schools of our country has been determined. The main aim of this study is to determine the opinions of the field experts who emerged depending on the effectiveness of the model and to evaluate the model with Nvivo package program and to present the suggestions related to the model. Working group members will be selected from the academics who have the necessary competencies in the model of the mausoleum. A number of questions prepared by the researcher are taken by the expert's opinion in order to get their views on the model through the semi structured interview form from the members of the study group. The answers given to the questions will be evaluated with Nvivo 11 package program and subjected to content analysis. Note: The study is supported by Inonu University Scientific Research Projects Coordination Unit under the scope of Normal Research Project.

Keywords: Education model, Expert, Turkey, Technological proficiency
USING STUDENTS' SELF REFLECTION TO IMPROVE MOTIVATION AND ENGAGEMENT IN LEARNING PHYSICS

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The traditional method of teaching advanced physics courses is modified by introducing a new item in teaching, namely students’ reflection throughout the semester. Students are asked to reflect on different items in their course and in particular to reflect on their achievement, struggles, goals, and skills. Students are encouraged to be open, direct, and to give details as much as possible. Consequently, instructors felt the mentor and facilitator connection with students that strengthened the feeling of academic responsibility. On the other hand, students expressed positive experience and were less concentrated on the minute details of the course but rather on a general and global picture of learning experience. This connected students with their goals, it reminded them of their struggle, confusion, and growing up experience during the process.

Keywords: education, physics education, self-reflection, portfolio learning
UNDERSTANDING ELECTROSTATICS TEXTBOOK IMAGES AS PHYSICAL MODELS

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Scientific textbooks use images to visualize concepts to aid the scientific explanations of phenomena. Photos and diagrams that occur in school textbooks can be perceived as physical models that connect the real world with more advanced mathematical models, such as graphs and equations. The intention is to enhance the textbook user’s conceptual understanding of physics. Embedded in such physical models are representational formats (symbols and structure), underlying concepts and principles, and assumptions and conventions, all of which depend on the target system under consideration. For example, in electrostatics a minus sign may depict a single electron, the excess charge on an object, or the negative value of a quantity, the difference between quantities, etc. A research study was conducted from the perspective of semiotics and cognition. First, electrostatics textbook images were analyzed in terms of their features as physical models and the meaning they intend to communicate. Second, the difficulties that 70 South African Grade 10 physics students experienced when reading the images were investigated using a mixed-method design. The results show shortcomings in the students’ understanding of the representational format, as well as the underlying concepts, principles, assumptions and conventions. These have consequences for the use of images as a mode of learning physics.

Keywords: textbook images, models, electrostatics
COMPARING THE INCULCATION OF THE VALUE OF RATIONALISM FROM THE AUSTRALIA AND MALAYSIA MATHEMATICS TEXTBOOKS

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This research seeks to compare the inculcation of the value of rationalism through the form four mathematics textbooks from Victoria (Australia) and Malaysia. One textbook is analyzed from each of the countries. Two chapters were chosen from both of the textbooks, namely Linear Equations and Trigonometry. Contents analysis was used to analyse evidence of the value of rationalism. Five characteristics of the value of rationalism are identified namely reason, explanation, abstraction, logical thinking and theorem. We found inculcation of the value of rationalism was moderate. However, the value of rationalism with characteristics of hypothetical reasoning and abstraction was missing from both of the textbooks. The inculcation of the value of rationalism with characteristics of reasons from both of the textbooks was fairly moderate. Generally, words which ask the students to give reasons from both of the textbooks rarely appeared in the textbooks. The inculcation of the value of rationalism with characteristics of explanation appeared significantly in both textbooks. The inculcation of the value of rationalism with characteristics of abstraction and theorem appeared only in the Mathematics Form 4 of the Malaysian textbook. This study highlights the need to inculcate the value of rationalism more thoroughly, especially the value of rationalism with characteristics of reason, hypothetical reasoning and logical thinking. The inclusion of the value of rationalism in the mathematics textbooks will enable students to understand mathematical concepts more deeply and meaningfully.

Keywords: mathematical values, value of rationalism, reason, explanation, abstraction, logical thinking, theorem and hypothetical reasoning
THE ANALYSIS OF SOCIAL MEDIA USAGE FOR COLLABORATIVE LEARNING

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In today's world it is obvious that social media usage is getting involved into every aspect of our lives. Naturally, even collaborative learning processes, such as team creation, communication between team members, file sharing etc., are conducted via various social media channels. It is very crucial to understand that how these two concepts interact with each other and how different parameters affect them separately and together, as taking into consideration how these concepts play a big role in our daily lives. The purpose of this study is to discover the relationship between social media and collaborative learning in a deeper manner, specifying differences among categories like several age ranges, genders, and educational levels in this relationship and with the difference of past researches, to understand better the satisfaction level of people using these two concepts together. In order to understand better the relationship between social media and collaborative learning and the satisfaction level of using both of them; interactivity with peers, interactivity with teachers, engagement, perceived ease of use, perceived usefulness which affect social media usage and positive interdependence, individual accountability, active learning and group processing which affect collaborative learning are questioned in an online survey study. After examining and cleaning the collected data, most appropriate analyses are determined. Regression analysis shows that the change in the satisfaction level of the people who use social media for collaborative learning is related with perceived usefulness, individual accountability, active learning and age.

**Keywords:** social media usage, collaborative learning, regression analysis
MIDDLE SCHOOL CURRICULUM AND SCHOOL MANAGEMENT FOR TALENTED IN SCIENCE AND MATHEMATICS: THAILAND

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In Thailand, talented in science and mathematics receives special supports from federal government. There are 12 regional science schools which is established by Ministry of Education since 2009. The schools are boarding science schools providing education from Grade 7 to Grade 12. For Middle school, the student performances in PISA 2012 and PISA 2015 were above 550 in both mathematics and science, which is much higher than average Thai schools and OECD. Thus, this study aims to study Middle school curriculum and school management of 12 regional science schools to provide guidelines for talented in science and mathematics education for Middle schools. The methodology is qualitative research in nature, collecting data from interviews of 138 stakeholders from 12 science schools. The results suggest that effective curriculum and school management for talented in science and mathematics should involve 1) clear vision, mission, and goals, 2) flexible school management, 3) strong science and mathematics teachers, 4) specific and context based curriculum that could be able promote attitude in careers in science and technology, 5) flexible and dynamic curriculum that fits with individual student need, 6) learner-centered learning that encourages high potential of individual student, 7) project-based learning to enhance deeper understanding and integration of knowledge and skills 8) authentic and integration assessment, 9) supporting learning and capacity infrastructures and internet access, 10) strong academic collaboration with universities, communities, international science schools, and private sectors to support student learning and capacities.

Keywords: talented, science and mathematics, middle school, curriculum, science school
ENVIROMENTAL EDUCATION CURRICULUM FOR STUDENTS IN THE FOREST TRESPASSED AREA

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Forest areas in Thailand have been greatly reduced, especially in the northern region. The deforestation leads to several severe environmental problems in the country. The deforestation in Northern Thailand was mainly caused by agriculture expansion for monocropping. The research suggests that the two main reasons for the deforestation are the lack of environmental literacy by people in the community and human-centered environmental ethics. Thus, fostering environmental literacy and ethics for new generations are a sustainable way for solving environmental problems. The objective of this study was to design an environmental education curriculum to promote student's environmental literacy and ethics for forest conservation. The procedure was composed of three phases. Phase I explored the environmental literacy and ethics of people in the province that have a big issue regarding forest trespassed areas. Phase II was the design and conducting a pilot study for the curriculum. Phase III was the implementation of the curriculum by teachers. This paper is mainly focused on Phase II. The curriculum was designed by including all aspects of environmental literacy related to the Thai curriculum standards, local contexts, and placed more emphasis on the aspects that people in the community lacked. The designed curriculum is composed of 12 activities for one semester of teaching. The curriculum was pilot tested by researchers with 28 middle school students in a volunteer school. The data were collected from observations, journals, and interviews. The pilot study indicated such a curriculum could enhance students' environmental literacy and promote environmental ethics toward ecocentrism.

Keywords: environmental ethics, environmental literacy, forest conservation
METAPHORICAL PERCEPTIONS OF PRE-SERVICE ELEMENTARY MATH TEACHERS ABOUT 'MATHEMATICS TEACHER'

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Teachers play a major role in educating qualified human power, socializing of individuals, transferring of the values that a society has to future generations. In this study the perceptions of the pre-service teachers who will perform this profession in the future are determined through metaphors about teachers who generally have a great importance for a society and in a special case, mathematics teachers who were studying in the learning process of mathematics course against which people own an anxiety and negative attitude. For this reason, the purpose of the research is to examine the metaphorical perceptions of pre-service elementary math teachers regarding the concept of mathematics teacher. Within the scope of this general objective, the answer was searched about "What are the metaphorical perceptions of pre-service elementary math teachers about mathematics teachers?" The research was conducted with qualitative paradigm in the type of survey method. The study group of the research consists of 83 pre-service teachers studying at Elementary Mathematics Teacher Education Department of Sinop University. The questionnaire consists of two parts. The obtained data were analyzed by using content analysis technique. As a result of the research, 70 metaphors were formed under total of 9 themes. Moreover, while the male pre-service teachers stated that they saw the mathematics teacher as a phenomenon shaping the students; the female pre-service teachers stated that they saw the mathematics teacher as a phenomenon in the context of counseling and guidance.

Keywords: mathematics teacher, metaphor, pre-service teachers
STUDY OF SCIENTIFIC CONCEPTIONS ON ORGANIC CHEMISTRY WITH THREE LEVELS OF REPRESENTATION USING MULTIMEDIA FOR GRADE - 11 STUDENTS

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The purposes of action research were to study scientific concepts of organic chemistry with three levels of representation using multimedia. The population consisted of 120 grade - 11 students from 5 classrooms at Princess Chulabhorn Science High School Nakhon Si Thammarat School, Nakhon Si Thammarat Province in the second semester of academic year 2017. Research sample were 24 students of grade - 11 students which were selected by cluster random sampling technique. The instruments used for collecting data were 1) 3 lesson plans on organic chemistry with three levels of representation using multimedia, 2) multimedia were composed of ball-stick-model with animations, and 3) the organic chemistry concepts test 10 items that had a reliability of 0.91. Statistics used for data analysis were frequency and percentage. The finding was as follows: Participating with three levels of representation using multimedia; by demonstration of the experiments for explain macroscopic level of phenomena, which address visible such as color change or dissolving; using animation to explain submicroscopic level, which address invisible such as atom and molecule; using ball-stick-model to show symbolic level, which involves the formulae and equations. As a result, 82.08% of students hold sound understanding they able to wrote structure of product and showed mechanism of reaction, 10.83% hold partial understanding they unable to illustrated absolutely mechanism of reaction, 5.42% hold partial understanding with alternative conception about physical properties in hydrocarbon, 1.67% hold specific alternative conception, which drawing arrow in mechanism incorrectly and not found students in no response

**Keywords:** three levels of representation with multimedia, scientific concepts, organic chemistry, multimedia
THE MEDIATOR ROLE OF STUDENTS' SCIENCE LEARNING MOTIVATION BETWEEN LEARNING ENVIRONMENT PERCEPTIONS AND SCIENCE ACHIEVEMENT

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The purpose of this study is to investigate the mediator role of the 7th grade students' motivation towards learning science in the relationship between students' science learning environment perceptions and science achievement. Correlational research design was utilized in this study which was carried out during 2016-2017 spring semester at 11 public and 2 private middle schools located in central district of Kars province, Turkey. A total number of 922 seventh grade students participated in the study. Students' science learning environment perceptions was measured by using What Is Happening in This Classroom? Questionnaire which includes subscales; student cohesiveness, teacher support, investigation, involvement, task orientation, cooperation, and equity. Self-efficacy, task value, intrinsic goal orientation and extrinsic goal orientation subscales of Motivated Strategies of Learning Questionnaire were used to assess students' motivation towards learning science. Moreover, Science Achievement Test was developed by the researchers for assessing students' academic achievement in science class. Data were analyzed through Latent Variables Path Analyses by using LISREL 8.8 programme. Results showed that students' learning environment perceptions were significantly and positively related to motivation (beta=.22) and science achievement (beta=.65). Moreover, students' motivation towards learning science significantly and positively mediated the relationship between students' perceptions of science learning environment and their science achievements. 24% of the variance in science achievement explained by the learning environment perceptions was due to the science learning motivation.

Keywords: classroom learning environment, motivation, science achievement
TRAINING OF FOREIGN STUDENTS UNDER THE MODERN PROFESSIONAL PREPARATION OF QUALIFIED DOCTOR

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The training of a qualified doctor is the main task of a higher educational institution. When teaching medicine to foreign students it is important to take into account the ethno-social problems that arise at the stage of practical training of a doctor in modern conditions. The purpose of the work is to introduce into the system of training foreign students' clinical situational tasks, the closest to the real cases of medical practice, which will improve the quality of mastering the discipline by foreign students of the 4th year and obtain the necessary general levels of theoretical knowledge, practical skills and abilities. For the practical stage of studying foreign students we offer situational clinical tasks in accordance with the studied topic, which indicates the previous diagnosis, as well as the minimum amount of laboratory and / or instrumental data studies. The experience of using clinical situational tasks for the practical training of foreign students suggests that this approach is optimal and allows you to effectively form the necessary level of knowledge and skills for students for the next general medical practice.

_**Keywords:** surgery, training, students_
WHY DO I NEED MEDICAL STUDENTS FOR AN INDIVIDUAL PLAN OF A TRAINING PROCESS?

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Individual plan of a training process for medical students contains: 1. Theme and list of training elements, content modules and modules. 2. Forms of control on individual elements of the educational process. 3. Reference balls for individual and total elements of the educational process. 4. Actual scores received by the student for his personal control of the level of knowledge for individual learning elements and the total level. 5. The individual plan should become a motivating factor for improving knowledge of the individual components of the curriculum. 6. Its content should be used in self-preparation of the student for the lesson.

Medical students in the course of training should analyze the mistakes made and fill in the gaps in their knowledge, as self-control is the basis of cognitive activity, reasonable independence, disciplines the student, develops a critical attitude towards oneself, being motivated to better education. The results indicate increase objectivity in the control of knowledge from teachers and students to increase interest in teach a subject that is allowed to integrate in medical education and, in future, in practical public health of Ukraine and other countries. Diagnosis is based on the comparison of resembling signs of a disease, in an examined patient, with manifestations of all the diseases with similar clinical presentation. In consideration of the importance of preparing qualified specialists, it's natural to increase quality of education in medical institution.

Keywords: individual plan, training process, medical students
INVESTIGATING PRE-SERVICE MATHEMATICS TEACHERS ABILITY TO CLASSIFY TWO- AND THREE-DIMENSIONAL SHAPES

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Geometry and spatial thinking constitutes an essential aspect of mathematics curriculum (CCSSI, 2010; NCTM, 2000; MEB, 2017). Geometry Standard of National Council of Teachers of Mathematics (NCTM)’s Principles and Standards for School Mathematics (2000) describes the study of both two- and three-dimensional shapes as an important component of elementary and middle grade mathematics curriculum. Despite the importance of geometric thinking, studies demonstrate that students at all levels struggle with two dimensional shapes (Fujita & Jones, 2006, 2007) as well as three dimensional shapes (Gokbulut & Alkis Kucukkaydin, 2012; Turnuklu & Ergin, 2016). Therefore, the purpose of this study is to investigate pre-service mathematics teachers (PSMTs) conceptions of two and three-dimensional geometric shapes. To do so, a geometry questionnaire will be administered to 52 pre-service mathematics teachers, who are enrolled in a geometry course offered at a public university in Turkey, at the beginning and again near the end of the Spring semester in 2017-2018 academic year. A sample of PSMTs (6 PSMTs), who demonstrate a wide range of geometric thinking levels, will be selected to be interviewed to further elaborate on their responses. It is expected to find out that the PSMTs might demonstrate limited understanding of two-and three-dimensional geometric shapes. Previous studies demonstrate that understanding hierarchical reasoning among quadrilaterals is not easy and requires a complex way of thinking regarding to two-dimensional shapes (Fujita & Jones, 2007; Zeybek, 2017). Furthermore, pre-service teachers demonstrate such a limited understanding of three-dimensional shapes (Gokbulut & Alkis Kucukkaydin, 2012; Turnuklu & Ergin, 2016).

Keywords: quadrilaterals, three-dimensional shapes, hierarchical reasoning
The importance of proof in mathematics education has been emphasized by current educational reform suggestions, which explicitly state “mathematical proofs should be an essential part of mathematics classrooms from kindergarten to high school” (CCSSI, 2010; NCTM, 2000). Studies, however, demonstrate that classroom textbooks and current educational reform suggestions do not align well (Bieda, Ji, Drwencke, & Picard, 2014; Newton & Newton, 2007; Stylianides, 2009). The purpose of this study is to investigate to what extent reasoning-and-proving tasks take place in grade 5-8 mathematics textbooks. For this purpose, the textbooks suggested by the Ministry of Education to be used in the area of Tokat province have been selected. Selected textbooks were analyzed by at least two coders in two stages. While in the first stage of coding the number of examples, tasks, problems, and practice questions in the textbook were determined; in the second stage the number of reasoning-and-proving tasks were detected. According to the findings of this study, among the total of 2831 tasks analyzed, only 177 (6%) tasks show the characteristics of reasoning-and-proving. Among these reasoning-and-proving tasks, 80 (45%) tasks show non-proof argument characteristics while only 18(10%) tasks show proof characteristics. These results demonstrate that the number of reasoning-and-proving tasks do not align with the recommendations of current education reforms and mathematics educators.

Keywords: conjectures, proofs, justifications, middle grade mathematics
IMPACT OF TEACHERS' TRAINING ON EFFECTIVE DELIVERY OF PRACTICAL SCIENCE ON: STUDENTS' INTEREST IN, AND ATTITUDE TOWARD SCIENCE OF GRADES 8 AND 11

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This paper we report on the impact of teachers’ Training on Effective Practical-delivery in Science on enhancing students’ attitude toward and interest in science. Teachers from 17 schools in Qatar, among them 24 secondary school teachers teaching grade 11 and 11 preparatory school teachers teaching grade 8, were enrolled in two, independent, extended training courses (four hours per week for 16 to 18 weeks) on delivery of practical science lessons. Each course was designed to train teachers to delivery practical activities aligned with science curriculum standards, in a way that allowed teachers to practice each activity during the training before delivery to their students. Teachers would then reflect on their teaching and discuss feedback with their trainers and colleagues in the subsequent training session. Evaluation of the program was based on Trainees’ performances, student performance and measure of students’ attitudes toward science before and after training. Results suggest a notable and significant change in the skills, knowledge and confidence of teachers in delivery of practicals in their science classes as reflected by results from tests and observations. This paper will focus on the measure of trainees’ students’ attitude toward science before and after training. Main findings using t-test show: Very significant increase in attitude of trainees’ students after training (p <0.0001) no significant change in control schools’ students over the same period (p 0.78 - 0.86) male students especially at preparatory level, show higher attitude & higher self-efficacy than female students especially toward practical part of science and future science career.

Keywords: science, practical, activities, attitude, achievement, inquiry based
MUBEM & BILSEM: STEM BASED SCIENCE NATURE CAMP

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MUBEM & BILSEM: STEM Based Science Nature Camp was held by Mugla Sitki Kocman University Application and Research Center for Science Education (MUBEM) and Mugla Science and Art Center (Mugla BİLSEM) between 12-18 June 2017 in Akyaka-Muğla/Turkey. The project funded by The Scientific and Technological Research Council of Turkey (TUBITAK 4004-Project number: 117B227). The idea behind of the project, STEM education is an approach that bases on integrative science viewpoint and involves the transformation of scientific knowledge into an artifact in teaching processes using curiosity and scientific inquiry. In this context, the goals of the camp were developing an integrative science perspective in accordance with the nature of STEM education, supporting career choices of participants for STEM fields, experiencing outdoor learning environments and scientific researches with scientists, internalizing engineering design-cycles by creating artifacts and comprehending interaction of nature and science. The participants were 6th and 7th grades gifted students (Male:15 and Female:15) who attend in Science and Art Centers. As data collection tools, STEM attitude scale, researcher notes, artifact, camp, and activity evaluation forms were used. The activities were conducting STEM based activities with experts/scientists, designing scientific knowledge-based artifacts as an individual/group, experiencing the contribution of universities to science and culture in the local region with technical trips and organizing a science fair with created artifacts. The varied science, social science, and art disciplines such as astronomy, archeology, music, and mathematics involved the camp. The participants found the opportunity to use advanced telescopes, experience an extensive archaeological excavation, observe the near-nanosize object with electron microscopes, construct a bridge like an engineer and design artifacts like rockets and holograms during the camp. According to the preliminary results, the project contributed participants to create an integrative perspective on science, support career choices to STEM fields and comprehend engineering design-cycle.

Keywords: stem education, gifted students, nature and science camp
WHY DO SOME STUDENTS FAIL TO EXPLAIN MACROSCOPIC BIOLOGICAL PHENOMENA AT THE MICROSCOPIC LEVEL EVEN WHEN THEIR KNOWLEDGE IS CANONICAL?

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Six 16-year-old Hong Kong students were interviewed weekly for three months to observe the influence of a pedagogy on their reasoning across different levels of biological organisation. Before the teaching intervention, explanations at the molecular level were generally fragmented from observable phenomena. When probed, some students provided more details at the molecular level. Their responses inspired me to experiment a pedagogy to address two questions: What elements facilitated or prevented application of knowledge across different levels of biological organisation? How, if any, did my pedagogy influence the interviewed students’ explanations of biological phenomena? Two elements facilitating cross-level reasoning in biology were identified: awareness to explain at different levels of biological organisation, and visualisation of mechanisms behind macroscopic phenomena. In contrast, unfounded assumptions about the phenomena prevented the students from applying certain concepts in their explanations. A pedagogy that emphasised the reasoning framework of multi-level nature of biological mechanism was trialled at the schools of the interviewed students. The students analysed exemplary mechanistic explanations based on a framework adapted from Mil, Boerwinkel, and Waarlo (2013). Then they constructed explanations of some biological phenomena to be critiqued by the whole class. Some students claimed they became more aware of constructing cross-level mechanistic explanation; however, they showed problems analysing their answers according to the framework. They did not master the mechanistic explanation skills yet, as they might not understand the rationale of the framework. How to move from knowing to understanding and to applying cross-level mechanistic reasoning framework will be discussed.

Keywords: biology, pedagogy, mechanistic explanation, reasoning
THE PERCEPTIONS OF PRE-SERVICE AND IN-SERVICE TEACHERS REGARDING A PROJECT-BASED STEM APPROACH TO TEACHING SCIENCE

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Whilst much attention has focused on project-based approaches to teaching Science, Technology, Engineering and Mathematics (STEM) subjects, little has been reported on the views of South-East Asian science teachers on project-based STEM approaches. Such knowledge could provide relevant information for education training institutions on how to influence innovative teaching of STEM subjects in schools. This article reports on a study that investigated the perceptions of 25 pre-service and 21 in-service Malaysian science teachers in adopting an interdisciplinary project-based STEM approach to teaching science. The teachers undertook an eight-hour workshop which exposed them to different science-based STEM projects suitable for presenting science content in the Malaysian high school science syllabus. Data on teachers’ perceptions were captured through surveys, interviews, open-ended questions and classroom discussion before and at the end of the workshop. Study findings showed that STEM professional development workshops can provide insights into the support required for teachers to adopt innovative, effective, project-based STEM approaches to teaching science in their schools.

Keywords: professional development; project-based learning; science; teaching innovation; stem
THE EFFECTS OF ARGUMENTATION BASED INSTRUCTION ON 8TH GRADE STUDENTS’ ACHIEVEMENT AND CONCEPTUAL UNDERSTANDING ON THE SUBJECT OF ACIDS AND BASES

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The purpose of this study is to investigate the effects of argumentation-based instruction on students’ achievement and conceptual understanding on the subject of acids and bases. In this study, quasi-experimental design was used. The participants of this study were 68 eighth grade students from two different classes in a secondary school. One of the classes was randomly assigned to control group (N=33), and the other one was randomly assigned to experimental group (N=35). Students were taught through traditional approach in the control group and argumentation-based activities in the experimental group. Data was collected through Academic Achievement Test (AAT) that consisted of 27 multiple choice questions and Conceptual Understanding Test (CUT) that consisted of 15 two-tier multiple-choice questions. AAT and CUT were administered as pre and post-test. The results showed that, there was no significant difference between groups in terms of students’ achievement on the post-test (t=0.077, p>0.05) while there was a significant difference between groups in terms of students’ conceptual understanding on the post-test (U=405.50, p<0.05). The results of this study indicated that argumentation-based instruction was more effective than traditional approach in terms of promoting students’ conceptual understanding and removing students’ alternative conceptions.

Keywords: argumentation, conceptual understanding, acids and bases, science education
PRESERVICE SCIENCE TEACHERS’ VIEWS RELATED TO STEM IMPLICATIONS IN 2017 SCIENCE CURRICULUM

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The aim of this research is to determine preservice science teachers’ views related to STEM implications in 2017 science curriculum. It was used simple descriptive survey method. The sample of study is comprised of 65 preservice science teachers who are in the 3rd grade from Atatürk University. A STEM scale consisting of 9 open-ended questions was used to collect data. In order to provide validity, it was taken expert views and necessary corrections were made at the scale. Science curriculum was examined within the scope of Special Teaching Methods I lesson and then, preservice science teachers’ views related to STEM were taken. For analyzing data, descriptive statistics were done, preservice science teachers’ views were categorized and were determined frequencies / percent values. It was seen that preservice science teachers evaluated positively the addition of STEM applications to the program, expressed that interdisciplinary studies should be carried out for the development of science education, said that the areas of technology, engineering and mathematics should be more associated with science, and teachers emphasized the importance to be given to science. In addition, it has been determined that STEM applications of gifted students in Science Art Centers will improve science.

Keywords: stem, preservice science teachers, science curriculum
STUDENTS’ COMMON DIVISOR CONCEPT FORMATION PROCESSES

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The purpose of the study is investigating formation process of common divisor concept for 6th grade students. Participants were 60 students who study in a middle school in Samsun, Turkey. Teaching process was designed with Realistic Mathematics Education (RME) (Freudenthal, 1968) and study was designed qualitatively. According to data which was acquired from group study papers of the students and observation during teaching process, seven students were chosen for clinical interviews. APOS (Action, Process, Object, Schemas) framework (Asiala, Brown, DeVries, Mathews, & Thomas, 1997) was used for content analysis. The findings demonstrated that one student could not construct the common divisor concept because of her schema in "action" stage. It has been observed that she tried to memorize the solution process and remember it while solving other questions. Moreover, other students constructed the concept passing through "process" and "object" stages. While some of them found common divisor(s) by using multipliers of given numbers, some used prime factorization method. Finally, it was identified that students who conceptualized common divisor properly could choose greatest common divisor and could say its meaning.

Keywords: concept formation, common divisor, rme, apos
COMPARISON OF SPATIAL ABILITY OF PRE-SERVICE PRIMARY AND SECONDARY MATH TEACHERS ACCORDING TO DIFFERENT VARIABLES

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The study aims to investigate pre-service teachers’ spatial ability in terms of their gender, department, class level, GPA, national central exam scores for entrancing to universities (OSYM), and the situation of taking preschool education. The participants were 226 pre-service teachers who study in Undergraduate Program in Primary and Secondary School Mathematics Education at Ondokuz Mayıs University. Purdue Spatial Visualization Test (PSVT) that were developed by Guay (1976) and revised by Yoon (2011) is used for the purpose of measuring spatial ability. Correlational techniques from quantitative research model are used to analyze data. At the end of the study, it is expected that spatial ability of pre-service teachers would not be significantly different according to the types of the programs since closeness of their OSYM scores. Moreover, their spatial ability might become different according to class levels. Also, pre-service teachers who take pre-school education might get higher scores on spatial ability. Finally, there were many researches studying the relations of spatial ability and gender. In this study, it is expected that spatial ability would change according to gender, yet the direction of the difference could not be estimated.

**Keywords:** spatial ability, pre-service mathematics teachers, gender, class level, purdue spatial visualization test (psvt)
USING OF DRAMA METHOD IN HISTORY OF SCIENCE COURSE

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The aim of this study is to examine the opinions of prospective elementary maths teachers on the using of the drama method in the science history course. For this purpose, in the fall semester of 2017-2018 academic year, 95 students studying in the 3rd grade in the Elementary Mathematics Teaching Program in a university in Eastern Anatolia were studied. During the first 6 weeks within the scope of Science History course, the subjects were distributed to the prospective teachers within the scope of the course and they were asked to explain the subjects prepared by the method of presentation by the prospective teachers. In the next 6 weeks, the prospective teachers were divided into 12 groups and the drama method was trained by educational drama technique. The two experts filled in the "Observation Form" each week by watching the classroom environment and dramas. "Drama Evaluation Form" was filled in by the students outside the group for each drama. The dramas recorded as video and both class and drama were observed by two experts. At the end of the semester, the "Science History Course Evaluation Form" was filled by the students. A face-to-face interview was conducted with 10 students and a voice recording was taken in accordance with their permission. It has been determined that Prospective Maths Teachers think that the using of drama method in science history course makes the lesson fun, more effective learning and information become more permanent in the direction of collected data.

Keywords: history of science, drama, prospective elementary maths teacher
SCIENCE TEACHER CANDIDATES’ CONCEPT IMAGES OF FUNCTION

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In this study, it was aimed to determine the science teachers’ candidates’ the concept image of functions, based on the Concept Image Theory developed by Tall and Vinner (1981). The study was designed with phenomenology, one of the qualitative research methods. The study was conducted with 59 of the first-year students of the Science Teaching Program in a state university in Eastern Anatolia in the academic year of 2016-2017. An open-ended questionnaire was administered to students to determine their concept images of function. In the questionnaire, students were asked questions such as the definition of function, in which cases the various indices indicate function which expressions given in graphics indicate function. They were asked to specify in detail the reasons for the answers to these questions. The obtained data will be subjected to content analysis and the concept images of the students will be determined by gathering them under appropriate codes and categories.

**Keywords:** function, concept image, prospective science teacher
THE STUDENTS AND LECTURERS' VIEWPOINT ABOUT EFFICIENCY OF MATHEMATICS TEACHING STYLES IN IRAN

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Hadi Saboori  
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Seyed Majid Ayat  
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The technological and industrial advances in any country depend primarily on the interactive academic developments. Indeed, the basis for technology has been constructed by basic sciences such as mathematical sciences as a top priority. In the present study, along with inspecting five distinctive educational psychology theories, various teaching styles of mathematics were scrutinized. For this purpose, a special questionnaire was developed in which every question includes one of fundamental characteristics of these theories. The participants in this survey were ninety B. Sc. students of mathematical sciences in University of Zabol. According to the statistical analyses, the heuristic problem-solving teaching and speech-based styles were the most interesting and least attractive methods respectively for the survey participant while the speech-based style is the most prevalent teaching style for them.

**Keywords:** schools of psychology of education, friedman nonparametric tests, kolmogorov-smirnov test, xi-two test, kruskal-wallis test
USING OPTIMIZATION SOFTWARE FOR SOLVING LINEAR SYSTEMS

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This study examines the use of optimization application software to solve linear systems because there are some complex linear systems that have a set of solutions, but the optimal solution is the one that satisfies all the system. The study was based on a linear system as a case study, which was solved using SimSolve and Matrix Calculator as a software designed using the traditional methods to solve the linear system under investigation. The same system was also solved again using the optimization software; Excel Solver and Lindo 6.1, where there was no difference in the correct solution in both methods. Then, the linear system, which is used as a case study, was modified to become more complex. When the new system was resolved using the mentioned software, the results were in favor of the optimization software Solver and Lindo 6.1; they could provide solutions with a margin of error, while, SimSolve and Matrix Calculator software, designed with traditional algorithms, failed to achieve a result. Based on these results, the study recommends introducing optimization software within the mathematics curriculum in the advanced stages of the educational system and training for both teachers and students to use such software in order to reduce the time and effort exerted for solving systems, and to obtain the best results when solving these systems. It is recommended to make use of information and communication technologies that make learning mathematics more easily to increase reliability on mathematical models in solving life problems.

Keywords: linear systems, optimization software, information technology, life problems
HOW DO LEBANESE EARLY CHILDHOOD EDUCATION PROSPECTIVE TEACHERS VIEW SCIENCE AND SCIENTISTS?

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A qualitative study was conducted on 24 students, all females, in their 3rd semester (2nd year), enrolled in their initial teacher education program in early childhood education during the academic year 2014-2015. The aim of this study was to collect and to assess students’ views about their NOS understandings at the beginning and at the end of their course on teaching science. The research questions were a) what are pre-service early childhood education views about NOS? b) did pre-service teachers change their views about science and scientists after attending the teaching science course? If yes, in what ways? Qualitative and quantitative data were collected from 1) Draw-a-scientist-at-task tool, 2) pre- and post-questionnaires about students’ views about science and scientists and 3) students’ formative and summative assessment scores. To increase the validity of results, a member checking was used. Results showed that prospective teachers’ views about NOS improved significantly after attending only one course and that the majority of students agreed on the importance of learning more about science for their professional development.

Keywords: nature of science, pre-service teachers, early childhood, pedagogical content knowledge, science literacy.
LEBANESE SCHOOL PRINCIPALS ATTITUDES AND LEVEL OF ICT USE IN PUBLIC SCHOOLS

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Ayoubi Zalpha  
*Lebanese University*

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The training program for the Lebanese public schools principals was 3 months in duration. 204 school principals participated at the training program at the Faculty of Education. At the end of the program, they received a survey questionnaire on leadership style, as well as to collect their attitude toward ICT. 192 filled-in the questionnaire; they were disseminated from all over Lebanon. Data collected was processed by using Statistical Package for Social Science (SPSS) program. Descriptive analysis and Pearson's correlation were used to identify the relationships between ICT use and gender, age, PC Number, earned Diploma, geographical location or province. Findings suggest that there is a no significant correlation between the use of ICT and school principal gender and age, the good equipment of schools is irrelevant with the school geographical location (urban/rural city). Moreover, older school principals did not encourage or incite their teachers' staff to use ICT in their classroom practices. Within this study, the researchers identify significant challenges faced by the trainees’ school principals, for instance, the little number and the lack of computers in their schools, the absence of IT teachers and even many of them did not use often computers in their daily routine works before the training program. Finally, Lebanese school principals adopted an administrative style with an emphasis on the accountable management behavior.

**Keywords:** school principals’ attitudes, university training program, ict
INEVSTIGATION OF ENVIRONMENTAL AWARENESS LEVEL OF TEACHERS

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The purpose of this study is to determine the environmental knowledge, attitudes towards the environment and environmentally friendly behaviors, i.e., the level of environmental awareness of in-service teachers and to understand whether certain variables such as major, gender, duration of experience affects these issues. The study was carried out in 2016-2017 academic year with 302 voluntary teachers who are in different education stages and majors in the city of Etimesgut in Ankara. In addition, the area of the study, represents the regions of Turkey where citizens are from different socioeconomic levels. In this regard, this study will be instrumental in having a general idea of the teachers in Ankara. Data were collected with a quantitative scale called "Environmental Awareness Scale". The scale consists of a demographic scale chapter and three main chapters to measure knowledge, attitude and behavior towards the environment. Analysis of the data was performed with SPSS 22.0; descriptive statistics, t-test, analysis of variance (ANOVA) and correlation analyzes were applied. Co. Alpha coefficient was found to be 0.98. Factor analysis was also performed. According to the research findings, participants' genders were found to have an effect on attitude and knowledge levels but not on their behaviors. The attitudes towards the environment of those who are interested in plants and animals in their childhood have been positively influenced. Moreover, it has been observed that attitude and knowledge do not have a positive effect on behavior alone but knowledge and attitude have a positive effect on each other.

**Keywords:** environmental awareness, environmental attitude, environmental behaviors, environmental knowledge
TECHNOLOGY IN MATHEMATICS AND SCIENCE DISTANCE EDUCATION: AUTOMATED TEXTUAL ANALYSIS OF ARTICLES AND PROCEEDINGS PAPERS USING LEXIMANCER

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This study characterizes scholarly discourse relative to the use of technology in mathematics and science distance education in terms of the concepts used by mathematics and science educators in 15 mathematics and 15 science education journal articles and proceedings papers. The study asks 1) Which concepts occur most frequently relative to each discipline? 2) How do frequent concepts vary between the disciplines? 3) Which themes emerge as most characteristic of this discourse? 4) What do the disciplinary document sets have in common? Relative to Research Question 1, the most frequently occurring concepts in the Mathematics Education documents were mathematics, pedagogical, digital, assessment, game, participants, knowledge, teaching, content, and school. In the Science Education documents, the concepts virtual, access, communication, science, blended, feedback, inquiry, skills, environment, and model occurred most frequently. Relative to Research Question 2, none of the 10 most frequently occurring concepts in the mathematics documents appear in the corresponding list of science documents. Relative to Research Question 3, Mathematics concepts are most closely associated with the themes Learning, Teachers, and TPACK and Science concepts with the themes Students and Concepts. Relative to Research Question 4, the concepts learning and students appear in both the mathematics and science education documents more frequently than other concepts. In conclusion, this study found strong evidence in support of a conjecture that discourse associated with the use of technology in distance education is conducted by mathematics and science education scholars using systematically different concepts and themes to represent their interests, methods, and findings.

Keywords: technology, distance, mathematics, science, education
PREPARATION MODEL FOR DEVELOPING MATHEMATICS PRE-SERVICE TEACHERS' META-COGNITIVE THINKING

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In the present study, we report the preparation of 24 pre-service teachers who were in their third academic year, majoring in teaching mathematics and computer science in the middle school. We used different tools to collect data: The solutions' texts of mathematical problems that emphasize metacognitive processes, the pre-service teachers' texts for the design and preparation of activities that encourage students' metacognitive processes, interviews with the participants, the discussion texts in the social network sites and observations of the implementation of activities. To analyses the data, we used the constant comparison method. The research findings indicated that the participating pre-service teachers developed their metacognitive skills as learners at the beginning and then as teachers. This development as teachers included two aspects: activity design and activity implementation. In addition, we describe a preparation model that included different phases starting from the theoretical phase and ending in a reflection phase, where some parts of these phases are cyclic. We concluded that it is possible to educate pre-service teachers for metacognitive practices, as learners and as teachers. To succeed in this education, the pre-service teachers need to solve activities that emphasize metacognitive skills, to build such activities, to teach them, to discuss their practices, and to reflect on the whole sequence of metacognitive processes. Special attention was given to using mobile technology in authentic real-life problems and to collaborative learning.

Keywords: professional development, mathematics education, metacognitive, metacognitive processes, pre-service teachers
LABORATORY ACTIVITIES TO DEVELOP THE GEOMETRIC REASONING

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A set of activities designed to foster geometric thought of students in the 2nd grade of junior High School (8th grade of elementary school in Brazil) is presented here. The activities were proposed to students of a public school. The learning was supported by teaching resources as Tangram, Geoboard and Bending. The activities, interdisciplinary, realistic and playful, were carried out in the Laboratory for the Teaching of Mathematics. The activities were performed in groups organized in such a way to enhance the interaction between students of different levels of knowledge. A test to check the van Hiele level of students was applied before and afterwards. The evaluations of the results of the tests reveal advances in the van Hiele level. The proposal applied to an experimental group provided an environment conducive to meaningful learning. It must be pointed that it also increased students’ confidence and stimulated them to develop continuity for the acquisition of new knowledge.

**Keywords:** van hiele theory, meaningful learning, geometry
THE IMPACT OF TECHNOLOGY ON THE UNDERSTANDING OF THE WORLD OF SCIENCE

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We can say that the science that has emerged in the direction of the researches which are the result of curiosity of the human being, and the process that continues until the day is passed in many stages. There are a number of factors that need to be learned, understood and embodied by the individual and society. At the beginning of these elements are the technological tools and equipment used in the period. Learning to classify and use these technological tools and equipment by individuals or by society will facilitate individual or collective scientific facts and events to make sense of the scientific world. In this study, it is suggested that researchers who analyze the technological structure used to make the world of science more understandable by taking the 20th and 21st centuries as a basis, should evaluate the findings obtained from the studies done by the researchers with supporting the literature. When studies on the subject in the study process are examined, many differences on the basis of findings reveal the importance of using technology in science world. The most important result that must be clearly understood in the end result is that the technological tools and tools that must be used to understand the world of science are close to the level of meaning of the individual,

Keywords: science, technology, tools, equipment
ANALYSIS OF THE ENHANCED REALITY APPLICATIONS IN EDUCATION IN TURKEY

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It has been observed that the technology which keeps the rapid development towards the day-to-day from the 20th century is supporting the teaching of some materials in many fields, especially in education. Increased reality applications, which are very popular in recent times, are expected to provide convenience to students and instructors in educational settings. Increased reality provides the enrichment and support of reality in the environment by embodying these knowledge and concepts in situations where individuals do not understand some information and concepts in the real environment and are confused. Increased reality enriches the virtual and visual environments visually with a simple basic structure. Increased reality is an innovative technology that provides the media and given combination of real world and digital media such as video, animation, three-dimensional model, sound, graphics and GPS position information. In this study, the level at Computer Technologies for the use of this technology in Turkey opinions of the teaching staff who work in the education branch of science was evaluated. In the study conducted, the answers of the questions in the semi-structured interview form were analyzed by using qualitative research methods' opinions of field experts and descriptive and content analysis techniques.

Keywords: increased reality, technology, learning, practice
A TEST DEVELOPMENT STUDY FOR EVALUATION OF PRESCHOOL CHILDREN’S SCIENTIFIC PROCESS SKILLS

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Scientific process skills have been increasingly emphasized in science education. Researchers agreed on these skills promote conceptual understanding of science and scientific inquiry, and also scientific literacy. Considered these studies, many countries stressed scientific process skills as an integral part of their science curriculum. In Turkey, National Ministry of Education has included scientific process skills in the last three science curriculum 2004, 2013 and 2017. Preschool teaching program standards in Turkey emphasized that care should be taken to using scientific process skills in the activities. The program encourages the child to recognize his/her surroundings, to ask questions about his/her curiosity, to explore, to discover and to learn by doing. Besides many science activities, such as; observing living and non-living beings in the nature, make a discovery and use simple tools, preschool science activities in the program also include experimentation, concept learning and analogy. These activities aim to children to pay attention, to ask questions, to observe, to examine, to search and to explore (MEB, 2013). The purpose of this study is to develop and validate a Scientific Process Skills Test (SPST) in order to assess preschool children’s skills appropriate for the scientific process skills in preschool education. This test will be an alternative assessment for researchers for their studies. For this purpose, the answers of the following questions have been searched: 1-To what extent the SPST is valid in order to measure the preschool children’s scientific process skills? 2- To what extent the SPST is reliable in order to measure the preschool children’s scientific process skills? The sample of this study is composed of 212 preschool children (aged 5,6 years). The study was conducted in four different preschools which two of them were state preschools, others were state preschool classes of primary schools in Istanbul. Older age groups of children (5-6 ages) in these schools were participated to this study during 2014-2015 and 2015-2016 academic years. The first pilot study of the test was applied to 32 children in a state preschool class of primary school. The second pilot study was applied to 180 children in two state preschool and one state preschool class of primary school and also children participated in the first pilot study. Both of the pilot studies were applied to the older age groups of primary school children. During the development process of the SPST, in the first step, in the scientific process skills appropriate for preschool children were determined from
the literature and 20 items related to these skills were prepared. This test was applied to the sample. In this study, during developmental process, a multi-form test was prepared appropriate for measurement and evaluation techniques. In the first step of test development process, early childhood scientific process skills were examined in literature and determined as observation, measurement, classification, prediction, interpretation and communication. In the second step, type of the questions that is used to determine the children’s scientific process skills have been decided. Care has been taken to ensure that the questions in the test were consistent with the skills. For this reason, besides the multiple-choice questions, three open-ended questions were also prepared for the test for which the children were expected to make inference. Children's ages and skills were considered during preparing the test items. Related with six different scientific process skills, 20 questions were prepared including 16 multiple-choice questions, 3 open ended questions and a performance-based question. Each multiple-choice question consisted of four options. After preparing test items, the test was applied to the 32 preschool children in one school in order to understand the readability of the test items, intelligibility of the figures and drawings, to remove the terms that were difficult to understand from the test, and to determine total time required for answering the questions. With this first pilot, various corrections and adjustments have been made on some expressions and figures that students had difficulty in understanding the test. Researchers have identified four questions that children had difficulty in understanding. The prepared test was presented to three experts who have studies about preschool science education in order to determine whether there were scientific errors both in the questions and in the options and also to test the content validity of the test. After reviewing process, final form of the test was prepared consisting of 12 multiple test questions, 3 open ended questions and a performance-based question. The second pilot test was applied to the 180 children in four different schools in order to find construct validity and reliability and also to perform item analysis of the test. As a result of the application, the correct answers for the multiple-choice test items were scored as 1, and the wrong and blank answers were scored as 0. The correct answer and the performance questions were scored in the same way. In this study, a Scientific Process Skills Test was developed to measure preschool children’s scientific process skills. For this purpose, 20 test items were prepared. At first step, the preliminary test was applied to a group of 32 children in order to test the understandability and readability of the test items. Four items were eliminated from the test since the children had difficulty to understand. The test was presented to the experts' opinions to determine the content validity. After reviewing process, 16 item test including twelve multiple choice, three open ended and one performance questions were prepared. To test the construct validity, hypotheses test technique was used and the results showed that hypotheses were supported and test items measure the test structure correctly. To test the reliability of the SPS test, internal consistency analysis was applied. Kuder Richardson-20 and Cronbach alpha coefficient were calculated and found to be .68, .68 respectively for multiple choice items. Consistency analysis for open ended and performance questions were also done by two academicians. Kappa statistics between to academicians was calculated. Remarkable characteristics of the SPS test were average
difficulty and discrimination values. Item analysis showed that both of them were close to the optimum values. Results of item analysis showed that the discrimination of the items was good and test items can be used. The findings of this study showed that the SPS test is a valid and reliable assessment tool for preschool childrens.

Keywords: preschool students, scientific process skills, test development
PRE-SERVICE SCIENCE TEACHERS PERCEPTIONS ABOUT THE USE OF DIGITAL MATERIALS: A Q-METHOD ANALYSIS

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This study aims to determine how the use of digital sources in teaching is perceived by pre-service science teachers and whether their opinions about using digital materials are coincide at a common point. Q methodology which includes both quantitative and qualitative processes is used in this study. Q methodology aims to reveal people's perspectives, opinions, beliefs and attitudes during the scientific research process in subjective and systematic ways. The importance of this research is twofold, one goal is to reveal the effects of teaching and the other goal is to reveal the effects of learning scientific concepts with digital materials on science teachers. Q Methodology is an analysis method which incorporates the analysis of qualitative and quantitative aspects using analytical methods, and is used in other branches of science, especially psychology. This research is also important for adapting the Q Methodology to educational researches. After a total of eight weeks in the Instructional Technology and Material Design courses, the interview form was applied to the pre-service science teachers and the collected data was analyzed by the "PQ Method 2.35" program. According to the results of the research, it was seen that the pre-service science teachers showed a common attitude towards the teaching and learning processes and this common attitude was positive. The overall average of the positive attitude for learning process of pre-service science teachers is higher than the average of the positive attitude for teaching process of pre-service science teachers.

Keywords: pre-service science teachers, digital materials, q methodology
INDEPENDENT LEARNING ACTIVITIES AND STUDENT PERFORMANCE IN LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

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The investigation aimed to compare the effect of two independent learning activities to student academic achievement of engineering students in an undergraduate linear algebra and differential equation course at Abu Dhabi Men’s College. Independent Learning Activity in Linear Algebra was administered in Fall 2016-2017 (n = 169) while independent learning activity in differential equations was adopted in Spring 2016-2017 (n = 133). In Linear Algebra Learning Activity, three application problems in linear algebra were assigned for students to self-study. In differential equation activity, four application problems in differential equations plus you tube video links were provided for students to self-study. Students were then required to write for a written exam in both instances. Collected data on progress tests, independent learning activity written assessments, and the Final Examination scores were analyzed using correlation analysis, t-test, and analysis of covariance. Results of the study showed no significant difference in scores in learning activity written assessments but Final Examination scores of those who did the differential equation activity were higher than those who did the linear algebra activity. Recommendations on implementation of independent learning activity in Linear Algebra and differential equation were posited.

Keywords: independent learning, inverted classroom, autonomous learning
THE EFFECT OF STEM EDUCATION ACTIVITIES ON PRE-SERVICE CHEMISTRY TEACHERS

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Science Technology, Engineering and Mathematic (STEM) Education is currently considered and introduced as the integrated approach for teacher in the 21st century. It has been the way to improve the meaningful learning and connect with the relevant academic concepts to the real-world lessons. In this study, the 33 pre-service chemistry teachers who enrolled in the Integrated Science course in semester I, 2016 at Faculty of Education, Thaksin University, Thailand, were divided into 8 groups (4-5 students each) and introduced eight STEM Education activities which designed and proposed by the Institute for the Promotion of Teaching Science and Technology, Thailand (IPST). The total of 18 hours contained 3 stages which at the first stage, each group was encouraged to learn and practice one activity and then introduced to other groups to practice. At the second stage, each group attempted to design their own STEM activities which related to any chemistry topics and at the final stage, each group introduced their own activities and proposed to other groups to practice. This paper presents the results of STEM Education activities designed by pre-service chemistry teachers and investigated the integration of science, mathematics, engineering and technology including the daily life connection.

Keywords: stem education, chemistry, pre-service chemistry teacher
INSPIRING SCIENCE: A CAPACITY BUILDING AND CURRICULUM DEVELOPMENT TO SUPPORT TEACHING AND LEARNING OF SCIENCE AT PRIMARY LEVEL IN SCHOOL ACROSS THAILAND

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Thailand has over the past fifteen years been going through a process of education reform, review, and development and the Office of the Basic Education Commission (OBEC) have identified the need to develop the teaching and learning approaches adopted in science classrooms. This has included the need for the utilisation of a broad range of active teaching strategies, in order to offer students a variety of creative and imaginative learning experiences that capture their interest and active involvement, and develop essential skills, thinking and creativity. Thus, to support and facilitate these needs, a partnership composed of the Sheffield Hallam University, UK, OBEC and the British Council (Thailand) has developed the Inspiring Science project that pragmatic support to more than 7,000 schools through a continuing capacity development (CPD) program, the development of comprehensive context-based teaching resources and accompanying professional development with on-going school-based support. The participants engaged in the CPD programme have developed their knowledge, understanding, confidence, competence and creativity in the development of the innovative teaching resources to meet the needs of science teachers to support the implementation of context-based, inquiry-based and active teaching and learning, the development of key skills. The innovative teaching resources have enabled teachers to inspire and motivate their students, as well as develop their knowledge, understanding, scientific capability and key skills. The teachers have become adopters and adapters of the teaching resources, and some have even become developers. The project is achieving its goals of widespread embedding and sustainability.

**Keywords:** context-based learning, continuing professional development, active teaching and learning, scientific enquiry
INTERRELATIONSHIP BETWEEN KEEPING SCHOOL EXPERIENCE DIARIES AND STUDENT TEACHERS EMPATHIC TENDENCIES

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Empathy is the process where individuals understand the thoughts and feelings of another while feeling the same way and communicating this to the other under a certain circumstance. Individuals with high empathic tendency levels act constructively within their attempts to understand others and consider the other parties during conflicting situations, empathic tendencies and skills of student teachers should be sufficient. Therefore, before starting their teaching profession, student teachers should experience required educational activities to attain empathic skills and to determine their empathic tendencies. Although empathic behaviors could not be taught directly to individuals, some activities could be taught to enable them to uncover their weaknesses and strengths, reveal their existing empathic values and increase their self-awareness. In other words, it is not easy to teach empathy; however, assistance could be provided for the formation of empathy. Sample survey includes 12 student teachers who have studied in Faculty of Education of Hacettepe University. In the research, Empathic Tendency Scale was used with the aim of collecting data. Within the framework of the research, student teachers were asked to keep school experience diaries in order to identify the interrelationship between student teachers’ empathic tendencies and expression in the experience diaries. In addition, elements related to the empathic tendencies of student teachers were eliminated from the student diaries produced in a systematic way to determine empathic tendencies. In this study it is tried to demonstrate how it could be more effective the courses which will be applied in the years ahead.

Keywords: school experience, empathic tendencies, student teachers
Inquiry based research requires individuals to think about a subject, to reason, to conduct in-depth research and to discuss the results. Inquiry based research lead the individuals to explore knowledge, investigation, and discovering facts. Permanent learning in science is thought to occur through inquiry, research and exploration. For this reason, in disciplines such as chemistry learning should be conducted by questioning, researching and exploring, that is, inquiry-based research. The purpose of this research is to investigate the effect of inquiry-based chemistry experiment practices on the inquiry skills and scientific creativity of prospective teachers. The sampling consisted of prospective chemistry teachers studying at Hacettepe University. In the research, inquiry skills scale and scientific creativity test were used as data collection tools. As a result of the research, it has been determined that inquiry-based chemistry experiment practices are an effective approach in order to improve inquiry skills and scientific creativity of teacher candidates. The research findings also reveal that the inquiry-based chemistry experiment practices allow the chemistry to be more understandable, given the opportunity to practice the theoretical knowledge and makes chemistry experiments fun.

**Keywords:** inquiry-based practice, chemistry experiment, inquiry skills, scientific creativity
AN EXAMINATION OF THE CRITICAL THINKING SKILL LEVELS OF THE PRIMARY EDUCATION STUDENTS

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What is intended in today's renovated and updated sense of education is not to bring up individuals who merely memorize the information units without questioning, but to bring up enterprising asking, questioning, wondering, problem-solving, and researching individuals, who are equipped with decision-making skills, who may make use of information technologies, and who may think scientifically, creatively, and multi-dimensionally. This is a study having been conducted with a total of 173 students from a primary education school in Ankara, which is registered to the Ministry of National Education, 84 of whom are from 6th Grade, 43 of whom are from 7th Grade, and the remaining 46 of whom are from 8th Grade. Cornell Critical Thinking Test-Level X (CCTTLX) was utilized in order to determine the critical thinking levels of the said students. According to the attained findings, critical thinking levels of the students from 6th, 7th, and 8th grades were found to be at medium level. A meaningful difference, which is in favor of the students from the 8th grade, was found between the critical thinking levels of the students from 6th and 8th grades. However, no meaningful difference was found between the critical thinking levels of the students from the 7th grade and those from the 6th and 8th grades. No meaningful difference was found between the critical thinking levels of the said grades also in view of the sub-dimensions of induction, reliability of the observations and sources, deduction, and that of defining the assumptions included within the assessment instrument.

Keywords: elementary science education, thinking skills, critical thinking
A STUDY ON THE LABORATORY ACCIDENTS IN THE SCIENCE COURSES

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Science lessons contain many abstract concepts. Laboratory work is important for students to learn abstract concepts in a permanent way. On the other hand, activities for students in experimental sciences such as science teaching, especially experimental activities, have a very important place. Students in the implementation of experimental activities; laboratory accidents, and so on. Qualitative research method was used in this study. In this qualitative study; document review was used for data collection methods. Within the scope of the research, a total of 63 laboratory accidents, which took place between 2000 and 2016. When laboratory accidents are examined; Accidents such as "Toxic Gas Outflow" at a frequency of 27%, "Experimental Tube Explosion" at a frequency of 25%, "Mercury Poisoning" at a frequency of 23%, "Volatile Chemicals" and "Breakdown of Glass Materials" at a frequency of 10% are more frequent than other laboratory accidents. When the accident reports are examined, it is understood that the laboratory accidents experienced in the schools have changed according to the education levels. 8% of the accidents occurred at university level, 24% at high school level, 27% at primary school level and 41% at secondary school level. Accidents occurring at primary and secondary school level account for 68% of all accidents. According to the applied curriculum, the number of accidents in the science laboratory is changing. When laboratory accidents are examined, it can be said that the lack of knowledge about laboratory use techniques constitutes a major cause of laboratory accidents.

Keywords: key words: laboratory accidents, reasons of laboratory accidents, laboratory usage techniques
DETERMINATION OF PURPOSE OF SAFE LABORATORY USE OF SCIENCE TEACHERS
BY PLANNED BEHAVIOR THEORY

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Laboratory work is important for students to learn abstract concepts in a permanent way. Due to the risks that laboratory activities may contain in science classes, careful planning and organization of laboratory practices is required. Because of this, laboratory safety is gaining importance. Among the aims of the science curriculum program is the expression "to recognize the importance of safety in scientific studies and to create safe working consciousness" (MEB, 2017). Factors such as poor perception of teachers' attitudes toward laboratory practices, inadequate safety precautions in the laboratory environment, inadequate physical conditions, and teachers' lack of knowledge about laboratory techniques have been identified as factors impeding safe laboratory practices. The purpose of this study is to use the Planned Behavior Theory to examine the behavioral aims of science teachers in using the laboratory safely. Relational survey model was used in the study. In the study, "Performing Safe Laboratory Use Scale" was developed by the researcher in accordance with the Planned Behavior Theory and taking into account the scale development steps. The sample of this research are 2405 science teachers from all regions of Turkey. SPSS 21 and AMOS 23 programs were used for analysis of the data. The data obtained from the scales were evaluated by structural equation modeling. The Cronbach Alpha reliability coefficient for all of the scales is .961. As a result, "Behavioral Object" of science teachers most effected by "Perceived Behavior Factor" on the other hand "Attitudes Behavior" and "Subjective Norm" was determined to have low impact.

Keywords: laboratory use, laboratory safety, planned behavior theory, laboratory accidents, structural equation modeling
INVESTIGATION OF THE ACTIVITIES FOUND IN SCIENCE COURSE TEXTBOOK

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In Turkey, secondary school Science and Technology Course Curriculum was changed to "Science Curriculum" Curriculum in 2013. The new curriculum suggests that teachers prepare and implement the activities they will or will do at school in accordance with the "research-inquiry-based" learning strategy. Activities for students in science teaching, especially experimental activities have a very important place. Among the aims of the science curriculum program is the expression "to recognize the importance of safety in scientific studies and to create safe working consciousness" (MEB, 2017). In this study, the activities in the textbooks of the 6th-7th-8th classes science lessons which were taught taking these characteristics of the program into consideration were examined and suggestions were made for the activities to be included in the books to be newly prepared according to the curriculum of 2017 in the direction of shortcomings. In book reviews, it is seen the activities meet the academic achievements of 2015-2016 curriculum, in-classroom and out-classroom activities are in equal numbers, and number of laboratory activities more than number of paper-pen activities. However, there are major shortcomings in the field of laboratory safety. There is no safety symbol in the 6th grade textbook, despite the fact that students are required to use dangerous materials, there is a lack of dangerous substance warning, especially in the case of chemistry subjects in 7th grade textbook, and the shortcomings of attaching the necessary safety symbols to the activities in 8th grade textbook indicate that the activities are designed to cause undesired accidents.

Keywords: science education textbooks, laboratory safety, laboratory activities, science education achievements
INVESTIGATION OF THE INFORMATION, ATTITUDE AND BEHAVIORS OF THE CONSERVATORY SECONDARY SCHOOL STUDENTS AROUND THE ENVIRONMENT

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The environment in which biotic and abiotic factors interact with each other in a balanced manner is called the environment. Biotic factors expressed here include living things, while abiotic factors include inanimate ones. But nowadays environmental problems are increasing. Environmental factors are all factors that negatively affect the balanced interaction of biotic and abiotic factors with each other. Environmental problems include air pollution, water pollution, soil and animal pollution, climatic changes and refuse problems. The human beings who cause these environmental problems also have a great reference to the removal of environmental problems. For this, environmental awareness must be established in the individuals. The concept of environmental consciousness consists of three main parts: environmental attitudes, environmental information and environmentally friendly behaviors. In this context, it was aimed to determine the information, attitudes and behaviors of 6th, 7th and 8th grade students in the survey. The sample of this research consists of a total of 76 people in a conservatory located in the province of Ankara, 22 of the 6th grade, 27 of the 7th grade and 27 of the 8th grade. The environmental awareness questionnaire (Erten, 2005) was applied to the students to collect the research data. The data obtained after the questionnaire application will be analyzed and the results will be interpreted. It is expected that there will be a meaningful difference between the results.

Keywords: environmental consciousness, attitudes towards the environment, environmental information, behavior towards the environment, middle school students
THE COMPARISON OF 2013 AND 2017 SCIENCE CURRICULUM FOR THE GAINS OF ENVIRONMENTAL SCIENCE

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The environment in which biotic and abiotic factors interact with each other in a balanced manner is called the environment. Biotic factors expressed here include living things, while abiotic factors include inanimate ones. Environmental factors are all factors that negatively affect the balanced interaction of biotic and abiotic factors with each other. Environmental education in the education and training of the individuals is effective in stopping environmental problems. The concept of environmental education is a tool used to educate individuals with environmental awareness. Aims in environmental awareness; having environmental knowledge and showing positive attitudes and behaviors towards the environment. The aim of the research in this context is to compare the achievements related to environmental science gains in the 3rd, 4th, 5th, 6th, 7th and 8th grades of the 2013 and 2017 Science Curriculum. In the method of the research, a document review (content analysis) which is one of the qualitative research methods was performed. As a result of the survey, the number of gains related to environmental science increased in the 3rd (from 6 to 9), 5th (from 2 to 4) and 8th grade levels (from 5 to 8) 10'a) and 7th grade (from 7 to 5). At the 6th grade level, the number of gains remains unchanged and remains at 6 gains. In the classes where the numbers are increased, the contents of some gains have been changed and new achievements not included in the 2013 curriculum have been added to the 2017 curriculum.

**Keywords:** environmental science, science curriculum, environmental science gains, science literacy
HOW PERSONAL BACKGROUND INFORMATION ABOUT A SPEAKER INFLUENCE THE LEARNING: A STUDY ON TED-TALK VIDEO

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The purpose of the study is to investigate how emotions of learners about the speaker influence their learnings. To do so, three groups of college-students, consisting of one control and two investigation groups, will be selected to watch a TED-talk video. The control group will not receive any information about the speaker prior to the talk whereas the second group will receive positive-personal information and the third group will receive negative personal-information about the speaker prior to the talk. Immediately after watching the video, each group of students will be given a multiple-choice exam to measure how much information they can recall from the talk. After the exam, a questionnaire, which consists of multiple-choice and open-ended questions will be administered to the students to evaluate their emotions regarding to the speaker. Approximately one month later, the same exam and the questionnaire will be administrated to the same students again without watching the video second time. Significant difference between the control and the two investigation groups will indicate the influence of emotions of learners about the teacher on learning. Moreover, significant difference between the second and the third group will allow us to interpret the direction of influence of the positive and negative emotions about the teacher. It is expected that such findings will also shed light about the situation of teachers who have physical-disability; are their disabilities really have a negative impact on students' learning in a way that their students' parents are concerned, or is it just a myth?

Keywords: emotion, personal information, negative-positive emotion, ted-talk, learning, engineering education
THE EFFECTS OF USING ALGODOO IN SCIENCE TEACHING AT MIDDLE SCHOOL

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The study examined the effects of instructional approaches as support for scientific learning using a simulation program, Algodoo. The well-known difficulties on learning science concept is supported by Algodoo program. Algodoo is a physic simulation program and it is integrated 7\textsuperscript{th} grade work and energy unit science classes. The study is conducted in a state school, 3 instructors and their two classes totally six classes and 202 students participate the study. The study designed as an experimental research. Each instructor's experiment and control group is randomly selected. During the three weeks, each instructor lecture control group with traditional method and experimental group is studied science lessons supported with Algodoo. Pre-test and post-test are applied to all participant as quantative data tools and reflections and worksheets are applied to experiment groups as qualitative data tools. The acquired results show that students have positive attitudes towards Algodoo program they seen lesson which is applied Algodoo more enjoyable and meaningful for them. The results show that there is meaningful difference between experiment and control group with respect to score of success test and scientific process test. Algodoo can be applied to students from different education levels.

Keywords: algodoo, work and energy unit, simulations
EFFECTS OF WRITING TO LEARN ACTIVITIES IN HANDS-ON AND VIRTUAL LABORATORY ENVIRONMENTS

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The Science Writing Heuristic (SWH) approach mainly developed by Hand and Keys (1999). The approach involves two sets for both teachers and students to be mindfully active in an inquiry-based laboratory environment (Burke et al., 2006). The set for students provides scaffolds in written form in order to help metacognition about their lab experiments (Hohenshell & Hand, 2006) and the set for teachers enable them to design inquiry-based science laboratories. In the current study, it was investigated that the effects of SWH approach in hands-on and virtual lab environments on pre-service science teachers’ laboratory skills and quality of written arguments. Students used the SWH approach-based writing templates developed by Choi (2008). The template involves beginning questions, procedures, data gathering and analyzing techniques, claims, evidence and reflection. The attitude scale towards laboratory skills developed by Alkan and Erdem (2012) also used in the study. The scale involves 25 items under four sub-dimensions. Quasi-experimental research design was used in the current study. Participants of the study were 51 pre-service science teachers. They were assigned into two groups, one of which them used hands-on laboratory environment, coded as control group. The other group used virtual laboratory environment called as experimental group. Based on findings, it was reached that although pre-service science teachers’ attitude towards laboratory skills developed throughout the study in hands-on and virtual lab groups. There are also no significant differences between pre- and posttest for each group. Moreover, students in both groups’ argumentation skills are similar based on their lab reports.

Keywords: hands-on laboratory, virtual laboratory, science laboratory, writing to learn, science writing heuristics
INFORMAL SCIENCE EDUCATION APPLICATIONS WITH SIMPLE AND EASY ACCESSIBLE MATERIALS

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It is aimed that experiments which are designed with simple and easily accessible tools and equipment, can be applied safely outside the laboratory. This research which aims to determine the opinions of the secondary school students and teacher candidates for the said implementation is a qualitative research. Phenomenology among the qualitative research approaches, is used in the research. The study group of the research consists of teacher candidates who study in science teaching program of education faculty in a university located in Central Anatolian Region and secondary school students. The experiments prepared in the application are given to the students in the appropriate age group for implementation. The opinions of secondary school students related with the experiments and usage of laboratory are taken before and after the application. After the implementation, interviews are made with teacher candidates and they are asked to share their experiences. The data of the research is collected by the semi-structured interview form prepared by the researchers. Descriptive analysis technique is used for data analysis. As a result of the research, it is observed that they state the necessity of making the experiments in laboratories due to the fact that the students may cause dangers before implementation and they emphasize that post implementation experiments can be made enjoyable in different environments with simple and easily accessible materials. It is also important that the teacher candidates express experience the teaching and they can develop themselves professionally with such implementations.

Keywords: science education, easy accessible material, experiment, phenomenology
STEM EDUCATION FOR GIFTED CHILDREN THAT ATTEND TO STEM WORKSHOP

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The purpose of this study is to determine the opinions of talented and gifted children that attend to STEM (Science, Technology, Engineering and Mathematics) workshop with regard to STEM. The study was conducted via qualitative research approach, an embedded multi case study, one of these approaches, was used. The study group consisted of 7 gifted children registered to Remzi Sakaoğlu Science and Art Center based on their consent. The students were individually interviewed in accordance with semi-structured interview developed by researchers. Data obtained from the participants during the interviews was recorded and after transcription, it yielded certain codes, categories and themes. At the end of the research, a majority of gifted and talented children pointed out that STEM works had a great contribution to project development and conducting them by experiencing and practicing was influential on their works. They expressed that STEM works in the workshop prepared them for more advance technological steps starting from their childhood. From the standpoint of the students, the most beneficial sides were as following: enabling them to find a more extensive solution rather than directly solving the problem by teaching them how to think, developing their imagination, time-planning, creating a product with limited materials. The students asserted that STEM works had no negative aspects, they enjoyed in STEM workshop as well as robotic workshop, and STEM even led them to think about studying software and engineering.

Keywords: stem, gifted students, interview
The purpose of this study is to determine the influence of cooperative learning activities and presenting reports by postcard and brochure, one of the cooperative writing methods for education purposes, on the physics laboratory achievement and the writing skills of teacher candidates in Fundamental Physics Laboratory Class III class. The study was carried out with 61 teacher candidates that study in Science Teaching Department of Ataturk University during 2017-2018 academic term. The study employed a quantitative research design. One of the experimental methods, quasi-experimental design with pretest, posttest, and control group was used. Preliminary information test launched the study for all groups. Teacher candidates prepared laboratory reports as following: cooperative postcard preparing in experimental group 1, cooperative brochure preparing in Experimental group 2, classic report writing in Experimental group 3. The results indicated that there was no significant different among preliminary information levels of teacher candidates at the beginning of the study. There was a significant difference among academic achievement levels of teacher candidates at the end of the study. Scheffe results, one of the multiple comparison tests that were conducted to determine which group had the significant difference indicated that cooperative postcard was superior to cooperative classic report and cooperative brochure was superior to cooperative classic report in terms of significant difference. When the writing skills for education purposes of teacher candidates were compared, it was observed there was significant difference among the writing skills of teacher candidates who used different cooperative writing styles.

Keywords: academic achievement, cooperative learning, brochure, postcard
CLASSROOM TEACHER CANDIDATES' INTEGRATED STEM TEACHING ORIENTATIONS AND STEM AWARENESS RAISING

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STEM education is considered to be an interdisciplinary approach that encompasses an educational process that includes higher education, beginning at the pre-school. Teacher candidates who will serve as class teachers play a very important role in the development of students' interests, attitudes, knowledge and skills in the fields of science, mathematics, engineering and technology. In this context, it is important to determine the STEM orientations and awareness of the prospective teachers. The purpose of this research is to determine the degree of orientation and STEM awareness of the Integrated Teachers' STEM teaching prospects. In this study, data were collected from 156 classroom teachers who were studying at state university. In the research data collection method was applied as a screening technique from quantitative methods. 'STEM Awareness Scale' and 'Integrated STEM Teaching Orientation Scale' were used in the research. In the analysis of the obtained data, arithmetic mean and standard deviation values were calculated. Findings have shown that classroom teacher candidates' overall orientation toward integrated teaching of STEM is generally positive. It was also determined that the STEM awareness of classroom teacher candidates participating in the survey was also positive. STEM awareness of male and female teacher candidates was found to be significantly different in favor of male teacher candidates. It is thought that classroom teacher candidates are closely related to both the integrated STEM teaching orientations and the positive STEM awareness that they receive in education faculty degree programs.

Keywords: stem, classroom education, stem awareness
DETERMINATION OF KNOWLEDGE LEVELS OF PRE-SCHOOL TEACHER CANDIDATES ON MOON AND SUN ECLIPSE EVENTS

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Today, in many developed countries around the world, research, evaluation and development studies are carried out on basic knowledge and skills that teachers should possess. Astronomy knowledge, which is part of these development works, is based on observations and theory-based studies that investigate the structure and evolution of the universe, as well as the learning of other sciences. In this study, according to qualitative research methods, it was requested that prospective teachers should picturize the events of the Moon and Solar eclipses and answer a series of open-ended questions. Attempts have been made to reveal the participants' ideas, conceptual misconceptions and deficiencies at the conceptual level in picturizing studies used as a research method in educational research field. For this purpose, pre-school teacher candidates were asked to draw the Moon and Solar eclipse events and to put on the paper in detail, and then the contents of the data collected by the researchers being analyzed. As a result of the research, it has been seen that the candidate teachers are inadequate regarding the topic of Moon and solar eclipse. It has been determined that some teacher candidates have inadequate information and misconceptions as they depict the Moon as being larger than the Sun, as the Sun rotates around the Moon.

Keywords: pre-school teacher candidates, pre-school science education, teacher education, moon and sun eclipse
A QUANTITATIVE STUDY ON THE PERCEPTION OF VIOLENCE

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In these recent years, increasing incidents of violence is attracting everyone's attention. The aim of this study is to investigate thoughts and values about violence of individuals. 368 people living in rural areas of Ankara were selected as the sample of this research. A semi-structured interview was conducted in the study. According to the obtained data, it is an act that is challenged by those who have difficulty in expressing themselves and applied as physically, psychologically, economically and sexually that causes harm and chaos. The vast majority of individuals exposed to violence. All of the individuals think ways of the prevent violence are education, psychological support and legal regulations must be made. It is seen some individuals internalize violence and think violence is a way to fix problems and education levels show no significant difference on internalizing the violence. Vast majority thinks traitors, terrorists and sex offenders deserves violence acts. They expressed causes of violence against women are gender discrimination within the society and mass media suggestions. They believe that the violence against women is unacceptable under any circumstances, and violence against women can be prevented with that given education about equality of genders to society. According to these results, most of the individuals aware that violence is a communication problem and everyone in the society is affected by violent acts one way or another.

Keywords: violence in society, gender discrimination, sexual health, violence
In this study, it was aimed to determine elementary school teaching department students’ concept images about functions of, based on the Concept Image Theory developed by Tall and Vinner (1981). The study was designed with phenomenology, one of the qualitative research methods. The study was conducted with 73 of the first-year students of elementary school teaching department in a state university in Eastern Anatolia in the academic year of 2016-2017. An open-ended questionnaire was administered to students to determine concept images about function of the students. In the questionnaire, students were asked questions such as the definition of function, in which cases the various indices indicate function which expressions given in graphics indicate function. They were asked to specify in detail the reasons for the answers to these questions. The obtained data will be subjected to content analysis and the concept images of the students will be determined by gathering them under appropriate codes and categories.

**Keywords:** function, concept image, elementary school teaching department students
6. GRADE STUDENTS' CONCEPT IMAGES ABOUT QUADRILATERALS

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In this study, it was aimed to determine 6. grade students’ concept images about quadrilaterals (square, rectangular, parallel edge, rhombus, trapezoid) based on the Concept Image Theory developed by Tall and Vinner (1981). The study was designed with phenomenology, one of the qualitative research methods. The purpose of phenomenology is to reveal the experiences, perceptions, and meanings of individuals about a phenomenon. Phenomena can be antagonized in various forms like experiences, perceptions, orientations, concepts and situations in the world we live in (Yıldırım and Şimşek, 2011: 72). The study was conducted with 77 6. grade students in a city of Eastern Anatolia in the academic year of 2016-2017. An open-ended questionnaire was administered to students to determine concept images about quadrilaterals of the students. In the questionnaire, students were asked the definition of square, rectangular, parallel edge, rhombus, trapezoid and their characteristics the obtained data will be subjected to content analysis and the concept images of the students will be determined by gathering them under appropriate codes and categories. Also, it will be supported with direct quotation of students’ answers.

Keywords: concept image of quadrilaterals, 6. grade students.
THE EFFECT OF USING SMART BOARD TO THE 7TH GRADE STUDENTS' ATTITUDES TOWARD THE ENVIRONMENT IN HUMAN AND ENVIRONMENT UNIT

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In this study, the effect of intelligent board usage in the 7th grade Human and Environmental unit was investigated on students' attitudes toward the environment. For research; two middle schools were used in Konya province Hadim District. One of the schools was chosen as the control group and the other was chosen as the experimental group. The Environmental Attitude Scale was used as data collection tools. For 4 weeks, the students in the control group processed the Human and Environmental unit according to the traditional methods while the students in the experimental group were processed using the same unit smart board activities. The Environmental Attitude Scale was applied as a pre-test to determine the students' attitudes toward the environment before the application started. After the application was completed, the same test was applied as a post-test to determine the students' attitudes towards the environment. The obtained data were analyzed with SPSS 22 statistical package program and t-test was used in the evaluation of the obtained data. As a result of the analysis of the post-test data of the Environmental Attitude Scale, although the score of the experimental group was higher than that of the control group, there was no statistically significant difference between the experimental group and the control group. Therefore, it has been found that the use of smart boards has not been effective in improving students' attitudes towards the environment.

Keywords: human and environment, smart board, environmental attitude, science teaching
A CONTENT ANALYSIS OF SCIENCE CURRICULA AND TEXTBOOKS: MODEL AND MODELING CONCEPTS

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Today, science curricula and textbooks are still important for teachers and students and they maintain their significance as a guide and information source. The aim of this research is to examine the situation of model and modeling concepts in recently administered 2017 science curricula and textbooks in Turkey. Furthermore, this study focuses on science teaching programs and textbooks to analyze and identify any insufficiencies in terms of model and modeling concepts and to provide possible suggestions for teachers. For this purpose, the qualitative research design was chosen, and the data were collected and analyzed through document and content analyses methods. As the source of data, new 2017 Physics, Chemistry, Biology, Earth Sciences-Geography and Science Education curricula and their 2017-2018 academic year science textbooks were used and systematically analyzed by using content analysis method. The results of the analysis show that the concepts of model and modeling are stated and mentioned in the curriculum, but explanation of scientific models and the role of these models in scientific progress are not mentioned. In the textbooks, it has been determined that there is a variety of information about the modeling activities and STEM emphasized activities for students. There is however, not enough information provided with regard to model-target relation and using different types of models for specific purposes both in curricula and textbooks. The findings and suggestions about model and modeling concepts in the new science curricula and textbooks will be presented and discussed in more detail.

**Keywords:** model, modelling, curriculum, textbook
MATHEMATICS TEACHERS' KNOWLEDGE OF EFFECTIVE PEDAGOGY BEFORE AND AFTER A PROFESSIONAL DEVELOPMENT WORKSHOP

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This study assesses mathematics teachers’ knowledge of effective pedagogy before and after a professional development workshop. The design for the study was an explanatory sequential design, comprising forty (40) mathematics teachers (11 females and 29 males), who were purposively selected from a school district in the central region of Ghana. The quantitative data gathered consisted mainly of teachers’ responses to a 5-point Likert scale questionnaire items. The qualitative data consisting of teachers’ responses to open-ended questions, helped to explain the differences in the quantitative data. The results indicated that mathematics teachers’ knowledge of effective pedagogy was significantly higher in the post-workshop (M = 4.39, SD = .35) than in the pre-workshop (M = 1.78, SD = .11), t (39) = 22.90, p = .00, 95% CI [2.36, 2.86]. The results indicated that the teachers learnt to connect theory to their professional practice. Through the use of interactive sessions and clear illustrations by the facilitators, the teachers’ knowledge of effective pedagogy was greatly enhanced. The teachers cited lack of motivation and time constraint as hindrances militating against their efforts at implementing effective pedagogical practices. A major implication of this study is that knowledge of pedagogical practices among teachers could be enhanced if professional development workshops are continually organized for them. However, for maximum benefits of such programs, teachers should be monitored in the classroom to ensure that the knowledge they acquire is put into practice.

Keywords: pedagogical methods, effective pedagogy, content knowledge, professional development
USING A LATIN-SQUARE DESIGN TO DETERMINE THE MOST EFFECTIVE MATHEMATICS TEACHING METHOD

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This paper investigates the most effective teaching method among four (4) mathematics teaching methods (i.e. direct instruction, inquiry-based learning, cooperative learning, and guided-discovery method). The study used a mixed-method design, with a preponderance quantitative 4 x 4 Latin-Square design, using four (4) classes, four (4) teaching methods, and four (4) mathematics teachers to determine students’ scores. Participants comprised two hundred and forty (240) students in a public high school in the western region of Ghana. Quantitative data were obtained from students’ examination scores after each teacher had used a particular method. Five (5) randomly selected participants from each of the classes were interviewed to constitute the qualitative data. The results indicated that there were differences among the four teaching methods, F (3, 6) = 860.67, p < .05, with inquiry-based learning having the highest mean. Tukey’s post hoc multiple comparison test showed that the mean score for guided discovery method was less than that for cooperative learning, t(3) = -9.75, p < 0.05, the mean score for guided discovery method was less than that for inquiry-based learning, t(3) = -14.50, p < 0.05, the mean score for direct instruction method was less than the mean score for inquiry-based learning, t(3) = -14.50, p < 0.05, and, the mean score for cooperative learning method was less than the mean score for inquiry-based learning, t(3) = -14.5, p < 0.05. The study concludes that mathematics teachers should be motivated to use more inquiry-based and cooperative learning in their instructions.

Keywords: teaching method, inquiry-based learning, cooperative learning, instruction
INTEGRATED DEVELOPMENT AND ASSESSMENT OF MATHEMATICAL AND SCIENTIFIC MODELING PRACTICES FOR CULTURALLY RESPONSIVE STEM EDUCATION

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Real-world problems often demand interdisciplinary solutions and provide opportunities for cross-disciplinary instruction and learning with mathematical sciences and STEM. Building on the vision of The Mathematical Sciences in 2025 (National Research Council, 2013) and with the motivation to prepare the students of the 21st century, interdisciplinary teacher teams are created to work together with students, university faculty, and community experts in solving and in building instruction around locally relevant STEM challenges. The goal of this research program is to provide equitable access to quality STEM instruction for all students with culturally responsive practices. Since 2014, with support from the National Science Foundation, in-service mathematics and science teachers, students, and faculty have been participating in year-long professional learning community (PLC) activities on STEM projects around culturally relevant topics such as lionfish population dynamics and control, water quality, and green homes. Based on the emerging local best practices with PLCs around interdisciplinary projects for the islanders, we will present how these projects support the development of interdisciplinary knowledge and practices by students, teachers and the community for learning mathematical sciences and STEM in and out of school settings. Highlighting one of the STEM projects, we will discuss focused professional development sessions for teachers on mathematical and scientific modeling of lionfish population dynamics and control using discrete, continuous and statistical methods.

**Keywords:** mathematical modeling, assessment, culturally responsive stem education, project-based learning, professional learning communities, interdisciplinary mathematical and scientific practices
PLAYING WITH MATHEMATICS IN THE CLASSROOM

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Mathematics is disliked by many and can be a cause of fear and anxiety. Could these emotions stem from unimodal teaching (e.g., lectures and worksheets)? Mathematics should be taught in a hands-on, multi-modal manner. Students have different learning styles and need engaging activities to increase motivation and engagement. The purpose of this oral presentation is to provide examples for teachers to make math lessons more student-centered. Differentiating instruction by learning style is an effective way to enhance students' academic success. By including auditory, visual, and kinesthetic learning modalities, teachers will be able to improve students' active participation. This oral presentation will be engaging, practical, and applicable to all K-12 math teachers. Various levels of content difficulty will be addressed (i.e., inverse of multiplication, inverse of division, graphing coordinates, one- and two-step equations). Demonstrations will be made to engage participants and stimulate hands-on learning of mathematics.

Keywords: mathematics, teaching strategies, learning styles
THE MARCH FOR SCIENCE MOVEMENT AS UNUSUAL MASS PROTEST FOR THE SAKE OF VULNERABLE SCIENCE, SO TO SPEAK: A DISCOURSE ANALYTICAL APPROACH TO PUBLIC SCIENCE UNDERSTANDING

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Discourse analysis focuses primarily on the meaning contents of individuals everyday conversations. Everyday language is rather constructed by various contexts and it goes beyond the real meanings of the words under the terms of social reality and results in much more complex interpretation. The language has been used as a socio-cognitive tool refers to values, perceptions, identities through discourse. As such, it could be stated that public science understanding is relatively interrelated with the language that constructed in a certain culture. However, the fact that science has no mutually accepted definition pushes science in an uncertainty on what reference points it considers. The present study seeks to investigate how people all over the world reacted to a mass protest in support of science and analyzed protesters slogans during The March for Science. Data analysis was carried out by discourse analytical approach because the analysis unit was merely based on texts available from internet sources. Texts were specifically analyzed by the terms of we and others in comparison. The results showed that people think about; science has prior role on policies, science draw its strength from evidence-based manner, there is no other planet to live in, ignorance avoidable, science is an action rather than silence, alternative facts cannot replace its counterpart, peer-review is vital on progression as a whole. However, the slogans also included positivist view of science more often when it comes to epistemology of science and its corresponding understanding of reality in social and individual contexts.

**Keywords:** the march for science movement, discourse analytical approach, public understanding of science
SEARCH FOR GROUNDED EVIDENCE ON THE RELATIONSHIP BETWEEN PRESERVICE TEACHERS’ PERRY’S SCHEME AND THEIR IN-DEPTH UNDERSTANDING OF HEAT CONDUCTION AT THE MODEL LEVEL

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The main purpose of the present study was to represent science and non-science major preservice teachers’ mental models of heat conduction. In addition, the relationship between emerging mental models and Perry’s Scheme was also examined through in-depth interviews. All of the participants selected for the sample of the study had passed the course in which thermodynamics was taught in fundamental physics. The study adopted a grounded approach to discover patterns regarding heat conduction. A three-phase interview protocol, related artifacts, and drawings were used in data collection. Following the constant comparisons on the data, participants’ responses were split into refined groups in relation to Perry’ Scheme Positions as well as the agents and process analogies they used regarding heat conduction. Based on preliminary results, it was concluded that there were individual differences in the participants understanding of heat conduction. This result was such an evidence that supported diSessa’s (2008) knowledge-in-piece claim on the construction of the knowledge.

**Keywords:** heat conduction, perry’s scheme, multidimensional analysis
CONCEPTUALISATION OF FEEDBACK EXPERIENCES IN A FORMATIVE ASSESSMENT PROCESS

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Feedback has a powerful effect on the learning process. A feedback enables students to evaluate their own performance by means of some criteria and provide an explanation of how they should improve themselves. The purpose of the current study was to focus on preservice science teachers’ feedback process based on their real teaching experiences. We therefore aimed at understanding how preservice science teachers view the meaning, use and effectiveness of feedback. The data were collected from various sources including interviews, video-recorded performances, and reflective journals. The study adopted an inductive approach for data analysis. Through analyzing and interpreting the data, constant comparative methods were operated and discrepancies among coders about the emerging dimensions were discussed and resolved through consensus. Based on the preliminary results, several dimensions of feedback were emerged such as timelessness of feedback, unproductive nature of feedback and less prompt feedback. The results suggest that preservice science teachers feedback experiences that is socially-constructed in the learning groups were qualitatively different in terms of contextual factors.

Keywords: reflection, formative assessment, feedback
DESIGN CHANGE MANAGEMENT PROCESS FOLLOW-UP

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Today, with the rapid development of technology, the diversity of customer desires and requests is increasing. Companies are working to respond to these changes and requests. Defense industry is one of the sectors that are sensitive in this regard. It is very important that the changes are managed and implemented in a harmonious and correct manner. When these changes are made, communication should also be very careful. In the context of this study, a literature survey on process management and change management was conducted first. How to deal with process and change management in a company operating in the defense industry is then elaborated on the basis of the manufacturing process of a defense vehicle. First, it is determined which process the product was produced through. Based on this review, the process map for the product is drawn. Possible changes in processes to increase fertility have been studied. Processes and processes that do not add unnecessary and value added for the desired process improvement have been eliminated. Thus, it has been decided that performance and customer satisfaction can be increased. To capture a good level of customer service, business processes have been defined that reduce deviations from the delivery of work.

Keywords: technology, engineering
EXAMINATION OF EFFECT OF GENDER ON OCCUPATIONAL ACCIDENT

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Competition among companies is increasing with the development of the technology and changing market conditions. Companies in this competitive environment need to reduce their costs (direct and indirect cost) and increase their productivity. Companies that want to reduce their costs should also give priority to occupational health and safety. So that in Turkey, legislation studies and programs about occupational health and safety are tried to gain the awareness of occupational health and safety. Determining whether these studies are successful is only possible with statistical analyzes using past years' data. In Turkey, datas of work accident and occupational disease are published by Social Security Institution (SSI). In recent years, it has been seen that female employees take part in many sectors. In this study, in order to determine the effects of gender of occupational accidents, statistical analyzes were carried out in the sectors of Electrical Equipment Manufacture and Manufacture of Textile Products which female employees are more and most of the occupational accidents are experienced. After the analyzes, the relationship between the gender and living occupational accidents was determined and interpreted.

Keywords: human factors, technology
EXAMINATION OF STUDENTS' METACOGNITION WHILE THEY WERE SOLVING PHYSICS PROBLEMS

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Metacognition is thinking about thinking. Problem solving, on the other hand, is one of the most significant factors in the cognitive process. Since metacognition refers to higher-order mental process involved in using appropriate skills and strategies to solve a problem, learners’ metacognition ability allows them solving of problems successfully. The purpose of this study was to examine students’ metacognition using while they were solving physics problems. Both qualitative and quantitative methods were used to collect and analyze the data. Participants of the study were eleventh graders studying in an urban all-boys school. The Metacognition Awareness Inventory was used to determine the students’ metacognition. A taxonomy of cognitive-metacognitive problem-solving behaviors was used to code their verbalizations of their thinking and to examine their metacognition when they worked on the physics problems. The taxonomy includes the following six classifications under five categories: understanding, analysis, planning, exploration, implementation, and verification. Levels of the problems were application, analysis, synthesis and evaluation. Think-aloud protocol was used and the students were video recorded as they were solving the problems. The students’ written notes were used to compare with their thinking processes. The students having different metacognitive awareness performed diverse metacognitive process from each other while they were working on physics problems. Since improving students’ problem-solving skills continues to be a major goal of science education, the conclusion suggests that instruction based on metacognition can promote increased problem-solving skills in the classroom.

Keywords: metacognition, problem solving, physics, high school students
In order to have a STEM implemented class, teachers need to hold certain skills and knowledge so that they can integrate technology and engineering concepts into their classroom practices. Learning science through engineering is challenging. If pre-service teachers’ thinking about STEM is understood, more collective and instructional representation related to pre-service science teachers’ learning about STEM education can be obtained. Therefore, for effective integration it is helpful to understand how pre-service teachers conceptualize STEM education. The purposes of this research were to identify pre-service physics teachers’ STEM perspectives and to examine role of their perspectives in their STEM integration. Multiple case study design was implemented for this research. The participants were pre-service physics teachers enrolling in a state university. Pre-Service Teacher STEM Education Survey was used to determine the participants’ STEM perspectives. Their lesson plans were examined to understand how they made STEM integration. Interviews were conducted to comprehend the role of pre-service teachers’ perspectives in their integration. The participants’ STEM perspectives were categorized as nested, transdisciplinary, interconnected, sequential, overlapping, and siloed. Engineering design process and real-world problem could be seen obviously in the lesson plans of the participants having transdisciplinary perspective. However, the participants seeing STEM components as sequential could not reflect this process to their lesson plans and wrote open-ended physics questions instead. Some participants whose perspectives could be categorized as soiled could not write performance goals and concepts to be taught. Results can be valuable in constructing theoretical framework of STEM education in teacher education programs.

**Keywords:** stem, integration, perspective, pre-service teachers
HOW DO THE OBJECTIVES IN TURKISH SCIENCE CURRICULUM REFLECT THE ELEMENTS OF SCIENTIFIC LITERACY?

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This study aims to question the potential of the current Turkish science curriculum in terms of fostering students’ scientific literacy. The most current science curriculum was released in 2017 and Ministry of National Education (MoNE) has set the vision of science curriculum as promoting students with scientifically literate individuals since 2004. However, 2015 PISA results indicated that Turkey is the second from the bottom among 35 OECD countries in science literacy scores. This means that –among other factors- Turkish science curriculum could not achieve its purpose at the desired level yet. Considering this, we analyzed the objectives of the science curriculum from grades 5 to 8 to determine the emphasis given to the aspects of scientific literacy: the knowledge of science; the investigative nature of science; science as a way of knowing; interaction of science, technology, and society; and affective dimension of science. We used the revised version of the scientific literacy framework developed by Boujaoude (2002) by adding the fifth dimension: “affective dimension of science”. The analysis of the curriculum objectives revealed that the curriculum includes scientific literacy aspects in varying percentages. The last three aspects -science as a way of knowing; interaction of science, technology, and society; affective dimension of science- are not included in the curriculum sufficiently. The knowledge of science and the investigative nature of science have been emphasized more in the objectives. That is the knowledge of science is emphasized in the curriculum more rather than other aspects.

Keywords: scientific literacy, science curriculum, scientific literacy framework
TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE OF PRESERVICE SCIENCE AND ELEMENTARY TEACHERS

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The purpose of this study is to explore and compare preservice science and preservice elementary teachers' technological pedagogical content knowledge (TPACK). Teachers' knowledge of technology integration to their lessons has been gaining importance among researchers and educators. Around the globe, we are experiencing rapid developments in technology and this will surely gain momentum in the coming years. To catch up with such developments requires some knowledge of technology. In the field of education, teachers should also have that knowledge in addition to the knowledge of how to use technology effectively in their lessons. In light of this, we conducted this study to find out the extent to which preservice science and elementary teachers have TPACK. Moreover, we wonder whether discipline, grade level, and GPA have an impact on their TPACK. The sample included 209 preservice science and elementary teachers from grade 1 to 4. The data were collected with Technological Pedagogical Content Knowledge Instrument developed by Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009). The instrument was adapted into Turkish by Öztürk and Horzum (2011). The instrument has seven aspects: technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge, technological pedagogical content knowledge. We compared preservice science and elementary teachers regarding these aspects and we also examine if the years they spend in teacher education programs foster their TPACK. The results were discussed in terms of teacher education with implications for effective technology integration into lessons.

Keywords: technological pedagogical content knowledge, technology education, science education, tpack
IDENTIFYING MOST CENTRAL AUTHORS IN THE CO-AUTHORSHIP NETWORK OF TURKISH EDUCATIONAL RESEARCH SOCIETY

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Co-authorship networks consist of interactions between authors those have co-authored scientific papers. Since bibliographic data is available with time resolution, this type of complex networks are good resources for studying connectivity patterns in real networks. Centrality measures in network analysis are key indicators of identifying nodes of high importance for a specific network. In this study, we constructed a co-authorship network of Turkish educational society based on data retrieved from Web of Science Core Collection, for the available timespan of 1975 to 2017. The raw data retrieved from web interface consisting of 6963 papers indexed by the Core Collection is further processed to define links between authors. We identified top “most central” nodes (authors) of this network with respect to betweenness, closeness and eigenvector centrality measures, each defining a different aspect of “importance” of an author. We also presented basic network analysis results together with the author list with highest connectivities. The analysis indicates that the network consisting of 13621 authors and 20698 links is a highly modular and clustered one, while universal properties like being small-world and scale-free are also evident.

Keywords: co-authorship networks, scientific collaboration networks, complex networks, centrality, bibliographic analysis
A BIBLIOGRAPHIC COMPARISON BETWEEN WORLDWIDE AND TURKISH AUTHORED PUBLICATIONS IN EDUCATIONAL RESEARCH FIELD

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Bibliographic analysis in a specific field provide valuable information about the trend of scientific activity. Web of Science (WoS) is a very common global resource for highly reliable, integrated, multidisciplinary research together with citation metrics collected from various sources within a single interface. Retrieving data from WoS Core Collection for educational research field restricted to both Turkish and worldwide authored studies, we presented the evolution of scientific activity level in yearly resolution. Both yearly and cumulative counts are presented with bar graphs. The results conduct that cumulative count of worldwide publications display exponential growing trend for all timespan, while Turkish studies exhibit fluctuations with an invincible rise from 2007 to 2012. Another noteworthy output is that, before 2000s, Turkish educational society has almost no contributions to the Core Collection of WoS, which includes scholarly literature in the sciences, social sciences, arts, and humanities and proceedings of international conferences etc. This is mostly overcome by the recent increase in academic staff in Turkish universities, reaching a distinct productivity of 1029 articles in 2012, from 7 articles in 2000. Worldwide trend is also boosted after 2015, which corresponds to a slowdown regime for the Turkish authors.

Keywords: bibliographic analysis, educational research, data retrieval
DETERMINATION OF LIKING CHILDREN LEVELS OF CHILD DEVELOPMENT PROGRAM STUDENTS

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In this early childhood period, one of the most basic needs of children is to be loved. Because, a person who is a social being is born with the need of love and being loved. It is very important to meet children's like and being liked needs in the pre-school education institutions in early. The aim of this study is to determine the liking children levels of child development program students who will be employed at pre-school institutions and continue to the Child Development Program. In the 2017-2018 academic year, the students who attend first and second year in the Vocational School of Social Sciences of Kafkas University comprised of the research group. The sample group consisted of 77 students who agreed to participate in the scale. The "Barnett Liking Children Scale" was used as a data collection tool which was developed by Barnett & Sinisi (1990) to measure people's attitudes towards children and this scale was translated to Turkish language by Duyan & Gelbal (2008). According to the results of the research, the mean score of liking children scale in the Child Development Program students was calculated as 91,85. Significant differences were found between the level of liking children and fondly prefer of students (U=206,0; p<0,05) and income levels ($\chi^2=8,385$; p<0,05). When these results are taken into account, for the occupational groups related to children, it is important that providing guidance services before choosing the professions and take into consideration of children's liking or disliking.

Keywords: liking children, child development program, student, early childhood period
EVALUATION OF THE EMPATHIC TENDENCIES OF PRE LICENCE STUDENTS IN TERMS OF VARIOUS VARIABLES

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It is expected that the interpersonal relations of the teachers and preschool educators who serve as master trainers in pre-school education are good and have empathy ability. For this reason, this study was conducted in order to determine the empathic tendencies of the child development specialists who are a member of institutions serving in early childhood in the course of their education. The sample of the research was consisted by 77 students attending in the Child Development Program of Kafkas University Social Sciences Vocational School in the academic year of 2017-2018. Personal information form and "Empathic Tendency Scale" developed by Dökmen (1988) were used in this research. It was determined that 77.9% of the students who participated in the survey were in the age range of 18-20 years and the family income level of 48.1% was between 1001tl-2000tl. According to the data, the empathic tendency point average of the students participating in the study 64.94. When the graduated high school types were taken into consideration, it was determined that the empathic tendency levels of the students differ significantly in favor of the students graduated from the Girl Vocational High School (U=518,5; p<0,05). However, the empathic tendency levels of the students who are studying second class (U=473,0; p<0.05) with the students who fondly preferred the department were found to be significantly higher (U=214,0; p<0.05). According to the results of the research, students should be encouraged to prefer the professions they are able to do while directing to the profession.

**Keywords:** empathic tendency, child development program, pre-school education
AN ANALYSIS OF THE CONTEXTUAL TEACHING PRACTICES OF TEACHERS: THE TOPIC OF HEAT AND TEMPERATURE

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The study analyzes the classroom practices regarding contextual teaching, which is among the defining characteristics of the reform introduced in the curricula in Turkey. Programs based on an innovative learning perspective, introduced since 2004, were analyzed in numerous studies, with respect to their appropriateness in Turkey, and their actual implementation by the teachers. The studies reveal that the teachers had particular problems concerning the design and application of student-centric learning environments, among the wider context of classroom practices. It is common knowledge that contextual and experiential approaches to the teaching of concepts associated with daily life have positive effects on both the learning of the scientific and daily-life references of these concepts, and active participation on part of the students. Executed as a didactic transposition study, the present piece of research reviewed how the topic of heat and temperature is introduced and discussed in the classroom environments, and how teachers establish connections between the topic and daily life. For this purpose, the classes taught by two physics teachers were recorded for three weeks, using a semi-structured class observation form developed for the study. The preliminary analysis of the data reveals that the teachers do not establish connections with daily life when teaching the topic of heat and temperature, and do not take into account potential learning difficulties the students may suffer, such as association with alternative concepts or misconceptions.

Keywords: teaching practices heat and temperature
KNOWLEDGE LEVELS OF TEACHER CANDIDATES ABOUT LIVING BEINGS

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It has begun since the day that people have relationships with the living things on earth. Humans have benefited from plants and animals in their daily lives for protection, warming, defense, disease prevention, and from their strengths. Today, relationships with living things have increased even more for people, and the presence of living things has become more important, especially on the basis of plants and animals, and has been incorporated into school programs. The purpose of this study is to demonstrate to our students how much recognition of living things. As the first step of the research, prospective teachers were asked, "Write down 5 living creatures that you know?" And the answers were taken in writing. As a second step a 30-question survey was applied. The study was conducted with 421 teacher candidates. The answers to the questions asked as open-ended are listed and it has been determined that the creatures that teacher candidates repeat most often are animals. There is a significant difference between recognition of living beings between men and women. While women generally gave examples from plants, men gave examples from animals. According to the results obtained from the questionnaire, our teacher candidates have reached to the fact that their knowledge is very limited, they know that most of the vitality features of the creatures are found in the animals, and they do not know that they have the same properties in the plants. Based on the findings of this study teacher candidates seem to have misconceptions about plants and living things other than animals. As result it has been tried to develop appropriate proposals to remove the misconceptions.

Keywords: creatures, plants, animals, teacher candidates
EDUCATIONAL TECHNOLOGY IN CLASSROOM: A CROSS COUNTRY COMPARISON

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One of the best ways to develop education is through the use of technology. Economic development is realized when a country is dominated by intellectuals. Technology is one of the factors that boosts the education sector in the United States and in Turkey schools. The United States has incorporated iPad technology in the classroom while Turkey has embraced the Whiteboard technology, known as Interactive Whiteboard (IWB). The main functions of these two technologies are to improve collaboration inside and outside the classroom, provide opportunities for learners to be able to work and succeed at their own pace, prepare for future careers, and enhance student - teacher engagement. The United States and Turkey have been able to improve their performances, create instructional flexibility, and achieve resource efficiency through the use of Interactive WhiteBoard and iPad technology. The aim of this study is to compare advantages and disadvantages of the educational technologies used in the two countries and discuss people's point of view and use of technology. United States and Turkey have different technology infrastructure therefore people's attitude towards technology differs. This research highlights several discrepancies between the two countries and technologies. At the end of the study recommendations are summarized for education decision makers.

**Keywords:** educational technology, ipad, interactive whiteboard, comparison
SOCIAL MEDIA AS AN EDUCATIONAL TOOL

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With the high percentage of young people on social networks, where students feel at home, social media is no longer a trend, but part of everyday life and each year it becomes a greater part of education. It’s a way that students, teachers, administrators, and community members interact and exchange information with each other. Their experiences with technology, compared to those of teachers and administrators who possibly remember when the Internet came to fruition, are drastically different. This provides a very different understanding of the twenty-first century student as a digital native. Specifically, this study examined how schools and educators use social media, and whether being connected presents a better way to educate the twenty-first century learner. It investigated the level of parent and community engagement using social media and the students’ perceptions of social media use in their education. Limited research exists on how teachers and schools actually use social media to enhance education and communication with school stakeholders, i.e., teachers, parents, students, and administrators. This empirical study attempts to fill this research gap and make some useful recommendations in the light of statistical findings.

Keywords: social media, empirical study, student, teacher, parents
EXAMINATION OF PRESERVICE TEACHERS’ LEVELS OF UNDERSTANDING AND EVALUATION RELATED TO MODEL-EVIDENCE RELATED TO CLIMATE CHANGE

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In today's climate of increasing environmental problems, we do not discuss the impact of climate change, it affects all nature. For this reason, it is necessary for the individuals to make a critical evaluation together with an environmentalist point of view and propose solutions to the problems. In other words, individuals should be able to assess a given knowledge based on evidence and gain the ability to reach solution by establishing proper relationships. It is important to determine the level of knowledge and skills that teachers and preservice teachers possess to possess these skills. In this respect, the aim of this research is to determine the extent to which teachers of the future will have evidence-based assessment skills on climate change and how to assess the models presented. The research is in the form of qualitative research and the study group consists of 26 preservice teachers who study in the third-grade teacher of the science teacher department of a state university. The data collection tool used in the research was originally the original MEL diagram developed by Chinn and Buckland (2012) and prepared by Lombardi, Sibley and Carroll, (2013) in the form of the Climate Change Model-Evidence (MEL) Relationship Diagram. Rubric developed by Lombardi, Bickel, Brandt, Bickel and Burg (2016) was used as an evaluation tool. As a result of the analyzes made, it is shown that the preservice teachers usually do not critically evaluate the model-evidence relations, but often make descriptive or related evaluations when establishing these associations.

**Keywords:** climate change, preservice teacher, evidence-based learning
ONLINE EDUCATION FOR PEOPLE WITH DOWN SYNDROME UNDER FAMILY SUPERVISION

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Down syndrome, is a chromosomal condition where a person has one extra chromosome that caused by genetic disorder. It is obvious that, when people with disabilities are thought to have the right to be individuals who are accepted in the society, the particular support of special education is very important. Lack of knowledge and insufficient conditions for special education, the way how educational institutions think about downs syndrome and the very low level of awareness of the families about the situation make it difficult for special education to be permanent. This study will ensure that the families can get involved to the education process easily and will help families to dispose of lacking permanent education, which is the biggest absence at special education. In this study, web-based curriculum will be prepared according to the level of the person with Down syndrome. Firstly, the families will specify their children’s mental level by intelligence test at the education platform, where they are a member of. Then the person with Down syndrome, whose mental level is determined, will start their education according to their level at the education module. In every module, there will be specific learning outcome. Acquirements at language and speaking skills, fine and gross motor skills, concept knowledge, self-care ability will be taught gradually. The special educations, that the person with Down syndrome took, their education programs, intelligence level and educational environment will be examined and a detailed databank will be created by surveys.

Keywords: down syndrome
INFORMATION TECHNOLOGIES IN A MODERN SCHOOL

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Any educational institution chooses for itself valuable reference points of development. The result of the quality of education largely depends on what position the educational institution will take in relation to schoolchildren. For us, the development of a Specialized Boarding school-lyceum "Information technologies" is the development of our students, ensuring their success in life. To achieve these goals in the implementation of the educational program of the school-lyceum staff there was a need to study and implement modern pedagogical technologies and innovative forms of education. The school-lyceum carries out activity in the STEAM direction with training in three languages with profound studying of computer science, mathematics, physics and other disciplines of applied character. The concept of the boarding school incorporates the best international experience in the construction of an educational model for the creation of information and educational space, favorable for the harmonious formation and development of the individual capable of self-development, self-determination and self-realization in the modern information society. The article reveals the peculiarities of studying in a Specialized Boarding school-lyceum "Information technologies", the ultimate goal of which is the formation of the basic, social, profile competence of the student.

Keywords: education
THE USE OF MULTIMEDIA IN TEACHING BIOLOGY AND THE IMPACT ON STUDENTS' LEARNING OUTCOME

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In this 21st century of Information and Communication Technology, a motivating and captivating approach should be encouraged to help students better learn. The use of multimedia in education has proven its importance due to its positive impact on the teaching and learning process. The study investigated the effectiveness of using Multimedia on students learning outcomes in biology. 150 students were randomly selected from three secondary schools and were randomly divided into three groups. Pretest-posttest control group quasi experimental design was employed for the study. Two experimental groups (video mediated and non-video mediated) were taught with the help of multimedia presentations whereas the control group was treated traditionally. The treatment was given for a period of 10 weeks. Validated Attitude Towards Biology Scale (ATBS) was tested for reliability using Crombach alpha which stood at 0.76 and Biology Achievement Test (BAT) which was also validated was tested for reliability using Kuder Richardson (KR,20), yielded 0.89 were used as data collection instruments. The data collected were analyzed using descriptive and inferential statistics. The results indicated a statistically significant difference between students learning outcomes and modes of instruction. Students under Multimedia Aided Instructions had better outcomes than their colleagues in traditional teaching method. Therefore, it is recommended that Multimedia Assisted Instruction most especially the video mediated strategy should be used in the teaching of biology at secondary school to improve students’ learning outcomes in the subject.

Keywords: multimedia-assisted instruction, students' learning outcome, biology, secondary school
MEASURING BULLYING AMONG STUDENTS USING THE RANDOMIZED RESPONSE TECHNIQUE

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Due to its sensitive nature, bullying is difficult to study empirically. The prevalence and the frequency of bullying are difficult to estimate using standard survey techniques due to the tendency of respondents to hide information in such settings. This behavior is known as social desirability, that is, the desire to make a favorable impression on others, and poses a significant threat to the validity of self-reports. Since the 1960s a variety of questioning methods have been devised to ensure respondents' anonymity and to reduce the incidence of evasive answers and the over/underreporting of socially undesirable acts. These methods are generally known as indirect questioning techniques (IQT) and they obey the principle that no direct question is posed to survey participants. Therefore, their privacy is protected because the responses remain confidential to the respondents and, consequently, their true status remains uncertain and undisclosed to both the interviewer and the researcher. This paper describes a survey asking sensitive qualitative questions about bullying, conducted using one of the IQT, concretely, randomized response technique (RRT). This work tests the efficacy of RRT in establishing higher rates of truthful self-reporting when compared to traditional survey techniques.

Keywords: bullying, social desirability, indirect questioning techniques, randomized response techniques
IDENTIFYING THE FACTORS INFLUENCING THE SCIENTIFIC COMPETENCE IN ANDALUSIA: A MULTILEVEL STUDY OF THE PISA 2012 RESULTS.

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This work aims to investigate the factors that contribute to the performance of Andalusian students in the scientific competence aspect of the PISA 2012 tests. We have considered multilevel regression models that including variables referred to the students, to the schools, and to the students and schools jointly, thus generating 27 models. Multilevel analysis of the variables reveals that between 9.58% and 14.68% of the differences in the performance are due to characteristics of the schools and that most of the variance is explained by the characteristics of the students. The most significant variables with respect to scientific competence, in a negative sense, are grade repetition, immigrant status and female gender; in a positive sense, they are family and sociocultural background and pre-primary schooling. In the light of these results, we discuss implications for education policy actions. Additionally, this study shows the multilevel analysis model to be a very useful tool in education studies.

**Keywords:** education, pisa, multilevel regression, performance, scientific competence, andalusia
THE EFFICIENCY OF REFLECTIVE JOURNALS IN THE LIGHT OF PROSPECTIVE PRESCHOOL TEACHERS' OPINIONS

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Nur Akcanca
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Reflective journals, besides useful to follow an individual's development and enhancing learning through enhancing high-level thinking skills, are one of the best methods to assess teaching and learning. It is important to examine how prospective teachers consider this method's effectiveness. The aim of this study is to examine the opinions of prospective preschool teachers about the assessment of 'Science Education' courses through the use of reflective journals. The study's sample consisted of 42 prospective preschool teachers at a public university in Anatolia. The reflective journals were completed by these prospective preschool teachers at the end of the ten-week science courses. These reflective journals included sections about the positive and negative aspects of the course, the personal attainments of the participants from these courses, as well as implications and extra information they wished to add. The data was analyzed using explanatory and inferential codes. The results showed that participant prospective preschool teachers thought that such journals were effective instruments not only for self-evaluation but also the assessment of the course. In addition, they saw the reflective journals as contributing to the development of creative ideas and ensuring the repetition of the course. The journals can also help the students feel like their opinions matter because they are taken into consideration through these journals. The prospective preschool teachers also suggested that these journals be used especially for applied courses so as to reinforce learning and to enhance the communication between teachers and students.

Keywords: reflective journals, teacher education, prospective preschool teachers
TEACHERS' LEVEL OF FOLLOWING SCIENTIFIC RESEARCH

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Today, teacher competences are measured in terms of pedagogical content knowledge, content knowledge, general culture, and pedagogical technological content knowledge. For the teachers to maintain the dynamism of their content knowledge and pedagogical content knowledge, not to mention their general culture, they need to keep an eye on the scientific research in their field. This study aims to assess the level in which the teachers from various fields keep up with scientific research. This is a qualitative research and semi-structured interviews used to gather data. The study sample is composed of a total of 25 teachers (12 primary, 13 science teachers) from different schools. The sample is a randomized one, with participants from easily accessible schools in the region. The teachers were asked about their leisure activities, and their views on keeping up with scientific research. The interviews were completed in approximately 30 minutes, in a silent environment and the views of the teachers were noted. The data were grouped with reference to their similarities and differences and were presented in tables. The data revealed that the teachers were unable to keep up with scientific research, on the grounds that they do not have time. They also noted that they attend seminars whenever one is organized, and that they also access knowledge through academic journals and the internet. The teachers recommended the development of settings to foster their development outside the classes. Further recommendations to reinforce the cooperation between the schools and the university were also voiced.

Keywords: teacher, scientific research, teacher development
THE EFFECT OF STORYLINES EMBEDDED WITHIN CONTEXT BASED LEARNING APPROACH ON GRADE 10 STUDENTS' ACHIEVEMENT OF MIXTURES UNIT

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The purpose of the present study was to investigate the effect of the context-based learning approach on grade 10 students' achievement of the mixtures unit and attitudes towards chemistry. Within a quasi-experimental design, the study was conducted with 48 10th grade students drawn from two intact classes in a high school. One of classes was randomly assigned to experimental group and the other to control group. The experimental group was exposed to the context-based materials, while the control group was taught with the traditional approach (teacher's explanation, question and answer, writing, etc.). The teaching intervention which took a couple of classroom hours (2x45 minutes; 8 weeks) in the experimental group was designed to actively engage the students in the context-based learning. The Mixtures Unit Achievement Test (MUAT) and Chemistry Attitude Scale (CAS) were used to collect data. MUAT with ten open-ended items was constructed by the authors. The results of this study indicated that the use of storylines embedded within the context-based learning approach resulted in the students in the experimental group performing better with respect to understanding concepts in the mixtures unit. Some suggestions are made on implications for practice and learning.

**Keywords:** context-based learning approach, mixtures unit, attitude, chemistry
INVESTIGATION OF LEARNING STYLES OF PRIMARY SCHOOL STUDENTS IN TERMS OF GENDER AND CLASS LEVEL

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The influence of individual differences in the learning and teaching process leads the educators to investigate the characteristics of the learners to increase the quality of the education. The learning style characteristics of the students are guidance for the teacher in planning the teaching process. When the relevant literature is examined, it has been found that the studies about learning styles of primary school students are very limited, the studies were generally carried with secondary school and college students. In this study it is aimed to examine determining the dominant learning styles that primary school students preferred through the Kolb Learning styles and how these styles differ between gender and class levels. Descriptive method has been used in the study which is a quantitative research approach. The sample of the study consisted of 76 primary school students, 28 primary, 23 secondary and 25 tertiary students who were randomly selected from different primary schools in Trabzon. Kose II Learning Styles Inventory was used to collect the data. Frequency and percentage calculations were made for data analysis. The results showed that the elementary school students have mostly "diverger" style and least "converger" learning styles. There was no significant difference in the distribution of learning styles owned by sex. Students are informed about the learning styles they have. This information was found effective by the students.

Keywords: elementary school students, learning style, kolb
A STUDY ON THE RELATIONSHIP BETWEEN NOMOPHOBIA AND VIRTUAL ENVIRONMENT LONELINESS

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Developments in mobile communication technologies have led mobile phones to be rapidly adopted across the whole world. While mobility of smart phones offers obvious benefits in meeting individuals’ basic needs, it also brings some new problems. One of these problems is called nomophobia, which is defined as fear of being deprived of smart phones or mobile internet. The purpose of this study was to investigate the relationships between nomophobia and virtual environment loneliness of various participants (university students, employees and housewives). In addition, the study explored whether or not the participants’ nomophobia and virtual environment loneliness varied by their genders, professions and daily smart phone use durations. 352 individuals in total living in a large city in central Turkey participated in the study on a voluntary basis. The research data were collected using “Nomophobia Scale” and “Virtual Environment Loneliness Scale”. Descriptive analyses, correlation analysis, independent samples t test analysis and one-way variance analysis were used to analyze the data collected within the scope of this study, which was conducted in accordance with the procedures of relational survey model and causal-comparative research. According to the findings of the study, nomophobia of the participants was above average for the following three sub-dimensions; in not being able to access information, not being able to communicate and losing connectedness, but below average in giving up convenience sub-dimension. Virtual environment loneliness of the participants, on the other hand, was found to be above average the following two sub-dimensions in virtual socialization and virtual loneliness, but below average in virtual sharing sub-dimension. It was found that the participants’ nomophobia and virtual environment loneliness were positively and significantly correlated except for giving up convenience and virtual loneliness sub-dimensions. According to another finding of the study, female participants were generally found to be more nomophobic than male participants, but no significant difference was observed between female and male participants in virtual environment loneliness in terms of gender. In addition, it was found that in general students were more nomophobic and felt themselves lonelier in the virtual environment when compared with employees and housewives. Finally, it was found that as the duration of daily smart phone use increased, the participants became more nomophobic and felt lonelier in the virtual environment.

**Keywords:** nomophobia, virtual environment loneliness, smart phone

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The rapid development and diffusion of technology change the power balances and competition areas among the countries. Keeping up with such a transformation and to become an arbiter, countries strive to get benefit from latest technology in their institutions. Intensive efforts are made especially on the information and technology-oriented economy and growth. To become successful in this issue, we need to integrate technology in education to train skillful and entrepreneur citizens. Computer-assisted instruction (CAI) is one strategy for fulfilling this goal. CAI aims to provide students with effective and enriched educational experiences that can ideally serve their needs and interests. Computers are also used in mathematics education where analytic processes such as calculation, visualization, prediction and intuition, modeling and generalization are required. The potentials of CAI in mathematics education have been explored in research studies. Examination of these studies is important in order to follow rapidly changing computer applications and related research trends in this area. Therefore, using a content analysis, this study provides an overall evaluation of Turkish graduate thesis focusing on the use of CAI in mathematics education completed between 2005 and 2016. Eighty-three theses were recruited from the online database of Higher Education Council. They were carefully read and the necessary information was transferred to the Microsoft Excel using 4N1K literature review method. The information about each study was coded in terms of research problem, CAI application, main variables, research methods, sampling, data collection and analysis methods and results and then converted into frequency and percentage tables.

Keywords: mathematics education, computer-supported instruction, graduate thesis, content analysis
Continuously and rapidly evolving information and communication technologies continue to take place in all areas and at every moment of our lives. These developments are accompanied by new digital identity, citizenship and life. Smart devices and the social media platforms that are growing with the widespread of the internet also facilitate the transition of individuals to the digital life. While this digital world offers many advantages, it has some uncertainties and risks as well. Therefore, in order to cope with the challenges of living in the digital world and become a conscious and responsible digital citizen, it is necessary to have some technical, mental and social skills. According to the World Economic Forum, privacy management is one of the eight key digital life skills that children should have in the 21st century. The purpose of this study is to evaluate conceptual and research trends about this emerging concept of digital privacy. It was designed as a survey of previous research studies published in Turkish. Relevant studies were gathered through national and international journals, Higher Education Council’s online database of graduate dissertations and Google search engine. They were summarized by 4N1K literature review annotation method. The results revealed that the majority of the studies were conducted by university students, participants' perception of privacy in real life was transforming to the social media, there was an awareness of digital privacy but it was not fully implemented, and there were concerns about individual privacy due to constant surveillance in the digital world.

Keywords: digital citizenship, digital privacy, social media, literature review
THE IMPACTS OF GAMBLING ON SOCIAL LIFE AND ACADEMIC SUCCESS OF STUDENTS IN HIGHER EDUCATION

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The gambling phenomenon in Turkey has expanded to become a growing mainstream occurrence with ever increasing accessibility and acceptance among young people and adults. The majority of gamblers range from young adults to the elderly persons. Although gambling perceived as a dangerous habit in the society, current studies are lacking about the impact of gambling on academic achievement and social life. Due to the increasing rate of gambling, particularly online gambling, and the higher rate of disordered gambling on university campuses, higher education administrators may want to consider developing policies and procedures that consider these impacts, thereby addressing the challenges that they present. Therefore, the purpose of this quantitative survey design study was to investigate the impact of gambling activities on academic achievement and social life of higher education students. This research is a descriptive study (relational-screening model). The sampling universe of the study was chosen from students studying in higher education institutions in Turkey. The analysis of data showed that there is a negative and low-level relationship between the academic achievement of students and gambling addiction scores. Furthermore, there is a significant difference between the dependency scores of the students who had the hobby and the dependency scores of the students who did not have the hobby. According to the results of the analysis, it can be said that the gambling addiction is more in the individuals who do not have the hobby.

Keywords: online gambling, academic achievement, social life, higher education
INVESTIGATING HIGH SCHOOL STUDENTS' AWARENESS ON SAFE INTERNET USE

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Using Internet in the realm of education is beneficial for all students to expand their knowledge in many ways. Students can find explanations from different sources through the Internet to help them be successful in school. Students in high schools are encouraged to use the Internet to do their home works and projects. The Internet is a powerful resource for students, but it also presents opportunities for those who would attempt to do them harm. Therefore, Security awareness for students is essential for reducing the risks that could affect them. The number of student who uses the Internet in Turkey is increasing. Hence, it is vital to know how those students are aware of the safe use of the Internet. The purpose of the study is to explore high school students’ level of awareness in relation to the threats that students are exposed to when they are using the internet. A descriptive survey model was employed to examine an existing situation for the research. Result of data analysis showed that the high school students are aware of the danger of on the Internet. Furthermore, no significant difference was observed between male students and female students in terms of the safe Internet use.

Keywords: internet safety, safety awareness, internet, high school
IMPACT OF INTERNSHIP PROGRAMME ON ENGINEERING EDUCATION

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A common opinion suggests that a distinction is somehow developed between the competence of engineering graduates and elemental requirements of the industry. Consequently, many universities in various countries have adapted internship programmes or industrial placement for some of their degree programmes. This approach is also accepted and supported by many potential employers in different fields. Internships and placements are a kind of work experience obtained during the undergraduate years. Thanks to internship, the practical knowledge and understanding of students are greatly improved, especially in engineering education. It provides students with an opportunity to gain valuable working experience in their specific field and to enhance their prospects for future employment and engineering career before their graduation. This study is an attempt to evaluate the impact of such programmes on the basis of benefits and challenges. The evolution of internship programmes, alternative methods and basic principles are discussed. On the basis of the experience of Namik Kemal University, it is clear that this programme provides certain advantages for all sides but also many challenges. The students are introduced with the work life before graduation and has the chances of better preparation for the professional life. From the company point of view, they can make a very realistic assessment prior to the employment. The success of the programme depends on the level of co-operation and commitment displayed by internship students, partner companies and university academic staff. The involvement and commitment of students, support and capabilities of the factories outstands as important success criteria.

Keywords: internship programme, engineering, engineering education, training
CHALLENGES OF INTEGRATING WORK HEALTH AND SAFETY COURSES INTO ENGINEERING EDUCATION IN TURKISH UNIVERSITIES

İ. Feda Aral

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Work Safety and health is still a critical problem worldwide according to the ILO reports. It presents even more serious issue to be solved in regard of Turkey where the statistics of work accidents and number of victims are alarming. Turkey was too late to legislate the Work Safety Act in comparison with developed countries. Since June 2012, employment of work safety experts and periodical risk audits have been compulsory as a result of the enforcement of the Act No. 6331 on Occupational Health and Safety. Development of a decent safety culture throughout the working people and employers has been inevitable. This is more important in case of engineers and technicians. That is why the Turkish Higher Education Board made work safety classes compulsory for all engineering curriculum and other relevant technical programs. Increasing the awareness of potential hazards, failures and risks associated with relevant field of engineering or work-place has been a great opportunity through these courses. provision of a general awareness of risk issues for all engineers during their initial formation is a common practice in many developed countries. The purpose of this study is to address the benefits and challenges of this practice based on the experiences in Namik Kemal University. Future engineers, architects, technical staff and managers will all need to take account of WHS in aspects in their working lives. Benefits of embedding WHS in the programme of engineering undergraduate students are really significant but there also some challenges.

Keywords: work health and safety t, training, engineering education
WHAT DRIVES ONLINE KNOWLEDGE PRODUCTION? A TEXTUAL ANALYSIS OF WIKIPEDIA ARTICLES

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Learning and education have evolved from traditional classroom environments to online platforms with the help of web technologies. Wikipedia is among those platforms that contribute to the collaborative education by relying on its users for the creation of knowledge. Having adopted a psychological perspective, in this study we aim to understand the content-related motivations of Wikipedia editors and how these motivations are related to the article production. We used a dataset of 63,289 articles extracted from the society portal of the English Wikipedia. The dataset contained lead sections of Wikipedia articles and article measures including the full article length in characters, numbers of sections, links, and images. Lead sections were analyzed via two sentiment analyzers to identify positive and negative content as well as content in relation to psychological constructs. The identified content characteristics were related to the article metric which was created combining the article measures via factor analysis. Results suggest that positive and negative content were both positively correlated to the article metric. Furthermore, a closer examination found that particularly psychological drive states (topics of achievement, reward, risk, affiliation, and power) were the best predictors of article production, accounting for 10% of the variance in the created article metric. Our findings suggest that positive and negative content as well as content that includes drives (i.e., particular psychological challenges) could be relevant motivators of Wikipedia article production. We further discuss the use of Wikipedia data to gain insights on collaborative informal education and to improve the technology-enhanced learning.

Keywords: technology learning, online learning, knowledge production, wikipedia, sentiment analysis
AN INVESTIGATION OF PRESERVICE MATHEMATICS TEACHERS' TRANSLATION ABILITIES

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Abstract Functions are regarded as one of the most important mathematics topics from elementary mathematics curriculum and beyond, and a flexible use of multiple representations indicates a deeper understanding of the function concept (NCTM, 2000). The main objective of this study is to investigate how preservice teachers translate between graphical, symbolic, tabular and model representations embedded in function context. The study was conducted in 24 senior year mathematics teacher enrolling in mathematics education faculty from a public university in İstanbul in the first semester of 2016-2017 academic year before they were taught multiple representation in method courses. For assessing preservice teachers’ translation skills, researchers developed a questionnaire consisting 12 items that each of them represents a pair of translation mode (e.g. from graphical representation to model representation). In this study, findings demonstrated preservice teacher’ limited translation abilities among different mode of representations across three criteria with regard to (1) total achievement score (2) total translation score and (3) total model translation score. According to findings, no participant preservice teacher could get enough score to become high achiever with respect to all three criteria; total achievement, total translation and total model translation score. 23 preservice teachers out of 24 could achieve to get middle achievement score whereas no one could manage to have high achievement score. Two preservice teachers who gained high score with respect to translation and model translation performance demonstrated relatively better understanding on multiple representations comparing with peers in this study. These results may indicate importance of addressing multiple representations in functions during preservice teacher education.

Keywords: multiple representation, preservice teachers, mathematics education
INVESTIGATION METHODS FOR A FAMILY OF CUBIC DYNAMIC SYSTEMS

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A broad family of differential dynamic systems is considered on a real plane of their phase variables $x, y$. The main common feature of systems under consideration is the follows: every particular system includes two equations with polynomial right parts of the third order in one equation and of the second order in another one. These polynomials are mutually reciprocal in the following understanding: their decomposition into forms of lower order does not contain common multipliers. The whole family of such dynamic systems has been split into subfamilies according to numbers of different multipliers in the abovementioned decomposition and depending on an order of sequence of different roots of polynomials. Every subfamily has been studied in a Poincare circle using especially developed investigation methods. As a result, all possible for the dynamic systems belonging to this family phase portraits have been revealed and described. There appeared to exist more than 200 different topological types of phase portraits in a Poincare circle. The obtained results have a scientific interest as well as a methodical and educational one.

Keywords: dynamic systems, differential equations, poincare circle, phase portraits
THE ROLE OF COGNITIVE CONFLICT IN DISCUSSIONS ABOUT SCIENTIFIC TOPICS

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Cognitive conflict is a central feature, both of general psychology and in the process of knowledge construction and exchange. The goal of the submission, paper, and presentation is to make plain this relationship utilizing three types of data. First is an outline of how the most discussed science papers and topics are both controversial and about important topics that cause cognitive conflict (e.g., disease, extinction, vaccines and autism). After laying out the ‘anecdotal’ evidence, we move toward a statistical analysis, utilizing text analysis tools LIWC, Sentistrength, and Hu and Liu (2012) to analyze tweets about scientific papers, to show that when papers and topics are more discussed, they also contain more controversial terms and that the most discussed topics are also significantly more controversial than the rest. Two other studies to be presented will show evidence that, in general, there are more negative keywords in scientific discussions, and that these negative keywords (e.g., disease, fear, stress) are discussed more often than their positive or neutral counterparts. These results demonstrate, utilizing large scale data and computational methods, that cognitive conflict plays an important role, not just in our wider discussion about science, but also in the topics that scientists and people in general are interested in learning more about. Most important to remember are the basic notions that when people disagree, that indicates that there is room to learn more, and that people will think and discuss more about things that bother or stress them, in general.

Keywords: knowledge creation, knowledge exchange, everyday learning, cognitive conflict, online data, text analysis, sentiment analysis, debate, hypothesis testing
FUZZY LOGIC APPLICATIONS IN THE FIELD OF EDUCATION

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Today, artificial intelligence techniques are used in many different fields. Thus, it is aimed to make intelligent systems equipped with specific qualities of human intelligence and able to think like human beings. Fuzzy Logic is one of the artificial intelligence techniques that is used in various fields such as economics, health and engineering. Fuzzy logic is a flexible calculation method. Unlike classical logic, it gives approximate results instead of exact results. In particular, the uncertainties experienced in problem solving and decision-making processes can be made clear by fuzzy logic. Thus, difficult and complex problems can be solved. Fuzzy logic approach, which is used in many areas, has started to be used in education field in recent years. In this study, fuzzy logic and usage areas are given and fuzzy logic studies done in the field of education are examined. In order to give ideas to researchers for future work, examples of studies on the applications of fuzzy logic in the field of education are given. Researchers generally investigated the effect of the fuzzy logic approach on performance evaluation and academic achievement. In these studies, the positive results of using fuzzy logic in the field of education are mentioned.

**Keywords:** education, fuzzy logic
DETERMINATION OF ATTITUDES OF ENGINEERING STUDENTS TOWARDS MOBILE LEARNING

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Along with evolving technology, the way of technology usage and habits of individuals have changed. Mobile technologies have a very important role in this change. With the spread of mobile technology, individuals are freed from the obligation of sitting at the computer. They have come to be able to meet their technological needs while on the move. These developments, which cause change in every aspect of life, have also changed the way in which individuals acquire and learn information. Now, individuals want to access and learn quickly and easily. It is thought that mobile technologies that provide learning opportunities independent of time and space can meet this need. For this reason, it is important to create mobile learning environments that will always provide learning in anytime and anywhere. In addition, individuals' positive attitudes toward mobile learning have great prospects for effective and efficient learning. The purpose of this study is to determine the attitudes of students in engineering faculty to mobile learning and to examine various variables. It is thought that the results obtained in the study are important for the mobile learning researches to be carried out with undergraduate students.

Keywords: education, engineering, mobile learning, attitude
IMPORTANCE AND LEGAL BASIS OF SEAFARERS SIMULATOR TRAINING

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Training of Seafarers has both national and international binding laws. Therefore, the all of the seafarer training centers, universities, colleges or high-schools should obey the regulations. Simulator-based training regulations have been well defined in the international convention on Standards of Training, Certification and Watch keeping (STCW) for Seafarers in 1978 and modified in 1995 by International Maritime Organization (IMO). There are various kinds of simulator trainings such as full mission Engine Room Simulator (ERS) trainings, Ship Handling Simulator Training, Cargo Handling Simulator Training etc. The related course for this study is Engine Room Simulator. The Engine Room Simulator training is defined and elaborately explained as International Maritime Organization model course 2.07 in Standards of Training, Certification and Watch keeping. In this paper we introduced an Engine Room Simulator and discussed its requirements regarding with the national and international regulations. Furthermore, we mentioned about effective utilization of it for training of seafarers.

**Keywords:** engine room simulator, IMO model course, marine engineering, stcw
LONG-TERM SEA TRAINING PROBLEM IN TURKEY

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Almost 90% of the world’s trade is carried by maritime transportation which is the cheapest way of moving goods. The training of people working in this sector has great importance in order to have a good maritime trade fleet. In recent years, Turkey has made significant developments in the maritime sector. Besides, a number of new maritime colleges opened in order to increase the number of educated seafarers. The new colleges result in very much increase in the number of maritime students. Turkey is in the second rank in the world in number of seafarers after China. The increase in the number of students results in the problem of not being able to find company for the long-term sea training. The factors such as the inexperience of the students in the sector, lack of adequate company knowledge and decision of what type of ship they want to work also contribute to this problem. In this study, the number of new maritime colleges, the number of students, and the number of ships in the Turkish fleet are examined to see the sufficiency of Turkish merchant fleet for long-term training of these students. The insufficiency of the Turkish merchant fleet is seen and some solutions to this problem are proposed for a better sea training environment.

Keywords: maritime education, long-term sea training, maritime colleges, Turkish merchant fleet
INVESTIGATION OF TEACHERS THOUGHTS ON SOCIOMATEMICAL NORMS

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In the class, Teachers and students constitute a social structure. Individuals who make up social work learn something through mutual interaction. In this learning environment, non-written rules that contribute to the mathematical development of students are described as sociomathematical norms. The aim of this research is to be able to reveal the perceptions and beliefs of teachers about sociomathematical norms. For this purpose, five different class scenarios were prepared and teachers were asked to interpret these scenarios and teachers were asked to comment on these scenarios. In this study, a mixed research model was used in which quantitative and qualitative methods were used together. The research was conducted on elementary, junior high and high school teachers in Konya with 21, 18 and 22 persons respectively. Parametric (Levene test) test was applied on the results. The group variances were found to be homogeneous (Levene statistic: 0,621; p = 0,541> 0,05). Based on this finding, ANOVA test was applied to primary, secondary and high school teacher groups as assumed that an independent variable and there was no significant difference between them (F = 1,096; p = 0,341> 0,05). Therefore, teachers' norm perception did not change according to the grade levels they were teaching. In addition, teachers also think that sociomathematical norms are applicable to higher grade achievement levels.

Keywords: in-class interaction, sociomathematical norms, norm consciousness
EXAMINATION OF UNIVERSITY STUDENTS’ MATHEMATICS-ORIENTED EPISTEMOLOGICAL BELIEFS AND ATTITUDES TOWARDS MATHEMATICS

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In this study, university students’ mathematics-oriented epistemological beliefs and their attitudes toward mathematics were determined and the relationships among mathematics-oriented epistemological beliefs, mathematics attitudes and mathematics achievements were examined. In addition, it has been investigated whether the university students’ mathematics-oriented epistemological beliefs and their attitudes towards mathematics changed according to gender and grade level. The study was a relational survey and participated in 191 university students studying in the Department of Mechanical Engineering at a university in Konya. The research data were collected through "Mathematics-oriented Epistemological Belief Scale" and "Attitude towards Mathematics Scale". The data obtained were analyzed by descriptive statistics, correlation analysis, independent sample t-test analysis and one-way ANOVA. As a result of the research, Mathematics-oriented Epistemological Beliefs of the students were above average in the belief that learning depends on effort sub-dimension, but below average for the following two sub-dimensions; in the belief that learning depends on ability and the belief that there is only one truth. University students’ attitudes towards mathematics were above the average. In addition, there is a positive significant correlation between the mathematics achievement of college students and attitudes towards mathematics and the belief that learning depends on effort. Although there is a positive significant correlation between attitudes towards mathematics and the belief that learning depends on effort, there is a negative correlation between attitudes towards mathematics and the belief that learning depends on ability. Lastly, university students' mathematics-oriented epistemological beliefs and their attitudes towards mathematics did not change according to the gender and grade level.

Keywords: attitudes towards mathematics, mathematics-oriented epistemological beliefs, mathematics achievement.
QUALITY MATTER IN DISTANCE LEARNING AND E-LEARNING MATERIALS

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Quality matter with the explosion of the distance learning worldwide become a crucial concept that should be considered carefully to provide effective and sufficient learning. This research focuses on the quality matter in distance learning and e-learning materials. The learning quality in distance learning has varied dimensions involving different areas and disciples. Actually, it is a kind of interdisciplinary study and collaborative work. Each aspect of the quality in distance learning can be separated to different parts. Instructional and visual design, technology using in distance learning and in e-learning materials, effective interaction, using some scientific and innovative approach, measuring learners’ satisfaction and review the current circumstances on distance learning in order to make changes on it can be major concepts. In brief, the qualified distance learning has to be compatible with learners needs and meets human psychological learning requirements. Instructional research, science of learning and interactivity contributes to distance learning and it has to meet certain standards for distance learning.

Keywords: quality of distance learning, e-learning materials
ENGINEERING EDUCATION PROBLEMS AND SOLUTION SUGGESTIONS

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Engineering is to apply scientific and mathematical principles with technology for the benefit of mankind. The engineer must have certain theoretical and practical knowledge to be able to do his work, while the fundamental of theoretical knowledge is directly related to the knowledge of science and mathematics. Turkey’s PISA score is far below the OECD average, ÖSYS results confirms this fact. ABET criteria and OSYS scores were examined and the reasons for the failure of students who settled in some engineering faculties were examined. In 2015, YÖK has initiated the practice of "restricting according to success" in engineering programs. In this study, it was concluded that the achievement rates of the students for the basic courses were compared with the OSYS success rank by taking the department as an example and it was inadequate to limit it according to success rank. In 2015, The Higher Education Council has started "The Application of The Restriction in Rank of Success in Programs for the Professional Execution". In this study, by taking NKU ÇMF, Department of Electronics and Telecommunication Engineering as an example, the success rate of the students for the basic courses are compared with the success rank of these students in the OSYS and it is concluded that the current method is not adequate for achieving the desired outcomes.

Keywords: engineering education, higher education
AN INVESTIGATION OF THE PRESERVICE SCIENCE TEACHERS' SCIENCE FICTION STORY WRITING EXPERIENCES AND IT'S EFFECT ON THEIR SCIENTIFIC CREATIVITIES

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Science fiction stories are based on science and fiction and require us to use our imagination to show how the developing science and technology will affect the world we live in. Scientific fiction writers use creativity and imagination in their stories to try to show the benefits and threats that science and technology can create. In this research, preservice science teachers' experiences of science fiction stories and its effects on their scientific creativity was examined. In this study, science fiction stories writing process was applied. While the written stories were evaluated according to science fiction story writing criteria, the effect of story writing process on preservice science teachers' scientific creativity was investigated. The research group of this study was 55 preservice science teachers who were studying in the Science Education Department in Educational Faculty. The study took six weeks and the students worked 2 hours a week in groups of 5-6 students to write the science fiction stories. Scientific Creativity Questionnaire was applied to the preservice science teachers which developed by Hu and Adey (2002). Written short scientific stories were evaluated with rubrics containing scientific stories writing criteria. At the end of the writing process, open-ended question form was used for evaluating preservice science teachers' opinions about writing short science fiction stories. 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, science fiction stories, scientific creativity
TEACHING THE UNIT 6 IN ACADEMIC PROGRAM OF SCIENCE AND TECHNOLOGY ON 8\textsuperscript{TH} GRADE “MATTER CYCLES, RECYCLE AND ENERGY SOURCES” AND THEIR EFFECT ON STUDENTS’ ENVIRONMENTAL CONSCIOUSNESS (AN IZMIR CITY CASE STUDY)

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In this study, the impact of the particular subject, which is covered as the sixth chapter in Science and Technology course of the eighth grade, “Matter Cycles, Recycle and Energy Resources” on students' environmental awareness was investigated. At the same time, the effectiveness of the studies which are practiced in the schools in line with the relevant achievements determined by the Ministry of National Education is examined. The survey method was used. The sample contains eight grade students (n=1600) from eighteen schools in İzmir. The data were collected by applying the "Environmental Awareness Scale" developed by the researcher. Data analysis is made by using SPSS 15:00 Data Analysis Package Programme. According to the results, the environmental awareness state of the students is turned out to be close to high. It is found that the students are successful on recycling and water saving, but they are dubious about how economical biofuels, acid rains, sun and wind energy are. It is found that female students’ environmental awareness is more than male students’ and the awareness level has been different as their schools’ change. It is understood that the children of high-income level families have a higher level of environmental awareness than the others. It is found that the education levels of the parents are significantly affecting the level of environmental awareness of the students. Finally, it has been concluded that when the students’ academic success level goes up, their environmental awareness level goes up.

Keywords: environment, environmental awareness, matter cycles, recycle, energy resources, primary education.
EXPLORING THE SOURCES OF TURKISH HIGH SCHOOL STUDENTS CHEMISTRY LABORATORY SELF-EFFICACY BELIEFS AND MOTIVATIONS

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Self-efficacy is a belief of individuals about their abilities to successfully complete an action. Self-efficacy is defined as the judgments of individuals about themselves on how successful they will be in dealing with difficult situations they may encounter. Self-efficacy beliefs are related to individual judgments about how well the necessary actions can be performed to handle possible situations. These beliefs affect the choice of activities an individual wants to do, the level of the efforts and the performance. Learners with strong self-efficacy beliefs aim at new tasks, show stability in these tasks and achieve ultimate success. This kind of learners’ trust in their abilities when they confront with problems and motivate themselves. Motivation is necessary for individuals to act as cognitively. Therefore, it is very important for teachers knowing in advance of their students' motivation degree and self-efficacy beliefs. In this research it is aimed that the analysis of the relation between self-efficacy beliefs and motivation variables which are highly effective on learning. For numerical analysis we studied 652 high school students in Turkey. The data is collected with chemistry laboratory self-efficacy beliefs scale and chemistry motivation scale. The correlation between the variables are examined using Structural Equation Modeling (SEM). With this study we conclude that there is a positive and significant correlation between chemistry laboratory self-efficacy beliefs and chemistry motivation. This result can be interpreted that the person with high chemistry laboratory self-efficacy has high chemistry motivation.

**Keywords:** structural equation modeling, multivariate analysis
EVALUATION OF EDUCATION LEVEL OF TURKISH PROVINCES IN 1925 USING DATA ENVELOPMENT ANALYSIS

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The main principles of education and training are set out in Turkey after the government passed republic in 1923. In 1924, the unity was established in educational institutions by the enactment of the Tevhid-i Tedrisat. In 1927, it was passed mixed education and in 1928 Latin alphabet is accepted. In this process, the administrators took great care to distribute education services to the provinces and districts. Whether these efforts have yielded positive results were discussed in society. In this study we try to examine education level in 1925 by using new statistical approaches. Data envelopment analysis (DEA) is an approach for identifying best practices of peer decision making units (DMUs), in the presence of multiple inputs and outputs. In this study, Data Envelopment Analysis is used to measure relative efficiencies of education level of Turkish provinces in 1925. The data is collected from Turkey Prime Ministry Republic Archivea. Input and output criterias are determined for all provinces in 1925 and evaluated using DEA models.

Keywords: data envelopment analysis, efficiency, 1925-1926 semester
EFFECT OF TECHNOLOGY ASSISTED MICRO TEACHING PRACTICES ON THE PERCEPTION OF TECHNOLOGY USAGE OF SOCIAL STUDIES TEACHER CANDIDATES

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In the last decade, traditional programs applied in teacher education in the light of rapidly developing technological developments are no longer able to provide all necessary qualifications needed by the candidate teachers in meeting the 21st century community demands during the teaching process. In this respect, it is necessary to increase the related equipment and awareness of the students while they are teacher candidates in the period of teacher training which is in teaching profession and preparation. This work; The purpose of this study was to investigate the effect of technology assisted micro-teaching practices on the perceptions of social studies teacher candidates on technology usage. Qualitative research techniques were utilized in the research. The study group of the study consisted of 4th grade social studies teacher candidates (n = 45). The data were obtained using the semi-structured interview form. The data were interpreted with descriptive analysis technique. They found that knowledge about selecting or preparing technological tools for the use of intelligent boarding and lecture presentation was the most increased in the direction of findings from the research. As a result of technology-assisted micro-teaching practices, it has been seen that teacher candidates perceive themselves adequately for the use of technology and there is a slight increase in their perceptions after their implementation. In the light of the emerging conclusions, proposals are presented such that the courses containing these applications which contribute to the field of technology use in the classroom should be given more place in the teaching of social studies.

Keywords: micro-teaching, technology, social studies teacher candidates
IMPACT OF TEACHER CANDIDATES ON EFFECTIVE USE OF INFORMATION BY IDENTIFYING WEB PAGES PREPARED FOR SOCIAL STUDIES

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The goal of contemporary education is; is to train people who produce knowledge, who use knowledge, who have acquired continuous learning habits and who have the knowledge of creative nature. Today, the rapid development of computer and internet technology is the end result, it is inevitable to utilize these technologies in the field of education. Through web pages located in the internet world, individuals contribute to the development of research skills, critical thinking skills by sharing their works and ideas. This study was carried out in order to determine the effect of social studies teacher candidates on the ability to use the technology effectively by preparing a web page. This study was conducted using qualitative research techniques. The study group of the study was conducted with 20 students in total, with 5 teacher candidates for each grade level. The data were collected with these semi-structured interview forms. It was determined that prospective teachers used web pages effectively, obtained information by using search engines, learned application programs and got a critical view on technology in the obtained data. On the basis of the results obtained, suggestions such as the necessity of using web technologies in all courses have been made.

Keywords: social studies, teacher candidates, technology, web
EXAMINING THE IN-SERVICE NEEDS OF SOCIAL STUDIES TEACHERS IN THE FIELD OF TEACHING TECHNOLOGY

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This study was conducted in order to determine what social studies teachers in secondary schools need to learn in in-service training activities and what they need in educational technology. This research was carried out by 14 social studies teachers (6 female - 8 male) who participated in in-service training activities in the Gaziantep Provincial Nizip District. This study was conducted with semi-structured interview technique from qualitative research methods. According to the findings obtained in the research, it was determined that the trainers who took part in these activities were not at the level of sufficient expertise. Nevertheless, they pointed out that these activities are scarce and not perfectly suitable. Some of the participants stated that they combine knowledge and technology through these technology trainings. The recent in-service courses say that those who are related to technology are usually under the title of the conqueror project. The use of technology in education has led to the conclusion that in-service courses are very useful for effective use of instructional materials. On the basis of these results, suggestions have been made that necessity analysis should be done before the in-service courses are made.

Keywords: social studies teachers, in-service training
THE ROLE OF ASEI-PDSI IN ATTAINING ACADEMIC EXCELLENCE THROUGH PROPER ATTITUDINAL CHANGE IN MATHEMATICS TEACHERS

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This paper, the role of ASEI- PDSI in attaining academic excellence through proper attitudinal change in Mathematics teachers, is necessitated because of the observed poor performance of students in Mathematics due to the teacher-centred methodology prevalent among primary and secondary school teachers in Nigeria. ASEI- PDSI is an acronym in which, A stands for activity, S for student-centred, E for experiments, I for improvisation, P for plan, D for do, S for see and I for improve. Teachers play a vital role in ensuring success and quality of education in any society. ASEI- PDSI teaching approach, which is both student-based and activity-based, is proposed as a solution to this problem. Its principles and practices were examined, and the gains in countries where it has been successfully applied outlined. These include: teacher attitudinal change, student-centred lesson plan, logical presentation of contents, concretizing Mathematics teaching, among others. It is recommended that all stakeholders in the education industry in Nigeria should embrace ASEI- PDSI to ensure improvement in Mathematics teaching and learning in order to reap the benefits of its teaching.

Keywords: mathematics, asei-pdsi, excellence, teachers, attitudinal
THE RELATION BETWEEN THE INFORMATION LITERACY SKILLS OF PRE-SERVICE TEACHERS AND THEIR EVALUATION OF THE TRUSTWORTHINESS OF INFORMATION SOURCES

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Güllem Muşlu Kaygısız
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Elif Benzer
Marmara University

The aim of this study is to examine whether there is a relation between the information literacy skills of pre-service science teachers and their evaluation of the trustworthiness of texts obtained from different online information sources about nuclear energy, which is a socioscientific subject. The study is in relational screening model. Within the scope of the study, Information Literacy Scale developed by Adiguzel (2011) and Trustworthiness Questionnaire developed by Braten, Stromso, ve Salmeron (2011) and adapted to Turkish language by Saylan (2014) are applied to 186 pre-service teachers getting education at science teaching program at Kocaeli University (KOU) in 2017-2018 educational year. SPSS 13.0 is used for data analysis. Findings shows that pre-service science teachers have high skill level in information literacy subject, information literacy scores do not show meaningful difference according to their gender and class levels, they find text obtained from online magazine less trustworthy, while text obtained from online book is found more trustworthy, there is no meaningful difference between scores regarding the trustworthiness of texts obtained from online information sources according to their genders and class level, they give their decision about the trustworthiness of texts mostly according to the content of the text and their own opinion, they pay least regard to publishers of texts and type of text when deciding about the trustworthiness, there is no meaningful difference between the scores regarding the criteria for determining the trustworthiness of texts according to their genders and class levels, they find the text obtained from an online newspaper very easily understandable, while text obtained from an online interview is found more difficult to understand, there is a low level and positively relation between their information literacy skill levels and their evaluation of the trustworthiness of online different information sources.

Keywords: information literacy levels, trustworthiness on information sources, socioscientific subjects, nuclear energy, pre-service teachers
THE EFFECT OF A COOPERATIVE LEARNING MODEL OF TEACHING THE CONCEPT OF THE WORLD, SUN AND MOON

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The aim of this research is to examine the effects of the concepts of sun, earth and moon with the cooperative learning model on the success of preschool children. The sample of the research is composed of children who continue to two different branches of the primary school of Agri Central Selahaddin Eyyubi Primary School in the fall semester of 2015-2016 academic year. The study group consisted of children aged 60-72 months. A total of 38 children, including 20 in the experimental group in which the cooperative learning model was applied and 18 in the control group in which the traditional method was applied, were carried out. Each child was interviewed before starting the practice and they were asked to draw a picture of the research topic and play dough before and after the application. The application lasted 3 hours, 1 hour per week. The application subjects include the concepts of shape, color, size, motion as well as moon and solar eclipse events. At the end of the study, interviews were made with the children in both groups and it was determined that the correct and logical answers given to the questions in the group in which the cooperative learning model was applied were higher than the control group. As a result of the interview, it was determined that the cooperative teaching model is appropriate and effective for the children to develop their sense of responsibility, to be more active and respectful in their communication with each other.

Keywords: pre-school, world, sun, moon, science education
The transition from high school to college can be a daunting challenge for many first semester students. Statistics have shown a high failure rate in introductory Math courses, calculus one in particular. The Center for Learning excellence (CLE) was created in 2012 to assist students at Al Akhawayn University in Ifrane with that transition by offering tutoring and mentoring services. This paper will emphasize on how assessment of tutoring services is conducted. The first part of the paper will discuss the effect of tutoring in general on students’ grades. Statistics gathered for the past five years will be presented. The second part will focus on comparing various tutoring strategies that have been adopted by the CLE, namely, group tutoring versus private tutoring. A comparison between those two strategies from a statistical point of view will be shown. Finally, the challenges faced by the CLE when it comes to tutoring will be discussed.

**Keywords:** private tutoring, group tutoring, assessment of tutoring, developmental education
USING COMPUTER FOR DEVELOPING ARITHMETICAL SKILLS OF STUDENTS WITH MATHEMATICS LEARNING DIFFICULTIES

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The aim of the study is to investigate the effects of using computer for developing arithmetical skills of students with mathematics learning difficulty (MLD). The study was carried out with pre-test–post-test single subject research design. The participants of the study consist of a girl and two boys who attend 3rd grade at elementary school. The contents of the computer-aided instruction materials consist of counting skills, place value and addition subjects which are related to 1st and 2nd grade mathematics course learning outcomes of primary school. The materials have been prepared in the light of educational neuroscience findings about mathematical cognition. Participants were given a total of 75 lessons of individual instruction for five weeks, every day on weekdays and 20-30 minutes a day with the materials developed. Achievement tests developed by the researcher were used as data collection tools. Test response times and correct answers of the participants were identified in the achievement tests. It was found that progress was achieved in counting skills and place value concepts and they could solve addition problems. However, it was revealed that the difficulties of students at the second-grade level continued with addition, especially when the numbers were given side-by-side. It can be stated that computer assisted instruction used in this study developed students’ arithmetical skills and increased their speed. Triple code and the models which help reduce the workload of working memory are advised to be used in the instruction of the students having MLD.

Keywords: dysscalculia, computer assisted instruction materials, educational neuroscience, arithmetical skills, mathematical cognition
MATH ANXIETY IN STUDENTS WITH AND WITHOUT MATH LEARNING DIFFICULTIES

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Mathematics anxiety refers to feelings of tension or worry that interfere with mathematical performance in daily life and school settings. The question of whether math anxiety leads to poor mathematics success or poor mathematics achievement leads to math anxiety is not yet fully answered. But the devastating effect of math anxiety on math success is known. The purpose of this study is to determine the dimensions of the relationship between mathematics anxiety and mathematics achievement of elementary school third grade students according to mathematics achievement levels. Data were collected from 288 elementary school students using math anxiety scale and math achievement test. According the mathematics achievement test scores, the students were divided into four groups: math learning difficulties (0-10%), low successful (11-25%), normal (26-95%) and high (96-100%) successful. The relation level was found -597 between students’ math anxiety and math achievement. There was no significant difference between the mean scores of the mathematics anxiety of the lower two groups as it was between the upper two groups. This indicates that the math anxiety level of students with math learning difficulties doesn't differs from the low math students'. However, a significant difference was found between the mean scores of math anxiety points of the normal group and the low successful group.

Keywords: mathematics learning difficulties, mathematics anxiety, primary mathematics education
INVESTIGATION OF THE RELATIONSHIPS AMONG THE TEACHERS' TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK) LEVELS, STUDENTS' SELF-EFFICACY AND ACADEMIC ACHIEVEMENT

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The aim of this study is to determine the level of teachers’ technological pedagogical content knowledge (TPACK) and to analyze the relationships among the level of TPACK of teachers, and students’ self-efficacies and academic achievements. Besides, it was researched that whether the TPACK levels of the teachers varied according to gender, teaching experience and academic programs. This study, which was conducted with the relational survey model, was conducted on 78 teachers teaching Science and Technology, Mathematics, Turkish Language, Social Studies and English Language in three different middle schools and 1597 students attending to the courses of these teachers. The research data were collected in three stages. Firstly, “Technological Pedagogical Content Knowledge Scale” was used to obtain data on teachers’ TPACK. Secondly, “Children Self-efficacy Scale” was implemented to the students who attended the courses of the teachers and participated in the study. Thirdly and finally, to determine the academic achievement scores, at the end of the first semester, students’ final grades of Science and Technology, Mathematics, Turkish Language, Social Studies and English Language courses were taken from the school administrators. Descriptive statistics, independent samples t-test analysis, one-way ANOVA analysis and multiple linear regression analysis were used to analyze the data collected from the scales. According to the results, it was seen that teachers’ level of content knowledge (CK) and pedagogical content knowledge (PCK) is “good”, technological knowledge (TK), pedagogical knowledge (PK), technological pedagogical knowledge (TPK), technological content knowledge (TCK) and technological pedagogical content knowledge (TPACK) is “average”. When TPACK level of the teachers from different programs and self-efficacies of students including their academic and social self-efficacies increase, the academic achievement of students in concerned courses also increases. On the other hand, when emotional self-efficacy of students increases, the academic achievement of students in concerned courses decreases. Finally, when gender and programs are considered, TPK levels of teachers were not changed. When year of teaching experience is considered, it was clear that the teachers, who have less teaching experience, showed higher TK, PK, TPK, TCK and TPCK levels forming TPCK than the teachers having more experience.

Keywords: technological pedagogical content knowledge, student self-efficacy, academic achievement
DESCRIPTIVE ANALYSIS OF DIAGRAMMATIC REPRESENTATIONS OF TURKISH MIDDLE SCHOOL SCIENCE TEXTBOOKS

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The aim of this study is to examine diagrammatic representations in middle school science textbooks based on diagrammatic typology to find out a general picture of how diagrammatic representations used in science textbooks over fifteen years. Textbooks are an important role in education as primary teaching and learning source. The sample consist of total number of twelve 6th, 7th and 8th grade science textbooks from 2002 to 2017 in Turkey. Textbooks analyzed based on content analysis method. Systematic coding and categorizing of diagrams, photos, charts, graphs, drawings and tables analyzed based on Hegarty, Carpenter and Just’s (1991) typology and Khine and Liu's coding scheme. Diagrams coded as Graphical Types including iconic, schematic, charts and graphs, and augmented reality; Gender Representation, Indexing, Captioning and Quality. Finding of the study showed that schematic representations is preferred compared to iconic and charts and graphs. Male representation is highly dominant in all grades of middle school science textbooks.

**Keywords:** science education, content analysis, textbooks, diagrammatic representation
CONTENT ANALYSIS OF SCIENCE TEXT BOOKS’ EVALUATION QUESTIONS BASED ON PHYSICS, CHEMISTRY, BIOLOGY, ENVIRONMENT AND ASTRONOMY SUBJECT AREA BY BLOOM’S TAXONOMY

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The aim of this study is to determine the distribution of the units in the 6th, 7th and 8th grade science textbooks according to the contents of Biology, Physics, Chemistry, Environment and Astronomy learning domains and analyze the evaluation questions in these units according to Bloom’s Taxonomy. The 6th, 7th and 8th grade science textbooks prepared in the framework of 1926, 1948, 1974, 1992, 2000, 2004 and 2013 science programs constitute the sample of this work. Questions to be considered in the study were evaluated independently by two field experts and the results were compared. As a result of the analyzes, it was determined that physics, biology, chemistry, environmental units were mainly included in every program but the number of astronomy units was less and only included in 6th and 7th grades’ science textbooks. According to the Bloom’s Taxonomy, when the questions are evaluated, it is determined that the questions in the Synthesis and Evaluation levels are insufficient and the questions in the Knowledge and Understanding levels are excessive. Based on the subject area, biology units’ evaluation questions in 1948 program, the physics units’ evaluation questions in 2013 program, the Astronomy units’ evaluation questions in 1926 program and chemistry units’ evaluation questions in 2000 program are prepared at the upper level based on Bloom’s taxonomy.

Keywords: science, bloom’s taxonomy
PROOF OF THE DERIVATIVE PRODUCT RULE WITH DYNAMIC MATHEMATICS SOFTWARE

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The calculus concepts and applications are very difficult for university students. Especially, proofs in calculus are more abstract for them. Therefore, they have difficulties in understanding calculus proofs. To overcome these difficulties, dynamic mathematics software can be used when the proofs are constructed in the learning environment. The dynamic mathematics software GeoGebra offers conceptual learning and collaborative reasoning environment in calculus course. When it is recognized that university students have difficulties about visualizations of the derivative relations and proofs, it is important to focus on this context. Proof of the derivative product rule is identified as one of the difficult concepts in calculus course. In this regard, the purpose of this study is to visualize proof of the derivative product rule in the dynamic learning environment. Accordingly, dynamic materials about product rule are designed and these materials are introduced to university students. They construct visual proof of the derivative product rule with the help of GeoGebra. It is observed that they can understand the role of limit idea in the process of construction of proof. It can be stated that these dynamic constructions contribute to investigate the proof of the derivative product rule.

Keywords: proof, derivative product rule, dynamic mathematics software
USING STRING ART TO INVESTIGATE SEQUENCES IN THE DYNAMIC LEARNING ENVIRONMENT

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Sequences are one of the fundamental concepts in calculus and are used to construct basic calculus concepts. But undergraduate students have difficulty in using or interpreting sequences. Especially, they cannot visualize and conceptualize the concepts. Visualization of the sequences can enable students to conceptualize the subject. At this point, string art can be used to provide motivational, productive, and interesting learning environment. Dynamic mathematics software GeoGebra can provide such opportunities to create string art by using sequences of points. Therefore, they can make connections between string art and sequences with GeoGebra in the dynamic learning environment. When it is considered that undergraduate students have negative feelings about calculus concepts and they have both low motivation and low achievement in calculus courses, string art with GeoGebra can be used for investigating sequences in the dynamic learning environment. In this context, the purpose of this study is to investigate sequences with string art in the dynamic learning environment. Accordingly, examples of string art about sequences are constructed with dynamic mathematics software GeoGebra and these materials are presented to undergraduate students. It is believed that string art with GeoGebra contributes to design dynamic, motivating, and interesting learning environments for learning calculus concepts such as sequences.

Keywords: string art, sequences, dynamic mathematics software
THE INVESTIGATION OF THE USE OF FORMATIVE FEEDBACK WITH ICT IN MATHEMATICS CLASSROOM

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It is well known that mathematical concepts are very difficult for students to understand conceptually. As students feel uneasy with algebraic and geometric representations of basic mathematical concepts, they should construct these representations in class activities based on formative feedback. However, teachers' using feedback to enhance learning has many difficulties in point of time, complexity or other factors. With the development of information and communication technology (ICT) tools and resources, the formative feedback can be supported with these tools to overcome these impediments. In this process, it is considered that formative feedback plays an important role to construct mathematical concepts. In this regard, the purpose of this study is to present a framework to use formative feedback with ICT in mathematics classroom. In this respect, this framework is based on Shute's study on formative feedback. Presenting this framework with ICT in this study contributes to mathematics teachers to reflect advantages of formative feedback in mathematics classroom. In addition, the role of ICT in formative feedback is discussed in terms of guidelines to enhance learning, timing issues and learner characteristics as stated in Shute's study on formative feedback. It is considered that this study may help mathematics teachers to give formative feedback frequently and instantly. In addition, an example is presented in detail to show how mathematics teachers use ICT to give formative feedback in mathematics classroom.

Keywords: formative feedback, ict, formative assessment, mathematics classroom
IMPROVING CRITICAL THINKING GROWTH FOR DISADVANTAGED GROUPS WITHIN ELEMENTARY SCHOOL SCIENCE: A RANDOMIZED CONTROLLED TRIAL USING THE SCIENCE WRITING HEURISTIC APPROACH

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In a cluster-randomized study, we investigate the impact of an argument-based approach to teaching science in elementary school on science learning and critical thinking skills. Forty-eight schools participated in the study, with data on 9,963 students across the two years of the intervention. Annual standardized tests assessing science content knowledge were used to evaluate the effect of the intervention on science using a hierarchical linear model. To assess critical thinking abilities, scores for the Cornell Critical Thinking (CCT) instrument were assessed for the 2,353 students in 5th grade using a multilevel model. While no statistically significant gains were found for science content, there was statistically significant evidence that the intervention was associated with an improvement in critical thinking scores (p<0.05, ES=0.167). The results from the multilevel model show that the Science Writing Heuristic approach had a significant effect on the improvement in critical thinking scores from the beginning of the school year pretest until the school year-end posttest. In particular, the strongest gains were for Individualized Education Program, Free and Reduced Lunch, and English Language Learner students. This is important because these students generally struggle to engage in science instruction. These results reflect the growth in critical thinking across a year compared to their counterparts in the traditional instructional classrooms. Given that the results ignore any impact from teachers in the development of students’ critical thinking abilities, this finding suggests that simply implementing the SWH approach can be effective in improving critical thinking skills for all students.

**Keywords:** randomized controlled trial, science learning, improvements in critical thinking, argument-based instruction, multilevel modeling, elementary science education
CLASSROOM TEACHERS PREFERENCES FOR FUNCTION REPRESENTATIONS

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Mathematics is a universal language and has its own representations (symbols, images, shapes, graphics etc.). For this reason, the skill of expressing knowledge and thoughts by using mathematical representations (such as concrete models, illustrations, graphics, and tables) becomes vital to learn mathematics. Therefore, it is very important that, starting from primary school, students know different representations of a concept and switch a representation to another one. Function concept which has many representations form (such as algebraic, table and graphic) is known to have an important place in mathematics. Based on these consideration, the main objective of this research is to reveal how students behave when they switch algebraic representation of function to graphical one, and vice-versa. For this purpose, Semiotic Representation Theory (Duval, 1993) has been fixed as theoretical framework. Founded by Raymond Duval, this theory is originated from the idea that mathematic concepts or relations cannot be comprehended directly and cannot be perceived in real life, since they are abstract (Duval, 1993, 2000). 5 open-ended questions including graphical <-> algebraic transformation of quadratic functions, are administered to 56 prospective classroom teachers studying at Primary Programme in a Faculty of Education. Results of the study showed that although it depends on the nature of the problem, candidate teachers faced several problems during switching from algebraic to graphical representations (and vice-versa) and relatively small number of the candidate-teachers benefited from verbal expression.

Keywords: function, representation, classroom pre-service-teachers
Knowledge of students, which consists of teachers’ knowledge about students’ misconception, prior knowledge, and their difficulties in a topic, constitute a key element of Pedagogical Content Knowledge that a teacher should possess. The concept of function is the most important subject of mathematics since it forms the basis of continuity, derivative and other many concepts. For this reason, teachers need to be able to predict misconceptions and difficulties of their students about functions concepts and correct them. Based on these consideration, this study aims to determine the competences of mathematics teachers to predict their students’ difficulties in functions concept. For this purpose, firstly the difficulties of high school students about functions were determined with the aid of a questionnaire consisting of open-ended questions and then the ability of teacher candidates to predict these difficulties was determined by means interviews. As a result, it has been determined that high school students have difficulties related to the definition and types of functions, interpretation of graphics, and inverse of function and teacher candidates have not been able to predict some of these difficulties.

**Keywords:** function, difficulty, teacher candidates, knowledge of students
A DESIGN OF ANDROID BASED MOBILE APPLICATION FOR DETERMINATION OF LEARNING STYLE

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In this study, an android based mobile application is designed for determining learning styles of individuals. Easy, rapid and efficient learning is very important for each individual that affects their success in business and daily life. As long as lifelong learning continues, the importance of recognizing the individuals learning abilities becomes more important. The aim of this study is to make individuals be aware of their abilities on the way of easy learning by using the proposed mobile application which can be executed on Android based mobile devices. As the technology evolves, the usage of mobile devices has become inevitable. Most of the individuals use smart phones for many different aims such as communication, entertainment and learning. Hence commonly usage of mobile devices makes the proposed system more practical. By simply downloading the proposed application to the mobile device, individuals will be able to run the program. The proposed system is designed and developed by using Java Android Programming.

Keywords: learning style, mobile application
A DESIGN OF MOBILE APPLICATION FOR STUDENTS WITH DYSCALCULIA

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In this study, a mobile application is designed for the students with dyscalculia which a learning disability is including all types of mathematical problems. Students with dyscalculia have problems in understanding the meaning of numbers, mathematical terms and applying mathematical principles in solving problems. In this study, we designed a mobile application which includes lessons about four arithmetical operations namely addition, subtraction, multiplication and division for such students to make learning these mathematical subjects more easy and practical. It is clear that if basic mathematics subjects are not understood clearly, students with dyscalculia will have difficulty in understanding more advanced mathematical applications. As the evolvements in mobile technologies occur, the usage of mobile devices increases day by day. Especially for school age children, it is thought that using mobile applications in teaching will be more effective and enjoyable. With this aim, a mobile application which includes user friendly interfaces is designed to teach students with dyscalculia subjects namely addition, subtraction, multiplication and division without making them getting bored.

Keywords: dyscalculia, mobile application
THE VIEWS OF SECONDARY SCHOOL STUDENTS ON A STEM EDUCATION PROJECT THAT THEY PARTICIPATED

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The aim of this study is to determine secondary students views on a Project which is titled “STEM Education Project”. The Project was created in collaboration with Gebze Technical University and Cayirova District National Education Directorate. 22 students participated to the Project who study in 11 different secondary schools located in Cayirova district. The education lasted four weeks during first period of 2017-2018 educational year and within the scope of this project students were trained within STEM Education applications and activities. The courses were given by academicians who work at Gebze Technical University and by a STEM expert who Works at Cayirova District National Education Directorate. The study was conducted as a qualitative study and five questions were asked to the students to understand impact of the Project for themselves. It has been understood that all students had positive views on the Project.

Keywords: stem education, qualitative, project
THE METAPHORS OF BULGARIAN AND TURKISH EIGHTH GRADE STUDENTS’ ON STEM CONCEPTS

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It is seen that STEM approach has an important role in education systems to prepare students towards 21st century skills. The aim of this study is to investigate what metaphors both Bulgarian and Turkish students have within STEM disciplines. The study was conducted with 30 eighth grade students, who study both in Bulgarian and Turkish schools, 2017 spring education year. For this purpose, a survey was developed, that has validity and consisted from two parts. First part has students’ background features within socio-economic and socio-cultural issues. In second part, it was asked students to respond their metaphors of STEM’s disciplines. Second parts started with “Science looks like ................because........................”. The same structure was also applied to other STEM disciplines. In the study, a qualitative method was benefited, within this context the study was conducted as a case study. It was seen that Bulgarian and Turkish students have different STEM disciplines’ metaphors.

Keywords: metaphor, stem, science
STUDENT OPINIONS ON WEB 2.0 TOOLS IN EDUCATIONAL ENVIRONMENTS

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Web 2.0 was first introduced by O'Reilly Media in 2004 and describes a second-generation web-based service, in other words, a system in which Internet users share and create. Web 2.0 technologies based on the participation of users are created with the contributions of users and their contents are improved through the cooperation and sharing between users. This sharing and business association provides interaction and content dynamism among people. Web 2.0 tools allow users to comment and share ideas in this way. Technologies and social software tools based on Web 2.0 (Web 2.0 applications) are: Social networking sites, blogs, wikis, RSS feeds, instant messaging (chat), podcasts and videocasts etc... One of the most important web 2.0 tools mentioned is blogs. The blog term is derived from the WebLog word, which is a combination of Web and Log words. Blogs are usually web-based publications where various articles are archived and their comments are sorted. Blogs are also a great tool for marketing products and services as well as for sharing information and establishing various links. The purpose of this research is to get the views of the associated students related to the use of blogs in education from web 2.0 tools. The research was carried out during a semester with students at a state university that continues its education and training activities in Anatolia. In the study, case study was used from qualitative research methods. The data of the research was collected by the semi-structured interview form developed by the researchers. The collected data were then analyzed using the content analysis method.

**Keywords:** web 2.0 tools, blog
Three-dimensional printers (3D Printer) are technological tools that can make objects in the digital environment hand-holdable by using various raw materials such as plastic, metal, clay. 3D printers have a number of features, such as time and cost savings, simplification of backup, rapid prototyping, security and privacy, geometric freedom and eco-friendliness. 3D printers, widely used in many areas such as architecture, medicine, industry, are being used more and more widely in education field. Especially with the STEM education, which is considered as the most important educational movement of the last decade, it has increased its importance even more. STEM education is an approach that enables the integration of disciplines of science, technology, engineering and mathematics, which takes the student center, cooperative learning, and the pre-program. The aim of this research is to introduce three-dimensional printers and three-dimensional printing technologies, to determine the relation with education, to examine the usage areas in our country and to explain its place and importance in STEM education.

Keywords: stem, 3d printer
INVESTIGATION OF STEM EDUCATION POLICIES IN COUNTRIES

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STEM is an innovative educational approach consisting of science, technology, engineering and mathematics. STEM education has been described by many researchers as one of the most striking educational movements in recent years. Stem emphasizing the three main titles (problem solving, innovation and design) that have an important place in the agenda of the countries, STEM has a strategic pre-emption so that the countries can have an international rekord vocabulary. The aim of this research is to examine the educational systems of the countries and to present the studies on STEM education. In this context, the education system, strategies and reforms of many countries, especially the G20 countries, are dealt with. The results of the study show that a large number of countries consider STEM as an educational priority. It has been seen that many countries allocate large budgets for scientists and engineers that they will need in the coming years and follow appropriate strategies and policies. The results of the research also reveal that China and India will be in a better position to STEM in the following years than in many other countries.

Keywords: stem, stem education policies
EXAMINING LONG TIME IMPLEMENTATION LEVELS OF ARGUMENT BASED INQUIRY TEACHERS

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The purpose of this study was to provide overall teachers' implementation trends of argument-based classrooms with the traditional classrooms in order to see differences in more than one unit and four semesters whether teachers kept using argumentation by concentrating on particularly argumentation or went back to traditional type of teaching. For this, a quasi-experimental design was used to show the differences between the argument-based teaching and the traditional ones. 44 teachers' classes, 25 from argument based and 19 from traditional classes, were examined based on the discourse analysis. A designed rubric was used to analyze the videos of the classes. The findings showed that the implementation levels in four semesters varied. The first semester of implementation was better than the rest of three semesters. The overall trend of the implementation levels was in a travers pattern. Even though teachers from argumentation classes did not went back to traditional type of teaching, they did not show completely high implementation level of the discourse analyzes. This implicated that having steady and high implementation results needed more pedagogical orientation and instructions.

Keywords: argument-based inquiry, discourse analysis
THE EFFECT OF THE SCIENCE WRITING HEURISTIC APPROACH ON 4TH GRADE STUDENTS' MULTIMODAL REPRESENTATION COMPETENCY

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One of the teaching approaches that may encourage multimodal competency development is the Science Writing Heuristic (SWH) approach. The Science Writing Heuristic approach is an immersive argument-based inquiry approach in which students benefit from writing to learn activities with argument-based inquiry. The purpose of this study was to examine the effect of the Science Writing Heuristic Approach on 4th grade students' multimodal representation competency. A quasi experimental method was used to compare the students in the SWH classes with the students in the non-SWH classes. Students' writing samples classes were analyzed with a designed rubric to measure the multimodal competency. The findings showed that the students in the SWH classes showed better results than the non SWH ones. Results of this study suggest benefit from engagement in an argument-based learning environment for multimodal competency. Further exploration aimed at clarifying the most effective methods for helping students develop better multimodal competency, and ultimately conceptual benefit from creating multimodal products is needed.

**Keywords:** multimodal representations, writing to learn, argument-based inquiry
EVALUATION OF THE USABILITY OF ONLINE SOCIAL EDUCATION PLATFORMS: COMPARISON OF WEB AND MOBILE AVAILABILITY STANDARDS

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The purpose of this research is to examine the web usability and usability standards that mobile and desktop platforms have set individually by experts in assessing the usability of educational websites, as well as what limitations and differences they have when evaluating websites on mobile and desktop platforms. For this purpose, an in-depth literature review was conducted using the keywords related to the subject and content analysis has been made. The literature review consists of 40 articles in which 20 of the English and the rest is Turkish. The examined articles were obtained from the National Thesis Center, ProQuest, and EBSCO databases. The study shows that the effectiveness of training websites developed on mobile and desktop platforms is to maintain usability standards at the highest level of efficiency and user satisfaction on mobile and desktop platforms, and whether these standards differ between platforms and if it differs what kind of differences will occur in the end. The "review" model was used as a descriptive study type which is a qualitative research method in the research.

Keywords: usability, usability evaluation dimensions, mobile usability, web usability, educational software
EXAMINING DISTANCE EDUCATION STUDENTS’ COGNITIVE FLEXIBILITY LEVELS IN TERMS OF VARIOUS VARIABLES

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Cognitive flexibility is an individual’s ability to adapt to an unexpected circumstance and find appropriate and different solutions to this newly emerged circumstance. The “Cognitive” part of this term refers to recollection of information from memory and reconstruction of this information during the process of acquiring new information. The “Flexibility” part of the term refers to the student’s ability to use this information in various situations in a flexible manner. In other words, first an individual transforms an information that she already has into a flexible condition, then she transfers this information from different routes and forms the new information. To be able to have students acquire cognitive structures that are flexible in cognitive processes, one needs a flexible learning environment. Distance education provides a flexible environment to students and in distance education students are responsible for their learning. These properties of distance education, help students have cognitive flexibility. Distance education is a type of education in which learner and teacher have long distance between them and learning is independent of time and place. In this context, the purpose of the researcher is to examine distance education students’ cognitive flexibility levels in terms of various variables and determine the circumstances that indicate difference in terms of their level of cognitive flexibility. The data is collected from distance education students of a foundation university in Turkey via a scale of cognitive flexibility and demographic questions. Acquired data will be analyzed using appropriate statistical methods and presented.

**Keywords:** cognitive flexibility, distance education
INVESTIGATION OF TEACHERS' MATHEMATICAL LITERACY AND PROBLEM POSING SELF-EFFICACY BELIEFS

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The aim of this research is to determine whether mathematics teachers' mathematical literacy and problem posing self-efficacy beliefs differ statistically by gender, type of faculty graduated, professional experience, recent graduation status, and type of school they work in. Moreover, mathematics teachers' mathematical literacy self-efficacy beliefs had been investigated as a significant predictor of problem posing self-efficacy beliefs. The research was a descriptive study and conducted with a survey model. The study group of the research consisted of 174 secondary and high school mathematics teachers working on two separate cities. As a means of data collection in research; a personal information form prepared by researchers, a mathematics literacy self-efficacy scale which was developed by Ozgen and Bindak (2008), and a scale which was developed by Kilic and Incikabi (2013) for teachers' self-efficacy beliefs related to problem posing were used. For the analysis of the data, SPSS package program was used. Mann Whitney U-Test, Kruskal Wallis H-Test and simple regression analysis were used to analyze the data obtained in the research. According to the findings obtained from this study, it was concluded that teachers' mathematical literacy self-efficacy beliefs did not show any significant difference according to gender, type of graduated faculty, professional experience and recent graduation status. However, the type of school mathematics teachers' work with has resulted in a significant effect on mathematical literacy self-efficacy beliefs. It was concluded that the problem posing self-efficacy beliefs of mathematics teachers did not show any significant difference according to gender, graduated faculty type, professional experience and recent graduation status variables. However, the type of school mathematics teachers' work with resulted in a significant effect on the problem posing self-efficacy beliefs of mathematics teachers. High school mathematics teachers were found to have higher mathematics literacy and problem posing self-efficacy beliefs than mathematics teachers in secondary school. In addition, mathematics teachers' mathematical literacy self-efficacy beliefs were found to be a significant predictor of problem posing self-efficacy beliefs.

Keywords: mathematical literacy, mathematics teachers, problem posing, self-efficacy beliefs
INVESTIGATION OF MIDDLE SCHOOL STUDENTS' ATTITUDES TOWARDS USING SMART BOARDS ACCORDING TO SOME VARIABLES IN MATHEMATICS COURSES

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Ali Tum
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It is known that Maths classes turn into a horrible dream for the most of the students due to its abstract content. This situation affects the interests, attitudes and the love of the students in a negative way. Therefore, a meaningful learning can be performed and the success occurs when the abstract content is embodied. To achieve this, smart boards that are included in the education technologies can be used. One of the essential conditions to be able to use this education technology effectively in the class and to provide success is to what extent students internalize it. For this reason, the aim of this research was to investigate the middle school students' attitudes towards using smart boards in mathematics courses. This research was conducted with survey methods. The samples of the research consisted of total 220 5th and 6th grade students. As data collection tools, Personal information form and Attitude Scale towards Smart Boards were used. The statistical software was used to analyze the data, using Mann Whitney u-test, Kruskal Wallis test and regression analysis. In this study, it was determined that middle school students' attitudes towards using smart boards were positive and students' attitudes was significant differed in terms of gender, grade level, mathematics achievement level, information technology achievement level and their academic standings level. In addition, it was found that mathematics course, information technology course and their general academic scores were predictors of attitude towards smart board use at low-level.

Keywords: achievement, attitude, mathematics, middle school students, smart boards
IS MATHEMATICS CONSIDERED A SCIENCE? PERCEPTIONS OF MATHEMATICS TEACHER CANDIDATES ON SCIENCE AND MATHEMATICS

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Whether mathematics that we use in many fields from our daily life to scientific and technological disciplines is science or not is a controversial issue. In this study, it was focused on the mathematics teacher candidates' perceptions on science, mathematics and relation between them. Qualitative methodology was taken as a basis in determination of study group and data collection resources. The study group of the research was consisted by 38 (20 male, 18 female) mathematics teacher candidates were studying at the faculty of education of a state university. The Scientific-Mathematical Perception Form (SMPF), composed of seven open-ended questions, was developed by researchers to collect the data of the study. The data gathered in the study were examined by content analysis technique. When the research findings considered it was observed that an important part of candidates expressed the scientific method as one single hierarchical way. Also, it was observed that they considered mathematical knowledge production process as problem solving and proof process and, an important part of them regarded mathematics as a scientific discipline and, some of them regarded it as a discipline which aid to science.

Keywords: mathematics teacher candidates, science and mathematics, nature of science, nature of mathematics
THE PRE-SERVICE SCIENCE TEACHERS' ARGUMENTS ABOUT A SOCIO-SCIENTIFIC ISSUE -NUCLEAR ENERGY-

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Volkan Varol  
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The purpose of this study is to examine the pre-service science teachers' arguments about a socio-scientific issue - nuclear energy - that they created based on Toulmin's argumentation pattern. The study group of the research consisted of 34 (27 female, 7 male) junior pre-service science teachers enrolled in science education program in a state university. Accordance with the purpose of the study, a 3-step training module was implemented at the beginning of the study to ensure participating teacher candidates comprehend Toulmin's argumentation pattern. After the module completed, participants were asked to create an argument text about “nuclear energy” in accordance with Toulmin's argumentation pattern. Then the content of the texts produced by participants were analyzed by considering the elements of Toulmin’s pattern. The analysis of the texts revealed that majority of the participants (n=23) used opposing claims and others (n=11) used supporting claims about “nuclear energy”. Among the supporting claims, participants used statements mostly related to “economy”. On the other hand, opposing claims were consisted of statements that were related mostly to “environment” and “human being”. In addition, the result of the analysis revealed that teacher candidates supporting the use of nuclear energy used rebuttal statements similar to data and warrant statements used by opposing teacher candidates. In the same way, teacher candidates opposing the use of nuclear energy used rebuttal statements similar to data and warrant statements used by supporting teacher candidates. Also, almost all of the teacher candidates used strong qualifiers such as "absolutely" in their statements.

Keywords: argumentation, pre-service science teachers, toulmin's argumentation pattern
VIEWS OF THE TEACHERS ON STEM EDUCATION AFTER ATTENDING STEM EDUCATION WORKSHOPS WITHIN THE STEM&MAKERS FEST/EXPO

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The concept of STEM, at the top of the agenda of education close to the end of the twentieth century, has become very popular in the first quarter of the twenty first century. Such popularity paves the way to the organizations of education programs, seminars, exhibitions and workshops on STEM education. In Turkey, STEM education expositions are organised in various cities under the name of STEM&Maker Fest/Expo, celebrated like a festival. One of those has been organized in December, 2017 in Konya Science Centre (Konya Bilim Merkezi). The aim of this study is to analyse the views of Science teachers, who attended STEM&Makers Festival, on STEM education. The attenders of the study are 5 volunteer Science teachers who attended the aforementioned Festival in Konya. The data of the study is collected through interview technique. The interview technique as a qualitative research method has been used as data collection tool within the study. The collected data has been analysed by descriptive analysis and content analysis method. The research result shows that the Science teachers who attended the STEM&Makers Festival have gained positive perspective on STEM education. It can be suggested that activities like festivals on STEM education may be diversified and arranged continually to increase the interest on STEM education.

Keywords: stem education, stem&maker, stem expo
INVESTIGATION OF PROBLEM SOLVING BEHAVIORS OF MATHEMATICS TEACHER CANDIDATES

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One of the important goals of contemporary education is to educate people who are able to solve the problems they are confronted with by themselves, that is, the difficulties that people face in their life and society. Problem solving abilities can effectively use advanced human knowledge and solve the problems they are facing more easily. The purpose of this study is to determine what methods the mathematics teacher candidates use to solve social problems and what the problem-solving behaviors involved in this process are. The research was prepared using qualitative techniques. The data were obtained through focus group interview and analyzed by descriptive analysis. According to the results of the research, it is seen that 1st and 2nd grade students are in a superficial approach to problem solving. However, it is observed that the teacher candidates who continue to the 4th grade have a deeper approach and use more problem-solving methods. In addition, the results show that the problem-solving strategies they use when solving social problems differ according to the class level and the use of the strategy belonging to experienced problem solvers as the class level increases. On the basis of the results obtained, suggestions such as the development of strategy teaching programs aimed at teaching students to solve problem-solving skills should be included in the lessons and to provide problem solving strategies for students.

Keywords: mathematics teacher candidates, problem solving method
PRE-SERVICE TEACHERS' GOALS FOR INTEGRATING TECHNOLOGY INTO TEACHING MIDDLE SCHOOL MATHEMATICS

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This study aims to investigate to what extent pre-service middle school mathematics teachers' self-reported goals elicited from their reflection papers were consistent with their intended purposes, drawn from their lesson plans, for using technology in teaching mathematics. Preservice teachers were asked to work in groups of two to prepare a technology integrated lesson plan for overcoming a particular mathematics misconception, implement the lesson plan to their peers and write a reflection paper regarding their planning and implementation processes. In this study, we present a pair of preservice teachers' work which were analyzed based on TPACK levels rubric developed by Lyublinskaya and Tournaki (2011) by building on the major work of Niess, et. al. (2009) and Niess, et. al (2007). Based on the cross-comparison of preservice teachers' lesson plans and their self-reported goals, we concluded that pre-service teachers took efforts to achieve the purposes of integrating technology consistent with what they reported in their reflection papers. However, they could not keep the level of tasks at the intended level due to taking the technological tool for granted that it would provide similar benefits for all tasks and not planning the flow of the instruction in detail. This cross-comparison revealed that pre-service teachers failed to evaluate the appropriateness of the technology for the content of the mathematical tasks. Thus, we suggest teacher education programs providing pre-service mathematics teachers opportunities with critical examination of the technological tool to be integrated and development of skills for keeping the intended level of the technology integration.

**Keywords:** education, technology
MIDDLE SCHOOL MATHEMATICS TEACHERS’ USES OF QUESTIONING TOOLS

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The purpose of the study was to investigate the questioning tools used by middle school mathematics teachers during their instructional processes in class. Participant teachers were different in terms of their teaching experience years and schools in which they were working. In this study, classroom data was analyzed in order to identify any questioning tools (physical tools or ideas as tools such as examples or analogies) that the participating teachers use, as well as to identify the sources that form a base for teachers’ use of these tools. Considering observable verbal and nonverbal behaviors of the teachers, whether or not something was used as a tool for questioning has been decided based on whether the teachers benefited from these tools while asking mathematical questions. Findings of the study showed that teachers have been asking questions with the help of a variety of tools which also reveals the complex structure of asking questions. Based on the data analysis, the tools teachers used in questioning were grouped under four categories, which were technological tools, publications, assessment materials, and teachers’ self-generated tools. Each of these categories involved both specific tools such as software, web applications, book pages, worksheets, as well as specific ideas or methods of questioning, such as examples, analogies, or use of student-generated mathematical ideas. Based on our findings, we argue that any effort for examining and improving questioning behaviors of teachers should pay attention to these tools in order to help teachers to establish an effective classroom environment with questioning.

**Keywords:** questioning, middle school mathematics teachers
ENHANCING STUDENTS' SPATIAL VISUALIZATION THROUGH THE MATHEMATICAL ACTIVITIES DESIGNED WITH 3D PEN

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Spatial visualization is a crucial component of understanding fundamental concepts, solving problems and reasoning in geometry. Rapidly evolving technology offers many different tools to improve spatial visualization. 3-dimensional (3D) pen is one of these tools that can be used to design different mathematical activities. The purpose of this case study is to examine students’ spatial visualization of basic geometry concepts while they were engaging in mathematical activities designed with the 3D pen. The study took place over two months in the fall semester of the academic year at the department of mathematics teaching in a state university. Four preservice mathematics teachers who completed Analytic Geometry I-II courses were purposefully selected as participants. Data were collected by a spatial ability test, several questionnaires and task-based semi-structured interviews involving spatial visualization problems about the concept of point, line segment, vector, line, and plane. Each data source was analyzed independently by content analysis method to determine the emerging themes. The results indicated that mathematical activities designed with 3D pen helped students to understand the constant properties of spatial objects and perceive spatial positions and relationships. Students developed the ability to construct and manipulate objects by observing and comparing the spatial relations among different concepts through these activities. They had an opportunity to enhance their spatial visualization and gain a better understanding of basic spatial concepts through active engagement with drawings created with the 3D pen.

**Keywords**: geometry, spatial visualization, technology, 3d pen
CONCEPTUALISATION OF PHYSICS CONSTRUCTS THROUGH MODEL-MAKING

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Introductory physics courses underpin aspects of many professional and technical occupations. However, the challenge remains to engage students enrolled in such courses with the necessary physics concepts in more meaningful ways. This paper examines a student model-making project that was devised as part of a health sciences introductory physics course which brought together conceptual and innovation elements in an attempt to address this challenge. Students were required to choose a topic or theme from any of their subjects and construct a physical model based on this in order to demonstrate the underpinning physics principles involved. The model had to be a working one from which measurable readings could be obtained. The project consisted of four main parts, namely; the construction of a working model, using the model to obtain measurable results, the preparation of a poster reporting on the project, and the presentation of the findings at a public exhibition. Videos to explain their work were also produced by students. The project aimed to engage students in more personally meaningful ways with the concepts of physics. The paper draws on elements of Active Prolonged Engagement (APE), developed at the San Francisco Exploratorium in the context of public engagement with phenomena at interactive exhibits, as well as on elements of Legitimation Code Theory (LCT), a flexible and developing tool used for a variety of educational environments, to analyze the results. The outcomes of this project included not only the artefacts and experimental results produced by the students, but also student engagement with academics and visitors to the exhibition where they had to provide explanation of their work and answer questions posed by visitors as well as by an adjudicating panel. The project pointed to model-making as a pedagogic engagement strategy promoting positive attitudes among students to understanding physics concepts.

Keywords: physics concepts, model-making, health sciences, active prolonged engagement, legitimation code theory
THE EMPLOYMENT OF DYNAMIC GEOMETRY SOFTWARE TO ENHANCE MATHEMATICS UNDERSTANDING AND CRITICAL THINKING SKILLS

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Rapid technological, Social and economic progress push educational capabilities to new levels and demand to equip and prepare students to be successful contributors with skills like problem solving and critical thinking. To improve and enhance these skills, students must be given a learning approach that allow them making observations, discoveries and asking questions to construct their own understanding and knowledge of mathematics. Dynamic geometry software (DGS) can be utilized as a tool to assist students in mathematics learning with an effective learning approach. The present study attempted to examine the effects of the use of dynamic geometry software (DGS) to support students’ learning of mathematics and improve their abilities. The participants of this experiment consist of 40 Moroccan high school students. The study employed a survey questionnaire, interviews with learners and observations. The research found that DGS can play a significant role in improving students' engagement and motivation in learning and giving opportunity in gaining mathematics understanding and critical thinking abilities.

Keywords: dynamic geometry software, mathematics understanding, critical thinking
THE USE OF DYNAMIC GEOMETRY SOFTWARE IN A SECONDARY MATHEMATICS CLASSROOM: AN EXPLORATORY STUDY FROM TEACHERS' PERSPECTIVE

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The use of the Information and Communication Technology (ICT) and its integration in education process is increasingly spreading nowadays. In fact, the emergence of new technologies in classrooms and during lessons forces mathematics teachers at all levels to re-examine existing approaches to teaching and infuse them with interactive digital tools to engage learners. Furthermore, several software systems are available for mathematics teachers, among which dynamic geometry software (DGS) have a significant presence. The aim of this work is to present the findings of a pilot study which was designed to explore teachers’ practices, attitude and perception towards the use of ICT in mathematics teaching at high school levels in Morocco, as well as to discuss the factors which prevent teachers from using ICT during their teaching process. This study's purpose is, in particular, to present the state of the usage of DGS in mathematics teaching and to find out teachers' views about possibilities of using it to improve mathematics education. Classroom observation, questionnaires and teacher interviews were employed for data collection.

Keywords: technology, ict, dgs, mathematics teachers
SMART CITY APPLICATIONS IN TURKEY

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In recent years, many studies have been done on smart cities. Most of these studies involve both smart cities becoming practicable and a broad framework of laws and legislation. Smart cities in Turkey is managed by the Ministry of Environment and Urban Planning. Within the Ministry, sectoral-regional policies, programs, institutional structures and legal legislation are being created. In addition, the work of the municipalities is at the forefront of making cities smarter. In this study, the web pages of all municipalities in Turkey examined and processes related to smart of cities have been examined and classified. In addition, the policies for smart cities in our country have been researched. In the study, the position can be determined exactly where the smart cities of Turkey. Thus, the roadmap for smart cities in Turkey will be revealed as a recent study. It will be beneficial to all stakeholders involved in smart cities.

Keywords: smart cities, municipalities, roadmap
SMART CITY COMPANIES IN TURKEY

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Smart Cities use Information and Communication Technologies to manage the resources and services offered by a city more effectively and to bring them closer to all stakeholders (citizens, corporations and public administration). Public or private companies implement smart city practices among stakeholders. Smart city practices are expected to accelerate economic growth and social development. However, it is a fact that a country has become fully smart cities but only with domestic and national companies. Technology companies that manufacture smart city in Turkey can be a domestic-national company or a company which is distributor belong to a foreign company. In this study, national and regional levels, market research and analysis have been performed related to smart cities in Turkey. As a result of this study, company's type and produced technologies are handled. Thus, the current studies will reveal about the companies located in Turkey related to smart cities. It will be beneficial to all stakeholders involved in smart cities.

Keywords: smart cities, companies, market research, stakeholders
EXAMINING PRE-SERVICE SCIENCE TEACHERS’ PROCESS SKILLS AT A SOUTH AFRICAN UNIVERSITY USING AN INQUIRY-BASED SCIENCE TEACHING APPROACH

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Various studies have reported the positive effects that inquiry-oriented science learning and teaching have on pre-service teachers’ understanding of the nature of science, attitudes and beliefs about science learning and teaching, and their classroom teaching performance (Liang & Richardson, 2009; Haefner & Zembal-Saul, 2004). Ireland, Watters, Lunn-Brownlee & Lupton (2014) also indicated that there is evidence to suggest that Inquiry Teaching can lead to strong learning outcomes for students which include developing accurate scientific knowledge and skills, understanding and content knowledge of science. This study examines pre-service science teachers’ process skills at a South African university using an inquiry-based science teaching approach. The quantitative as well as qualitative depth of students’ process skills were analyzed within a physics component of a science education module. Two cohorts of students (n=60 and n=62 respectively) participated in science investigation activities as well as explaining a model of an electric circuit which they built. The findings show that both cohorts have weak integrated science process skills such as analyzing and interpreting data whereas basic process skills appear to be well developed. The students are also weak at qualitative reasoning and explaining how their model works. These findings support studies found in the science education literature but also have wider implications for pre-service science teacher education in South Africa.

**Keywords:** process skills, inquiry-based science teaching, pre-service science teachers, data analysis
SELF-COMPETENCE PERCEPTIONS OF CLASS TEACHER CANDIDATES TOWARDS MATHEMATICS CLASSES

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Nesrin Özsoy
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The purpose of the study was to examine the self-competence perceptions of the students of Faculty of Education, Class Teachers Department towards Mathematics classes. The study population consisted of Class Teachers Department students of Educational Faculties of Artvin Coruh University and Adnan Menderes University in 2015-2016 Academic Year. The sampling of the study consisted of 350 class teacher candidates selected with a proper sampling technique. 73.4% of the participants were female and 26.6% were male; 17.4% were 1st Graders, 28.9% were 2nd Graders, 45.4% were 3rd Graders, and 8.3% were 4th Graders. The dataset obtained from the questionnaires was analyzed with the SPSS 22.0 Package Program. The participants considered themselves as competent in the content of the mathematics at a rate of 68.2%; in teaching methodology of pedagogy/mathematics at a rate of 43.7%; in lesson plan and lesson program at a rate of 67.9%; in integrating computer technologies to mathematics teaching at a rate of 43.8%; in developing the critical thinking and problem-solving skills of the students at a rate of 64.6%; in evaluating (measuring) the lesson at a rate of 78%. The rate of those who did not feel incompetent in any fields was 30.7%. The data of the study were limited with the Class Teachers Department students who studied at Artvin Coruh University and Adnan Menderes University in Aydın in 2015-2016 Academic Year. It was recommended that similar studies would be conducted in other universities. In addition, it was also recommended that the needs of class teacher candidates be determined in the schools and supplemented with in-service trainings and academic help. Note: This study was supported with the scientific research project with the number of 2015.S30.02.02 by Artvin Coruh University.

Keywords: class teacher candidate, mathematic classes, self-competence
EXAMINING THE ATTITUDES AND SELF-COMPETENCE PERCEPTIONS OF STUDENTS FROM CLASS TEACHERS DEPARTMENTS OF EDUCATIONAL FACULTIES IN MATHEMATICS ACCORDING TO GENDER VARIABLE

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The purpose of the study was to investigate the attitudes and perceptions of Class Teachers Department students of Educational Faculties 2 state universities in terms of gender variable with the Review Model. The study was conducted in 2015-2016 Academic Year. 350 class teacher candidates selected according to Random Sampling Method constituted the sampling of the study. 73,4% of the participants were female and 26,6% were male. Questionnaires were used as the data collection tool. The dataset was analyzed in the SPSS 22.0 (Statistical Package for Social Sciences) program. According to the findings, it was concluded that there is a significant relation between self-competence in mathematical content and the gender (p < 0,05). The self-competence value was 64,5% in females and 78,5% in males. A significant relation was detected between self-competence rates in Pedagogy/Teaching Mathematics Methodology field and gender (p < 0,05). The self-competence rate in females was 39,7%; and 54,8% in males. A significant relation was detected between “The topics in Basic Mathematic classes must be consistent with the Mathematical Program of the 1-4th Grades in Primary Education”, included in the Class Teachers Program, and the gender variable (p < 0,05). We may claim that the opinions of males are more negative than females. The Independent Sampling t-test was used to test if the opinions of the participants on the statements about teaching mathematics differed according to gender. It was found out that the agreement level to “In order to become a good class teacher, I need to learn Mathematics well” showed significant difference in terms of gender variable (p < 0,05). The opinions of the males were more negative than those of females. It was suggested in respect to the study that class teachers graduating from educational faculties should develop themselves in academic and professional terms throughout their lifetimes.

Note: This study was supported by Artvin Çoruh University with the scientific research project with the number 2015.S30.02.02.

Keywords: class teachers, mathematics, attitude, competence.
ANALYSIS OF THE RELATION BETWEEN THE STUDENTS MENTAL MATHEMATICAL SKILLS AND ACADEMIC MATHEMATICAL SUCCESS

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Mental mathematical skill is among those which has a central place in the use of mathematics in daily life. In some countries, tests which are meant to assess the mental skills are included within the scope of national evaluation test systems. The current study aims to reveal the effect of students’ level of mathematical skills on their academic success. Its relation to the students’ academic success in mathematics course was tested using correlation and hypothesis tests via mental mathematical skill test developed. The mental mathematics test was developed making use of the mental mathematics tests included in the Key Stage tests which are implemented in England. The 25-item-test developed for the 5th graders was given to 102 students. The calculated reliability coefficient for the test was (KR 20) 0.84 and the mean for the item test correlations was calculated 0.38. These results show that the test used in the implementation has the sufficient internal consistency reliability. For the students’ academic success, 12-item academic tests implemented on monthly basis were used. Then the results of the study were analyzed, highly significant and positive relation (r=0.795) was found between mental mathematics test and academic success test. In addition, when the relation between the response time and the academic success is analyzed, the correlation between the academic success and the first set of items was calculated as (r=0.67), the second set of items as (r=0.79). Considering the findings, it was observed that there was a significant relation between the mental mathematical skill and academic mathematical success. Meanwhile, it was also observed that as the response time in mental skill decreased, its relation with the academic success decreased as well, which can be considered as an indication of the possibility that response speed in mental mathematical skill had a lower relation to mathematical skill.

Keywords: maths education, mental maths
LONGITUDINAL ANALYSIS OF THE STUDENTS’ ATTITUDES TOWARDS REAL LIFE PROBLEMS TESTING THEIR HIGH-LEVEL THINKING SKILLS IN MATHEMATICS

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Thinking is an innate activity of the individual. High-level thinking can be improved via the variety of the experience the students have had in line with their age and cognitive level, and the high-level questions which open their path to high-level thinking skills (Ersözlü & Kazu, 2011). This research was conducted in the scope of a TUBITAK Project (no: 115K531; title: “A Recommended Model to Increase Success Level of Turkey in Mathematics in International Wide Scale Exams. Effectiveness of the Cognitive Diagnosis Based Tracking Model”). The purpose is to reveal if the students’ attitude changed when they encountered such kind of problems. 3 tests focusing on the subjects of the mathematics in the 6th graders were given to 2049 students in 2 month-intervals. At the end of each test, students were asked about their thoughts on the effects of their coming across with “grasping the role of mathematics in daily life”, “increasing their will to learn” and “will to encounter similar questions”. Thus, both their test performance and views related to the questions were tested. The tests used consist of 12-14 items including open-ended, multiple-choice and true-false questions. Subject areas were determined according to the curriculum of the 6th graders and implemented following the students’ initial study of the subject. It was observed that as the students encountered such kind of questions, their attitude towards the skills of high-level thinking increased. It was seen that the influence quantity of the difference between the first and third measurement was statistically high. Findings show that if such items are used in longer texts, graphics and problems with multiple items depending on a common root, students’ prejudices and negative attitudes might change.

Keywords: high order thinking, longitudinal research, real life problems, attitudes towards maths
COMPARISON OF MATHEMATICAL REASONING AND STRATEGY DEVELOPMENT SKILL: A CROSS-SECTIONAL DATA STUDY

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Matbeg

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Mathematical reasoning and strategy development are among the high-level thinking skills. These skills are questioned in PISA and TIMSS exams. Mathematical Reasoning can be identified as being able to generalize, reaching to a solution at a first sight and the skill of being able to reach mathematical deduction. Strategy development means creating, relating or transferring mathematical solutions to different problems. In this study, the change in the mathematical reasoning and strategy development skills of the students in their mathematical performance in terms of their grades was determined. In addition, the change in two skills were revealed in terms of grade level. 8582 students in total were included in the study: 875 4th graders (408 girls, 467 boys), 1697 5th graders (802 girls, 895 boys), 2165 6th graders (1084 girls, 1018 boys), 1683 7th graders (830 girls, 853 boys) and 2162 8th graders (1056 girls, 1106 boys). The data were analyzed through MATBEG exam scores. The distribution of the number of questions according to the grades in the test was as follows: 4th graders=13, 5th graders=15, 6th graders= 14, 7th graders= 15 and 8th graders=15. All the items in the test were graded as open-endedly and partially. The calculated reliability coefficient for all graders changed between (alpha) 0.71 and 0.86. The analysis of the data in the research was done via hierarchical regression. It was found that mathematical reasoning skill was more deterministic in mathematics performance, which has a similar result for all grades. In terms of graders, it was observed that strategy skills increased gradually (4th graders=63.28, 5th graders=66.95, 6th graders=76.39, 7th graders=106.08 and 8th graders=128.85). No statistically significance was found for the 4th, 5th and 6th graders but for the 7th and 8th graders.

Keywords: mathematical reasoning, strategy development, cross-sectional data study
THE IMPACT OF ACADEMIC EXPERIENCE ON TEACHERS' PERFORMANCE: A CASE STUDY OF STUDENT’S PERCEPTIONS OF TEACHERS’ ASSESSMENT

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Seeu

Sadri Alija  
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This study aims to analyze the overall performance appraisal of the lecturer versus his academic experience, relying on the assessment of teaching and learning at the University, made by the students. The data were taken from the survey conducted by the Quality Assurance and Management Office on the evaluation of teachers of the Faculty of Business and Economics South East European University, by the students in the academic year 2016/17. In total the questionnaire had 22 variables divided into three groups where the students rated the course, the lecturer and finally some information about the student. In the study, besides the descriptive statistic and the cross-tables, two mathematical models will be built which consist of student assessment for some of the basic characteristics of the course and the teacher versus the academic experience. The study found that most of the characteristics related to teaching have a positive impact versus the academic experience of the teacher.

Keywords: performance of lecturers, teachers experience, student evaluation of teaching, odd ratios
THE EFFECTIVENESS OF METACOGNITIVE PROMPTS ON A GENETICS TEST AMONG HIGH SCHOOL STUDENTS IN KENYA

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This study investigated the effectiveness of using metacognitive prompts in improving scores on a genetic test among high school students in Kakamega and Vihiga Counties, Kenya. The study, a post-test only control group quasi-experimental design involving 2x2x3 factorial matrix also investigated the intervening effects of gender and self-efficacy beliefs. A total of 2,138 form four (grade 12) students from intact classes participated in the study that was carried out in 17 high schools in Kakamega and Vihiga Counties. Three validated instruments: Metacognitive Prompting Questionnaire (MPG), Self-efficacy Questionnaire (SEQ) and Genetics Test (GT) were used for data collection. Data were analyzed both descriptively (means and standard deviation) and inferentially through a 2x2x3 Analysis of Covariance (ANCOVA). Findings showed that testing method (Metacognitive prompting Versus Conventional) and self-efficacy beliefs had significant main effects on students genetics test score (F(1,2132) = 4.568, p = 0.033) and (F (1,2132) = 963.740, p < 0.001) respectively. This implied that use of metacognitive prompts had superior effects to conventional method of testing. It also implied that students who are highly efficacious do better on tests than students with low self-efficacy. There were no significant 2-way and 3-way interaction effects of variables on genetics test score. These findings have implications for Biology teachers who are implored to adopt the use of metacognitive prompts during testing and to promote self-efficacy beliefs among students.

Keywords: metacognitive prompts, self-efficacy, genetics
DIFFICULTIES OF A PRESERVICE MATHEMATICS TEACHER IN GEOMETRICAL CONSTRUCTIONS AND THE USE OF DYNAMIC GEOMETRY SOFTWARE FOR SCAFFOLDING

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This paper is a part of ongoing large-scale research project focusing on instrumental genesis of preservice mathematics teachers while working construction tasks with the use of dynamic geometry software (DGS). In this proceeding, we will present pilot study results regarding difficulties of a preservice mathematics teacher in constructing geometrical figures and the role of DGS as a scaffolding. Task-based interviews under qualitative paradigm were conducted with a preservice mathematics teacher, a senior level student in mathematics teacher program. While working on construction problems, she had limited experience in paper-and-pencil environment, but no experience in DGS. The collected data were analysed within a theoretical lens of instrumental approach and zone of proximal development. Main results are: (i) while constructing figures in paper-and-pencil environment, she had difficulties in justifying her strategies referring to appropriate mathematical knowledge with the use of given tools, (ii) she mostly tested her constructions by the use of dragging, measurement and intersect tools as a scaffolding, (iii) instrumentalization of DGS tools re-shaped her knowledge regarding construction of mathematical figures which was a trace of her zone of proximal development.

Keywords: geometrical constructions, instrumental genesis, zone of proximal development, dgs
THE EFFECT OF USING ACTIVE LEARNING MODEL ON FOURTH YEAR PHYSICS STUDENTS' ACHIEVEMENT IN THE SUBJECTS 'TEACHING AIDS' AND 'DEVELOPMENT OF CRITICAL THINKING'

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University of Mosul

This research aims at identifying the effect of using Active Learning on the achievement of 4th year Physics students in "Teaching Aids" and "Development of Critical Thinking". To bring about these aims, two null hypotheses and 5 secondary hypotheses that follow the second main hypothesis have been set. To validate the hypotheses, a sample (71) male and female 4th year Physics students at the College of Education had been selected and divided into two main groups, namely the experimental group and the control groups with (35) and (36) students in both groups respectively. A process of equivalence was done for both research groups in terms of the variables (Intelligence, Previous Year Achievement in Physics, Age, and Critical Thinking). The experimental group was taught according to the Active Learning Model, while the traditional (ordinary method has been adopted in teaching the control group. The researcher prepared the basic requirements of the research represented by identifying the teaching material and the behavioral objectives behind teaching it. Also lesson plans for teaching both the experimental and the control groups have been set according to the Model of Active Learning and the Ordinary Method, side by side with the provision of the teaching aids and laboratory instrument for applying the experiment. Finally, the researcher has put forward some suggested topics for future researches.

Keywords: education development, education methods, education methods of physics
EARLY INTRODUCTION TO SURGICAL SKILLS IN MEDICAL EDUCATION

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Surgical skills are a crucial aspect of medicine that is taught very late in medical education. In many medical schools, there is no formal teaching or assessment of surgical skills. The reason for teaching surgical skills very late is said to be requirement of excellent anatomy knowledge. However, this situation leads to graduation of doctors inexperienced in suturing which is a major task in emergency medicine, probably one of the first duty places of a new graduate. In order to explore early teaching of surgery, an inexperienced group of high school students were taught basic suturing skills and assessed by a standardized marking scheme used in medical school final examinations in the United Kingdom. In the end, although having minimal anatomy and medical knowledge, all students managed to obtain a pass grade. After leaving one-week time gap with no experience, students were re-assessed. In the average of second assessments, students improved their grade by 10%. Therefore, it could be concluded that theoretical knowledge is not a requirement for starting surgical skills teaching and students would benefit from early exposure to practical skills teaching.

Keywords: medical, surgical, teaching, education
Entry into medical schools is a very selective process in the United Kingdom. For this, school knowledge is not sufficient and extra courses are necessary. Theoretical and practical sessions were mixed as theoretical knowledge delivered to all students and practical knowledge delivered to smaller groups in stations. An economically and timewise efficient course was designed to teach the basic clinical and practical skills required for entry into medicine and was assessed objectively by using standardized medical school final examination mark schemes and subjectively by feedback forms. In objective surgical skills assessment, a pass grade was obtained by all students and in subjective course feedback assessment, 67% of students strongly agreed that the course met their expectations, 33% agreed that the course met their expectations; and, 76% strongly agreed that they would be able to apply their knowledge whereas 24% agreed that they would be able to apply their knowledge. Overall, both objective and subjective assessments revealed satisfactory grades for this time-efficient course design.

Keywords: medical, surgical, education
FIRST AID EDUCATION TO HIGH SCHOOL STUDENTS

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First aid training is one of the health education topics that should be mandatory for everyone. Simple steps could save a life or having basic knowledge on common cases could significantly decrease the workload of accident and emergency departments. The question is: how early should we start teaching the first aid? The answer would be as early as possible; however, teaching cardiopulmonary resuscitation and how to deal with cuts would require competence of the student. This 4-hour course was designed to teach: choking, burns, bleeding, recovery position, cardiopulmonary resuscitation and communication with the emergency service to high school students. All topics were taught in practical case studies and all students have experienced all cases. In this study, the practical approach of teaching, advantages and disadvantages of the course, student feedbacks, strengths and required improvements have been explained. In conclusion, course was found to be well-organized and the skills taught were appreciated by the students.

Keywords: health, education, medicine, first aid
3-D PRINTING IN MEDICAL EDUCATION

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3-dimensional printing is increasingly used in the medical field. Medical models have been studied, patient tomographical images have been printed for operation planning, implants have been produced and protheses have been created by 3-dimensional printing. In plastic surgery, the expected nose result could be printed which could form a scaffold for the operation. In cardiovascular surgery, vessels and stents could be printed. In neurosurgery, tumor model could be printed for practice operation. However, 3-dimensional printing has not been integrated into medical education as much as it should have been. Nowadays, certain virus and bacteria models are printed in macro-sizes in order to help medical students understand their structures. Certain anatomical model prints are used in traditional anatomy teaching. In this study, medical and engineering aspects of creating 3-dimensional simulation models (anatomical models with added stimuli and reflexes), pathology models, microanatomy and microbiology models, physiological systems and models for practical skills teaching have been investigated and explained.

Keywords: 3d printing, medical, education, health, technology
THE EFFECT OF MATH SUCCESS AND ATTITUDE OF GRAPHING CALCULATOR-ASISTED TRANSFORMATION GEOMETRY TEACHING

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This research was carried out to investigate the effect of advanced graphing calculator assisted transformation geometry on students' attitudes towards academic achievement and geometry. In the study, pre-test-post-test group model was applied and semi-experimental design was used as research design. The research sample consisted of 49 students who were randomly selected from a secondary school in Balıkesir. Transformation Geometry is an advanced graphical calculator in 27 experimental groups; In the control group consisting of 22 people, the technology was applied for 6 weeks without using the material. In the Survey Geometry Achievement Test, students' attitudes towards geometry between groups were examined with the academic achievement and Geometry Attitude Scale among the groups. Reflective daily form was applied to the students of the experimental group and interview was made. The data were analyzed quantitatively and qualitatively. For quantitative analysis, unrelated sample t test was applied to the data obtained from achievement test and attitude scale using SPSS 22 Package Program. Analysis of the data showed that only a significant increase in the academic achievement of the experimental group was observed. There was a slight increase in both the control and experimental groups when looking at the geometric attitude, but this increase was not significant. The Ancova test was performed for the attitude scale scores formed by controlling the gender factor and a significant difference was obtained in favor of the experimental group. For the qualitative analysis of the data, content analysis was performed using reflective observation forms applied to the experimental group students and the data obtained from the interviews made with the students. Generally, it has been determined that the students of the experimental group make their knowledge permanent with an advanced graphic calculator, facilitate their learning, develop a positive attitude towards the lesson and make the lesson enjoyable.

**Keywords:** technology-based teaching, transformation geometry, graphing calculator, math achievement, attitudes towards geometry
We conducted this study in a mathematics method course in 2016-2017 school years in fall term. The participants of the study were 33 (8 male and 25 female) pre-service teachers who are in mathematics teaching program in a university located in the west part of Turkey. For this study, it was asked pre-service teachers to solve a complex problem that requires mathematical model eliciting activity and report their solution. The problem is called bigfoot problem. To solve problem cooperative group activities were done in computer lab. Pre-service teachers studied in the groups. While pre-service teachers were solving the problem and writing their report, they were audio recorded. Pre-service teachers were allowed to use GeoGebra software to solve this problem and they had access to GeoGebra through computers. Additionally, their solutions and reports for problem were collected. All three various data sources used for triangulation to make the data collection process more reliable. Both researchers have analyzed and coded the data and their codes were checked in terms of agreement to make credibility stronger. The problem-solving behavior is used as a theoretical framework from the study conducted by Kim et al. (2013). This framework has six categories. First the behavior is classified as cognitive or metacognitive. Then the behavior (its either cognitive or metacognitive) should also be classified as Individual, Social, Environmental Levels. Additionally, Goos (2002)'s episode framework was also used to decide the quotations' codes for metacognitive activities. A pre-service teacher's explanation might have more than one code based on its context. However, a pre-service teacher's explanation might not have any code because of its context. This study has implications to develop meta-cognitive activities for pre-service teachers. Additionally, it can be said that there is potential usage of technology for the role of metacognition in mathematics education.

**Keywords:** metacognitive, modelling activity, stem, pre-service math teachers
THE REASONS OF STUDENTS' ATTITUDES TOWARDS TO USING INTERACTIVE WHITEBOARD IN MATHEMATICS CLASSROOMS

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The aim of this study is to investigate the reasons of the students' attitudes about using interactive whiteboard (IWB) in mathematics classrooms in middle schools and high schools. For this purpose, the influence of IWB's features, students' math anxiety, teachers' ICT integration, students' math achievement and gender to students' attitudes towards use of interactive whiteboard was searched. This study is a descriptive research designed as a relational survey method. The research sampling consisted of 350 students in middle schools and 557 students in high schools in Balıkesir. The Attitude and Features of IWB scale to measure the students' attitudes and the perceived features of IWB was used. Also, the Mathematics Anxiety scale that consists of five items was used to measure students' math anxiety. To determine the students' opinions about the teachers' technology integration approaches, the ICT integration approaches scale was used. In order to determine the structural validity of scales confirmatory factor analysis was conducted. In order to determine the relation between the students' attitudes about using IWB and independent variables multiple regression analysis was conducted separately for the both data collected from middle schools and high schools. According to the results of regressions analysis of the data collected from middle school students, IWB's features, traditional ICT integration and math achievement are positive predictors and math anxiety is negative predictor of students' attitudes. The results for high school students show that features of IWB and gender are predictors of students' attitudes. This study has several implications for teachers about reasons of students' attitudes towards using IWB in mathematics classrooms so that they could have effect on students' attitudes and organize their classroom environment. Also, that kind of studies leads the use of information and computing technologies and helps to plan the future investments for educational technologies effectively.

Keywords: interactive whiteboard, attitude, features of innovation, math anxiety, ict integration, scale development
USING FPGA’S FOR EDUCATIONAL PURPOSES IN LOGIC LABORATORY

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The logic design laboratory is a fundamental laboratory course which takes place in the curriculum of undergraduate programs in the Electrical-Electronics, Computer, Biomedical and Mechatronics departments of engineering faculties. This laboratory course includes the design of logic gate circuits, encoder-decoder circuits, the design of digital-analog / analog-digital converters and the design of arithmetic logic units. This laboratory course includes experiments such as logic gate circuits, design of encoder-decoder circuits, design of digital-analog / analog-digital converters and design of arithmetic logic units. Integrated Circuits (ICs) that include logic gate designs are used in the experiments conducted in most of the logic laboratory courses included in the relevant programs of the engineering faculties in our country. In these experiments carried out in the laboratory; there are certain disadvantages such as not being able to intervene in the internal structure, making a single experiment with a hardware design, mechanical failures in sets due to usage of a large number of students. In this study, in order to avoid such problems, it has recommended to use Field Programmable Gate Array (FPGA) training cards, a platform in which students can design the whole experiment on it with software. In this way, students will be able to create their own designs, will be able to solve the different problems with the same hardware by changing the software on the card and will be able to develop their application skills without the need for fixed hardware. The proposed method in this work is also described on an experiment, highlighting the difference between FPGA design and hardware designs already in use.

Keywords: logic design laboratory, fpga, engineering education, logic design experiments.
INTEGRATION OF PROGRAMMABLE HARDWARES TO ENGINEERING EDUCATION: FPGAS

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Microprocessors which are the brain parts of the technological devices have become more important in recent years, especially with the rapid development of technology. It is especially gains importance to teach microprocessors in the education of engineering students. Some lessons in which the working principles of microprocessors are described take place in the undergraduate curriculum in the relevant engineering departments of the universities. However, in some applications where high performance is required, modern microprocessors are very inefficient. In applications where, high processing power is required, FPGAs are an attractive alternative because they have flexible working structure and able to take the place of microprocessors in applications where parallel processing is required. FPGAs are widely used in many different fields such as defense industry, automotive industry, digital signal processing, telecommunication and medical imaging. In this study, the features, usage areas and advantages of FPGA are presented, it is emphasized that the FPGA needs to be more involved in engineering education.

Keywords: microprocessor, fpga, engineering, technology.
Using Computer Technology Education Faculties at Graphic Training in Art and Handwork Departments of Education Faculties

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Today, science and technology develops so fast that it is almost impossible to catch up with. The consumer of this technology is always humankind. Art, different from technology, reflects the aesthetic perspective of human soul. It has never had the purpose of making life easier. Through different periods of life, artists used the materials they could find while creating their masterpiece. In every period art works are created with different materials and different formats. As a branch of art, graph has also been affected from technological products in different time periods. Visual communication, which is the reason of existence of graph work today, has been carried to enormous levels in design and application. Many works that used to be done manually are now prepared in computers easily. And even, every level of graph works, from design to print, are prepared with computer technology. With the development of science and technology, education has been through important changes also. This change has been in material use and in different teaching techniques. Through this study, we try to find answers for “how we get used to these changes and developments in art education and technology”, “what do the students think about these?”, “what is the situation at hand?”. 

Keywords: art, education, computer technology
ILLUSTRATIVE DIGITAL TEXTURES ON MOVIE POSTERS IN THE CONTEXT OF ART AND TECHNOLOGY

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Illustrations are the most important factors that generate visual solutions in advertising and promotional applications. They provide re-perception by adding different meanings and dimensions to the content they are connected to. It is the most effective method of ensuring that expressions, concepts, actions are communicated easily. Illustrations are among the contemporary visual arts with their own style of the creator, like a signature, with different and extraordinary production techniques. With the developing technology and digital possibilities, the art of illustration can be produced by traditional methods as well as in the digital environment. One of the areas where illustration is often used is media fields such as cinema and television. Today, traditional tastes from the past are preparing illustrative content posters for many films. Purpose of the research; to examine and evaluate the approaches of digital illustration artists to textures which is one of the basic elements of visual expression language of art in cinema posters that one of the leading visual media faces of our time is cinema banners.

Keywords: cinema, movie poster, digital illustration
INVESTIGATION OF MATHEMATICAL RESPECTIVE-INTEREST LEVELS OF SECONDARY SCHOOL STUDENTS ACCORDING TO VARIOUS VARIABLES

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Anxiety of maths can be defined as a state of unreasonable fear that causes students to worry when they think of mathematics, which causes them to lose their performance and thus prevent their learning, thereby leading to mathematical success. It is important to determine the causes of mathematics anxiety and anxiety affecting mathematics success to contribute to the work of increasing mathematical achievement of students in national and international exams. For this reason, it was aimed to determine the demographic variables affecting math anxiety-apprehension levels of middle school students in the research. In the research, relational research method based on quantitative research approach was used. The "Mathematics Anxiety-Apprehension Survey (MAAS)" developed by Ozdemir and Gur (2011) was used as the data collection tool of the research. The sample of the research is constituted by 130 students from three secondary schools in the Sinop province in 2017-2018 education year. The data obtained from the study were evaluated by parametric analysis methods. According to research results, there was a meaningful difference between the students' achievement status and their mathematics dissatisfaction status on the Mathematics Anxiety-Awareness scale scores, but it was found that there was not a meaningful difference in terms of gender and class level variables. Based on the results, studies can be done to eliminate math anxiety and worry of middle school students in order to increase mathematics success.

**Keywords:** math anxiety, math success, secondary school student
THE EFFECT OF USING SMART BOARD TO THE 7TH GRADE STUDENTS' ACHIEVEMENT IN HUMAN AND ENVIRONMENT UNIT

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In this study, the effect of intelligent board usage in the 7th grade Human and Environmental unit was investigated on the academic achievement of the students and their recall levels. For research; two middle schools were used in Konya province Hadim District. One of the schools was chosen as the control group and the other was chosen as the experimental group. The Unit Achievement Test was used as data collection tools. For 4 weeks, the students in the control group processed the Human and Environmental unit according to the traditional methods while the students in the experimental group were processed using the same unit smart board activities. The obtained data were analyzed with SPSS 22 statistical package program and t-test was used in the evaluation of the obtained data. In this study comprised of quantitative data on the results of the analysis of the data obtained in academic achievement between the experimental group and the control group, the experimental group in favor of the students it was identified as statistically significant difference. Furthermore, according to the results of the application recall test, the recall rate of the students in the experimental group is higher than the students in the control group. In the data obtained in this study; to the 7th grade students of the junior high school, the use of intelligent board in the teaching of the Human and Environmental unit has achieved academic success and easier to remember learned information.

Keywords: human and environment, smart board, level of recall, science teaching
INVESTIGATING THE IMPLICATIONS OF E-SERVICE QUALITY DIMENSIONS ON CUSTOMERS BUSINESS BEHAVIOR OF JORDANIAN ONLINE AIRLINES TICKET PURCHASING

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Petra

This article aims to identify e-service quality dimensions that motivate customer's behavior to use online airline ticket purchasing. It focus on our current data by testing an customers behavior model which accounts for e-service quality dimensions (Content quality, Navigation and visual design, Management and customer service, System reliability and connection quality, Privacy, and Fulfillment) in addition to previously studied of website characteristics and b) considering the context in which influence their cultural behavior and support business behavior. The hypotheses are tested by using regression models on a large sample of Jordanian online airlines ticket purchasing. A study model has been introduced and empirically tested. Results of the empirically tested model suggest Content quality, Navigation and visual design, Management and customer service, System reliability and connection quality, Privacy, and Fulfillment influence their cultural behavior and support business behavior. This study highlights the role of e-service quality dimensions in customers business behavior and emphasizes the importance of cultural behavior and support business behavior. This multi-disciplinary research enriches customers business behavior literature and offers practical implications for customers using website technologies as well as developers of mobile learning platforms.

Keywords: e-service quality dimensions
TEACHING COMPUTER SCIENCE IN NIGERIA UNIVERSITIES: CHALLENGES

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Computer Science is fast becoming the moderating disciples in modern education worldwide is not an overstatement. There is virtually no academic or professional discipline that computer science has not influenced in the last five decades. This paper presents the challenges of teaching Computer Science in tertiary institutions in a third world country like Nigeria. Using the Anchor University Lagos as its locale, the paper investigates the challenges being faced by students and teachers, alike, in the teaching of Computer Science. After a comprehensive survey of different cadre of staff and students, the paper asserts that under-funding, insufficient teacher-training facilities, lack of basic educational technology facilities remains some of the primary barriers to effective and efficient teaching cum learning Computer Science in Nigeria. To address this situations a number of cost-effective recommendations were made to address this problem. Some of which are the need for adequate budgetary provisions to the teaching and learning of computer Science, need for adequate teacher motivation, improvisation of needed facilities, improved teacher-training syllabus etc.

Keywords: teaching, computer science, Nigerian universities, challenges
E-WASTE GENERATION, AWARENESS AND MANAGEMENT IN THIRD WORLD COUNTRIES: PROSPECTS AND CHALLENGES

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The millions of tons of e-wastage being generated annually as a result of development of science and technology since the 20th is, to say the least, a time-bomb waiting for explosion with disastrous consequences, if left unchecked. This paper presents the outcome of a survey in e-waste generation, awareness and management in third world countries like Malaysia and Nigeria. The choice of these two countries (one from Africa and the other from Asia) is borne out of their strategic locations and activities in e-wastes generation cum management scale of preference. The paper examines the major present sources of e-waste, their effects on the ecosystems and the present management infrastructure put in place by the relevant authorities in the management of e-wastes. Using the Anchor University Lagos, Nigeria and the Universiti Malaysia Pahang, Kuantan, Malaysia as its locale, the paper investigates the awareness of the hazards posed by e-wastes, prospects of effective e-waste management in the economic and social development of third world countries, challenges being faced by the respective national authorities in managing e-wastes and makes far-reaching recommendations aimed at turning e-wastes to e-wealth.

Keywords: e-wastes, e-wealth, awareness, prospects, challenges
A MINIATURE SMART CITY EXPERIMENTAL SET FOR ENGINEERING EDUCATION

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This paper introduces a miniature experimental set demonstrating a smart city and its components for engineering education. The model prototype simulates the real life loads such as residential houses, schools, industrial premises, social and cultural sites, and public parks, and energy sources in a small lab scale. ZigBee communication technologies and power electronics hardware were installed for smart energy management to monitor and control of renewable energy sources and loads. The grids become smarter with the increase of renewable energy systems’ usage, distributed energy production, and the availability of control and communication technologies on power grids. Therefore the education institutions take actions to educate the students on the state of the art smart grid components. As a part of this goal, the miniature smart city model was developed and some interactive software applications have been embedded to mimic the real smart city applications for engineering education. The idea of using this type of experimental set is very useful in education since the students can visualize and understand the concepts better.

Keywords: smart city, smart grid, zigbee, wireless control, laboratory equipment