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We would like to dedicate these extended abstracts and references to the doctors, nurses, health workers and all those fighting on the front lines, risking their lives to keep us all safe from the deadly corona virus

We as mathematics educators involving in curriculum studies, have a great and historical responsibility to facilitate and enhance students' learning in this rather strange era! The paradigm shift is happening right in front of our eyes. If we don't use this opportunity to make a better future for our children, the regret will rest upon us forever.

(Celebrating the Establishment of the Doctoral Program of Mathematics Education after 20 Years of its Foundation in the beginning of this millennium: 2000)

Summer 2020

The Necessity of Developing a Qualitative Rubric to Implement the Descriptive Evaluation of Mathematics at the Elementary Schools in Iran

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Extended Abstract

Introduction

More than 15 years has been passed since the Ministry of Education in Iran, launched the "descriptive evaluation" program for elementary schools at the national level. To support the successful implementation of this program that had several pilot studies prior to that, almost all elementary teachers have participated in various in- service training sessions at national, regional and local levels.

Purpose

A number of national assessments indicated that the implementation phase of the "descriptive evaluation" program has not reached the expected level. For this reason, a study was conducted to shed more lights into this issue by investigating more in- depth, the elementary teachers' ambiguities with the ways in which, the descriptive assessment expected to be implemented according to the formal guideline imposed by the Ministry of Education in Iran.

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Methodology

To serve this purpose, a qualitative study was designed and conducted in which, one 5th Grade class with 27 students along with its teacher, as well as seven other 5th Grade independent teachers, voluntarily participated in that. The data were collected via two mathematics word problems focusing on reasoning and the data were collected through various sources of triangulation and the for the sake assurance the conformability of the data. These sources included classroom teacher's assessment of students, 27 students' portfolios including sample of their activities, solutions to mathematics problems, teacher's observations and other documents related to their mathematics learning. As well, seven independent teachers' assessments and the 1st author's field notes and observations while students were solving problems. The data then, systematically reduced at three different levels; at the first level, 27 individual files were made containing the solutions of each to both problems. At the second level, all solutions to two problems, merged into eight classes according to the variety of reasoning types and finally at the third level, one major category emerged and labeled as "reasoning."

Result

The main result of the study was identification of "principles" for designing a "descriptive rubric". These principles entailed of qualitative vs. quantitative, relative vs. absolute, flexible vs. rigid, content- dependent vs. content- free and based on teachers' judgments supported by the documents and observations collected in students' portfolios as opposed to being objective.

Discussion

The study came to the conclusion that the successful implementation of any kind of descriptive evaluation programs, requires knowledgeable and independent teachers with relatively high self-esteem who believe on the effectiveness of descriptive evaluation for the enhancement of teaching- learning process, to some degree. Further, elementary teachers need to be supported by the education authority not just being told what to do in training sessions, but also their judgments and decisions be reinforced by them, regarding students' performance. Last not the least, is to clearly hear elementary

teachers' unheard voices that the learning at any level, is reciprocal and interactive. No teacher could silently sit hours and hours in a training session to be dictated guidelines that he/ she has not been part of it. Instead, teachers should be considered as the major stakeholder for implementing any education change- no matter small or large scale.

Keywords: Descriptive Evaluation Program, Qualitative Rubric, Elementary Teachers, Mathematics Content, Grade 5 Students.

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Developing a Model based on Constructivism Approach, for Teaching Simplification of Algebraic Expressions in the 8th Grade

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Extended Abstract

Introduction

Mathematics, due to its nature, has a special role and place in school mathematics curriculum and its teaching and learning has always been one of the great concerns of educational systems in the world. However, the world needs competent people more than ever, to use mathematics for modelling real world phenomena and finding suitable solutions for them.

Purpose

The aim of the present study was developing a model taking constructivism approach, for teaching simplification of algebraic expressions in the 8th Grade.

Methodology

The study conducted at two phases, and according to its purpose, mixed research methodology was chosen. At the first phase, a model was developed and a focus group was formed consisting of 15 volunteer mathematics teachers of the same grade. They met three times until the model was modified and validated for implementation. At the second phase, an experimental study was designed involving 60 Grade 8 students that randomly selected and assigned to two experimental and control groups. After administering a pre-test, both groups were taught by the first author whom, is mathematics teacher for 11 years and has taught the Grade 8 national mathematics textbook

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accordingly. The control group was taught as usual and the experimental group was taught using the developed model as treatment. At the end of the teaching the simplification of algebraic expressions, a post- test was carried out for both groups to see the effect of the treatment; i.e. the developed model. For the analysis of the data collected from post- test, a Co-variance test was conducted.

Results

The results showed that the difference between the two groups' scores was statistically significant in the favor of the experimental group. This indicated the effectiveness of the developed model on students' performance on simplification of algebraic expressions.

Discussion

Teaching models have proved to be effective in enhancing students' performances in mathematics. Therefore, by explaining and implementing educational models based on the constructivism approach, students' mathematics learning was improved. Educational models based on constructivism, inspire students to think and encourage them to cooperate and interact with each other while solving problems and enhance their mathematics learning. As well, students engaged in the process of constructing their own knowledge of algebraic expressions, which is the chief principle of the constructivism approach. The concluding remark of this research study is that mathematics teachers need all kinds of educational support for designing, developing and implementing mathematics teaching models to enhance students' mathematics learning, using constructivism approach.

Keywords: Constructivism, Simplification of Algebraic Expressions, Mixed Method, 8th Grade Students.

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Influencing Factors and Relationships between them to enhance the Usage of Digital Technologies by Primary and Mathematics Teachers

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Extended Abstract

Introduction

Integrating digital technologies in teaching and learning processes is a universal phenomenon which is often recommended by governments, universities, education faculties, and schools in order to improve educational systems. Despite the capabilities of digital tools, their usage is new in classrooms and restricted to primary grades.

Purpose

The present study was conducted with an exploratory sequential mixed method approach in two steps to extract influential factors that enhance the use of digital technologies in the courses such as mathematics which student achievements based on international exam are less than average score.

Methodology

To do so, in the first step, semi-structured interviews were conducted with six groups of from 3 to 5 primary and mathematics high school teachers, respectively. These informants were selected purposefully according to accessibility level to digital technologies and teachers' skills to use them. In addition, influencing factors were extracted, through a quantitative approach, survey method participating 457 people using path analysis, and the relationships amongst factors were examined, and several recommendations were proposed. Validity and

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reliability were improved through the Rasch-Andrich measurement model. Additionally, structural equation modeling also was applied to examine construct validity as well.

Results

Some themes were extracted in the first step of the study, such as lack of hardware and software infrastructures, in-service education, technical support, and lack of situations in textbooks to use digital tools and a high volume of textbooks. Students' use of digital tools and teachers' sharing experiences of using digital technologies, teachers' beliefs, and the principals' roles and importance of the schools were some other themes as well. Next, using a quantitative approach, a survey using a questionnaire was conducted to investigate the construct validity and the relationships between the latent factors. Exploratory factor analysis showed factors which named school importance, availability, and collaboration, students' use of digital tools, teacher's beliefs, and skills. School readiness contributed to teacher readiness, and these two had a statistical significant effect on student's use of digital technologies.

Discussion

Findings are applicable in integrating digital technologies in textbooks and teacher education programs as well. Providing technical supports, along with the promotion of the teachers' skill to work with digital technologies, are suggested to facilitate integrating digital technologies in teaching and learning processes, particularly in mathematics education. Digital technologies can be used for more than provision and support of traditional teaching and learning methods. Not only should teachers learn to use digital tools to promote traditional teaching models, but also they should learn how digital technologies can be integrated into teaching and learning to enhance a student-centered perspective.

Keywords: Digital technologies, Upper primary School, Primary Teachers, Junior Secondary Mathematics Teachers.

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Changing School Mathematics Curriculum: Challenges and Required Research

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Extended Abstract

Introduction

In the recent decades, school mathematics curriculum reforms have taken place in many countries. Although the contexts of these reforms differ significantly, research could reveal much informative facts about them. For instance, there is a tendency for many countries to include curriculum standards of developed countries in their national curricula. Due to the special role and nature of mathematics, this tendency can be seen even more in this subject. This phenomenon has become a driving force towards an international curriculum. As result, it is expected mathematical literacy of students across the countries does not differs dramatically, which can be consider as a positive aspect. However, we cannot ignore the negative aspects of this adoption as well.

Purpose

In this regard, and in order to create a change in the Iranian education system, in the last decade, we have witnessed radical and comprehensive changes in terms of structure, content and implementation at the macro level of the Iranian education system. The experience of the last decade shows implementing these changes caused major challenges to the education system in Iran. Given the breadth and complexity of the debates surrounding these challenges, in this article we just focus on the changes in the content of the school mathematics curriculum and, its required research.

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Methodology

For this purpose, after making a distinction between curriculum change and curriculum reform, the influential factors on school mathematics curriculum reforms since the second half of the 20th century onward, and the challenges which have been caused by them have been reviewed.

Results

In recent years, also, the internationalization and globalization of the economy, universality of technological development and related needs for new skills and knowledge play the role of strong historical motivations for curriculum reforms that bring calls for unified standards for mathematics in school. Studies, however, show that the one of the main reasons for the challenges is the neglect of the social and cultural conditions of the countries in the processes of developing their school mathematics curriculum. For example, East West differences in mathematics curricula and reforms which have gained less interest, from the result of international studies such as TIMSS and PISA.

Discussion

Curriculum as a changing agent in an educational reform, plays a significant role in mathematics education. Because it has to determine what students learn, when they learn it, and how they will learn it. Therefore any reform required research to provide clear answer for questions, such as, what aspects of the curriculum should be changed?, how might a curriculum be improved to meet the needs for ever-changing world?, how can educators ensure that the development of students' conceptual understanding does not come at the expense of the development of basic mathematical skills? Or can students learn algorithms and master basic skills as they engage in explorations of mathematically intriguing problems? These are some of the fundamental questions that mathematics educators need to consider in curriculum development and research.

Key words: curriculum change, curriculum reform, school mathematics curriculum.

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The Effect of Flipped Classroom Teaching Method on Mathematics Learning of 7th Grade Female Students

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Extended Abstract

Introduction

Flipped classroom is a new educational approach in which instructional content are available to students via the Internet, teacher made videos or other visual media, outside the traditional classroom space. Usually students learn mathematical content at home, Library, etc. and then they will participate in the classroom and continue their deep understanding with the guidance of a teacher. They discuss about the topic and its application together with their peers and do the homework through group work at classroom. Since in this approach the typical lecture and homework are reversed, it is called as flipped classroom.

Purpose

The present study aimed to evaluate the effect of flipped classroom approach in teaching and learning mathematics in grade seven at "exponentiation and square root" content.

Methodology

This study was performed in eight sessions (90 minutes) for the topic of "exponentiation and square root" from the mathematics textbook, with the participation of 60 girl students in the Seventh grade. The statistical population of this study was 7th grade girl students in the

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center of one of the southeastern provinces of Iran, which was 2543. Sampling method in this research was randomized sampling. These 60 students were divided into two groups: “experimental” and “control” group. Student in experimental group learn mathematics content related to “exponentiation and square root” with flipped classroom method and control group students learn same math content with traditional teaching method. All students in both groups were participated in final exam with same mathematical content. Experimental group students complete a questionnaire at end of course which ask about students affects about flipped classroom approach. For analyzing the scores of the two groups, co-variance analysis was used.

Results

The results of this study showed that the flipped classroom approach is effective on students' learning progress but the differences in the average for the two different groups are not statistically meaningful. In addition by reviewing the feedback of the students who had participated in the flipped classroom, through the questionnaire and with the help of descriptive statistics, it was found that flipped classroom is encouraging for most of students. Indeed, more than seventy percent of students in experimental group reported that learning mathematics through flipped classroom approach was more enjoyable than the traditional teaching approach. Furthermore, more than eighty percent of students in experimental group revealed that if they have new chance for choosing flipped classroom approach in next school year, then they choose flipped classroom approach.

Discussion

The results of the analysis of students' answers to the questionnaire showed that most of them believe that learning through flipped classroom approach was very effective in improving their learning, because they could watch instructional videos several times and keep the videos when some of the math concepts needed more practice. While in the traditional approach, this was not possible for them. In the flipped classroom approach, students are engaged in the process of learning and discovering concepts actively. In other word, students

were more active and dynamic in flipped classroom approach than in the traditional classroom.

Key words: Flipped Classroom Approach, Traditional Teaching Approach, Mathematical Learning, Constructive Interaction.

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Teachers' Perspective of how High School Mathematics is influenced by University Mathematics

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Extended Abstract

Introduction

In the beginning of the 20th century, Felix Kline wrote a book titled "Elementary Mathematics from a Higher (Advanced) Standpoint" for school teachers to enhance their mathematical knowledge suitable for teaching. More than a century has passed and still, there is even a bigger argument about the nature of mathematical knowledge that high school teachers need to teach.

Purpose

In last three decades, there has been a growing body of research findings in the field of mathematics teacher education, regarding different kinds of mathematics knowledge necessary to prospective secondary teachers' preparation. However, in recent years, a new construct called "School- Related Content Knowledge: SRCK" has been introduced to the field; a unique kind of knowledge that is content- based to make connection between academic/ university mathematics and mathematics that is taught at high school. This knowledge is mathematical in nature and its purpose is to legitimize school mathematics and change the academic subject into a more suitable school subject to better understand the relation between university and school mathematics, a study was designed and conducted with 19 upper secondary mathematics teachers

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Methodology

To conduct the research, qualitative methodology and in specific, grounded theory and narrative method was used. The data collected from four different sources to ensure the validity of the findings using triangulation technique. The data collected via educational and teaching background of the participants to better understand their university and school mathematics experiences, semi- constructed individual interviews with 12 questions, written interviews with five mathematics problems and first author's class observations and field notes.

Analysis

By systematic reduction of the data, two categories emerged with of a number of sub-categories. The first category labeled as "the ways in which, teachers use academic mathematics in their high school teaching" with five sub-categories as "direct use in teaching", "to make example or contra- example", "when encounter with problems that there is no classic answer to them", "to give a holistic view about the nature of mathematics and university and school mathematics" and "to prepare for answering unexpected questions from students". The second category shaped as "the gap between academic vs. high school mathematics" and included three sub-categories labeled as "the lack of holistic view towards student- teachers at secondary level", "the unfamiliarity with real- word problems" and "the lack of consistency between different mathematics teacher training programs" in Iran that its education system including curriculum and assessment, is centralized.

Conclusion

The study concluded that for enhancement of the mathematics teacher education program in Iran, it is important to design specific mathematics courses that are content- based, different from both mathematics and all kinds of pedagogical courses that their main responsibility is to help prospective high school teachers to re-tailoring academic mathematics to better serve the purpose of high school mathematics.

Key words: University Mathematics, School Mathematics, High School Teachers, School- Related Content Knowledge.

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Critical Review of Studies in the Field of Mathematical Word Problems

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Extended Abstract

Introduction

Mathematics plays an important role in empowering people to live and work in extremely complicated world. Thus in almost all formal educational systems, mathematics is essential school subject matter. Numerous researchers believe that mathematical word problems are effective in enhancing students' mathematical knowledge and their problem solving skills and enabling them to apply mathematics in solving daily life problems. Because of the importance of word problems, a considerable number of research have been conducted in Iran within the recent decade 2009- 2019.)

Purpose

The purpose of the present study was to evaluate the research methodologies used by researches conducted in the field of mathematical word problems in Iran to help mathematics education researchers to learn from what have been done and choose their future direction more realistically.

Methodology

In doing so, major relevant Iranian data bases including Iran doc, Sid, Google Scholar, Noor, Civilica, Magiran, central library database of Farhangian university, Ferdosi university of Mashhad, University of Tehran, Shahid Beheshti University and Elmnet, were reviewed and searched and 136 studies were identified. By taking one decade time

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interval of 2009 to 2019 and using "verbal problem" or "mathematical verbal problem" as keyword in research reports' title, 19 studies in the field of word problem were identified. In the next step, these reports were evaluated by using critical review research method.

Results

The results showed that the majority of these 19 researches, used quantitative methodology. In addition, most of them dealt with student's challenges in solving word problems. Some of the researches involved the effects of new teaching methods on solving word problems. A number of researches discussed the role of cognitive – metacognitive and emotional factors on students' word problem solving performance. Furthermore, investigating neurological factors and linguistic abilities in solving word problems were another focal point some of the researches that carried on in this field. In the next step, descriptive information of selected researches consisted of research questions, research methods, characteristics of participants and the way they have been selected, data collecting tools, technical reports of instruments, structure of mathematical problems and the data analysis methods were critically reviewed.

Discussion

In reviewing research methodologies of 19 research reports in the field of mathematical word problems, the improper statement of research questions and inconsistency between the type of research method and research questions were salient. In addition, many other research component including incomplete use of "statistical population", insufficient report on the method of determining the sample size, failure to report technical characteristics of measurement tools, ignoring exploratory analysis of the data, failure to refer to the assumptions of statistical models and insufficiency to report evidence of the data, threatened the validity of those research studies. The concluding remark is that it is necessary to make sure that the research approach is relevant and consistent with the nature of research purpose and research questions. Also, in taking either quantitative or qualitative approaches to research, every measure should be taken to assure the precision and validation of research process. Only in this case, the findings could be trusted and validated and reliable.

Key Words: Mathematical Word Problems, Critical Review, Research Methodology.

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