Trends in Mathematics Education Reform Conference

March 5, 2013, Prague, Czech Republic

Book of Contributions
Abstract

This paper will discuss a program of international and comparative research to explore the opportunities to learn that best prepare high quality mathematics teachers before they begin to teach and on the first years of teaching. I will briefly describe the TEDS-M study which collected data in 2008-2009 from teacher education policy and programs in 17 countries. The study investigated how diverse policies have shaped pre-service teacher education programs across high achieving countries and searched for patterns that begin to explain future teachers’ performance on assessments of mathematics teaching knowledge. Building on TEDS-M, FIRSTMATH is a collaborative, cross-national study of novice teachers’ development of mathematical knowledge for teaching and is currently working with several countries to develop the methods and instruments to explore the connections between previous preparation and what is learned on the job as it concerns knowledge, skills and curricular content. In addition the study will investigate the degree to which standards, accountability and other similar mechanisms operate to regulate the support that beginning teachers of mathematics receive during their first years of teaching; and how all this connects with teaching practice and pupils’ learning.

Text

Aims

I will briefly describe the IEA TEDS-M study, including key results showing evidence that quality assurance strategies and opportunities to learn mathematics knowledge for teaching provided to future teachers in pre-service teacher education programs has been able to produce highly knowledgeable teachers, a result that is more marked in high achieving countries. I will then briefly describe the aims of FIRSTMATH and how we intend to make connections between these two studies.
Methods

Both studies, TEDS-M and FIRSTMATH, are the result of collaborative efforts of worldwide institutions to study the mathematics preparation of future primary and secondary teachers and how and whether this preparation serves them well once on the job. The two studies combined, explore if what future teachers learn in pre-service teacher education leads to more effective knowledge and practice of mathematics and mathematics for teaching.

Both studies are large scale and thus are breaking ground in the development of valid and reliable research methods that can be taken to scale. The methods include the development of viable research designs, including rigorous measurement and sampling strategies. For instance for TEDS-M we implemented a two-stage sampling design: (a) selected samples representative of the national population of institutions offering pre-service education to the target populations; (b) all programs in those institutions were included in the survey; (c) within institutions (and programs), samples of educators and of future teachers were surveyed. Samples had to reach the IEA rigorous sampling standards. In the case of FIRSTMATH we are in the process of developing the instruments to do the study (this is an important goal of this meeting), and in our next meeting we will develop the sampling design for the participating countries. Following TEDS-M methods, FIRSTMATH will use surveys to explore the influence of individuals’ background and teacher education program characteristics (such as opportunities to learn, philosophy, selection policy, curricular policy, and program staff and resources) on future teachers’ performance using assessments, observations and other strategies to better understand the mathematics knowledge and mathematics pedagogy knowledge of novice teachers. In every case the research design has to fit the particular context of the country while allowing for comparison to explore the effects of the same variables across all countries.

Findings

In this paper I will briefly report on findings from future primary school teachers and their programs in “high achieving countries” in mathematics as indicated by international assessments in Chinese Taipei, Germany, Poland, Russian Federation, Singapore, Switzerland and the U.S. The data comes from the TEDS-M future teacher survey and from the survey of teacher education programs. The future teacher survey consisted of questions asking about background characteristics and opportunities to learn, and an assessment of mathematics knowledge for teaching which measured mathematics content knowledge and mathematics pedagogy content knowledge. The survey of teacher education
programs consisted of questions asking information about the organization and content of the programs included in the study.

I will also report on the advances achieved by FIRSTMATH so far and on what we expect to be able to do as a result of our joint efforts.

**Significance**

FIRSTMATH just as TEDS-M will be the first cross-national study of the influence of previous preparation to teaching knowledge and practice in mathematics. Both studies together will be able to provide valid and reliable on an increasingly contentious area whether or not effective teachers are born or made. TEDS-M has collected data on the policies, curriculum, organization, processes and outcomes of teacher education from national probability samples of institutions, teaching staff and students in these institutions and has implemented the first international assessment of learning outcomes based on national samples in teacher education. FIRSTMATH will attempt to collect comparable data from novice teachers. These two studies will provide the most rigorous scientific evidence on the effectiveness of mathematics teacher preparation to date to offer policy makers well-grounded evidence of what works in mathematics teacher education. In addition and most importantly the study will work in collaboration with teacher educators and teachers on strategies to support teachers’ developmental knowledge of teaching and learning to teach mathematics effectively.

**References (selected)**


comparative perspective. ZDM - The International Journal on Mathematics Education.


Abstract

The research report investigates the nature of pre-service teachers’ ability to notice phenomena in a classroom, as directly related to the content of mathematics, mathematics teaching and learning. The ability to notice is seen as an important part of the student teachers’ PCK and as its manifestation. Two types of studies will be presented. An analysis of 30 pre-service teachers’ written descriptions of a whole mathematics lesson on the video as well as of 122 pre-service teachers’ commentaries on short video clips with clearly framed episodes against relevant expert identified phenomena yielded results that confirm an overall low level of attention given to content-specific aspects of teaching. It also identifies some most significantly omitted issues and suggests a connection with pre-service teachers’ mathematics knowledge for teaching. The report indicates ways to further link the ability to notice to both teacher development design and effective teaching practice.

References


Problem posing and enhancement of teachers’ professionalism

Abstract

Study of ways leading to improvement of professional competences (both in pre-service and in-service teacher training) has been in the center of our interest for a long time. Our special attention has been paid especially to the development of subject didactic competence. What we meant by subject didactics competence is the knowledge of mathematical topics, the possibilities of its didactics elaboration, and the ability to apply this knowledge in teaching (Hošpesová, Tichá 2006; cf. knowledge base for teaching, Shulman, 1986). One of the attributes of a good level of the teacher’s subject didactic competence is ability to pose problems (not only in lesson planning but also directly in teaching whenever needed). Our experience proved development of the ability to pose problems to be a very productive motivational means, helping both pre- and in-service teachers realize their possible deficits in the subject matter knowledge and motivating them to eliminate these deficits.

Text

Aims

Similarly to a number of mathematics educators (Freudenthal, Kilpatrick, Silver, English, Cai, etc.) our experience from primary school teacher training and research connected to teachers’ professional development shows that problem posing could play significant role in the process of teacher’s professionalization. The range of the posed problems made it possible to open a discussion (in the form of joint reflection) on the various components of subject didactic...
competence, that is knowledge of mathematical content, its didactic elaboration and possibility to apply this knowledge in teaching.

Recently we have begun stressing that problem posing can be a significant motivational force resulting especially in:

- deeper study and effort to improve one’s knowledge base for teaching,
- deeper understanding of concepts,
- boosting repertoire of interpretation.

Our pedagogical practice shows that in-service teachers are sometimes unaware of deficits in their subject matter knowledge. It seems that when posing problems they can grow aware their knowledge does not meet the required level. In our research we came across the following two extremes:

- teachers who do not realize that their subject didactic knowledge should be better, deeper;
- teachers who are well aware of their weaknesses, of not knowing certain things who want to do something about it:
  - some of them expect there are some ready-made universal recipes they can learn by drill,
  - others who realize that they will have to improve their knowledge.

We want to illustrate the opinion mentioned above by results of a study carried out with practitioners. The aim of the study was to document that problem posing is the tool leading teachers to deeper analysis and reflection of the teaching content. We asked the question if problem posing may motivate teachers to deeper reflection on mathematical content, to their effort to develop their knowledge.

**Method**

The study was carried out with a group of 24 participants who voluntarily enrolled life-long learning course for professional development. All of them were in-service teachers with the experience as primary school teachers. We worked with this group for approximately 3 months: they solved and posed problems whose topic was related to subject matter taught at primary school level, they discussed a variety of questions related to teaching mathematics.

In the end of the course the participants’ task was to pose 3-5 problems with fractions \(\frac{1}{2}\) and \(\frac{3}{4}\) (similarly to Tichá & Hošpesová, 2012). This area of mathematics was chosen for problem posing deliberately as the part-whole relation and the concept of fraction are one of the key areas in primary school mathematics. The participants were also asked to write what they think about the benefit of problem posing in teacher training.

In the data analysis we used qualitative approach based on grounded theory (Strauss & Corbin, 1990). In the first phase we classified participants’ ideas using
open coding. In the following phase we confronted the posed problems with opinions expressed by the respondents in the first phase.

## Findings

The repertoire of problems posed by participants of this study was comparatively rich. They posed $n$-tuples of problems in which different sub-constructs of fractions, various environments etc. were used.

E.g.: Participant Filo (nickname) posed the following problems:

- **Children ate cakes. One of them ate $\frac{1}{2}$, the other $\frac{3}{4}$. How many quarters did they eat?**
- **In one vessel, there is $\frac{1}{2}$ l of liquid, in another one $\frac{3}{4}$ l of liquid. How much liquid is in both vessels?**
- **The sides of a rectangle are $\frac{1}{2}$ cm and $\frac{3}{4}$ cm. Calculate its area.**
- **$\frac{3}{4}$ of a field were seeded with corn but $\frac{1}{2}$ did not germinate. How many quarters germinated?**
- **There were 20 passengers on a plane. $\frac{3}{4}$ of the passengers left the plane during the stopover, $\frac{1}{2}$ boarded the plane. How many passengers continued the journey?**

These five problems could serve as a good base for joint reflection in which we can draw attention to the pluses and minuses, even to phenomena that can result to incompetence to solve problems.

Several problems posed by the respondent included some inaccurate, ambiguous formulations; despite the fact that the teachers often stressed the importance of comprehensibility of any problems.

Another respondents' demand was that the problems be "real" but the posed problems did not meet this criterion. E.g. Svataš's problems:

- **I need $\frac{1}{2}$ m of fabrics for jacket. I need $\frac{3}{4}$ m for trousers. How much fabrics will I have to buy? How much will I pay if 1 m costs 200 CZK?**
- **Petr jumped $\frac{1}{2}$, Pavel $\frac{3}{4}$ m. Who jumped more? By how much?**

## Discussion

In the study the discrepancy between respondents' declared awareness of importance of problem posing for teachers and their lack of experience in this activity was proved. Obviously many of them were surprised how difficult for them it was to pose problems for primary school pupils. This fact stimulated some of them for reflection on what knowledge and other prerequisites are needed for successful problem posing. On the other hand some participants showed effort to avoid problem posing and relied on problems from textbooks.

The potential of the use of motivational force of erroneously posed problems is manifold. First of all the author, or the other participants, may be asked to solve the problems. However, it sometimes happens that even when asked to solve erroneous problem they do not realize that there is something wrong with the
In the phase of grasping such problem they look, on the basis of their previous experience, for suitable interpretation of the assignment and then they solve it. A more secure way leading to discovery of deficiencies is joint reflection discussed in detail in our preceding studies (Hošpesová, Tichá, 2006). In our opinion the educator leading the seminar should take part in the joint reflection as his/her questions give the right direction to the discussion. It is possible to proceed in more ways: the educator offers examples of posed \((n\text{-tuples of})\) problems, points out flaws, mistakes, misconceptions (e.g. published in Hošpesová, Tichá, 2010).

We come across the opinion of some teachers that inclusion of “problem posing” distracts from “appropriate, genuine mathematics” oriented on “mastering of craftsmanship – carrying out calculations”. Some of the teachers are afraid their training is not sufficient as to enable them inclusion of these activities in their teaching. Others object that it would require intellectually and time demanding planning. Many are hindered by the fact they would not know how to evaluate problem posing.

References (selected samples)


Remark: Elaboration of contribution was supported by RVO 67985840.
The paper focuses on a possible way of approaching, study and improvement of students’ school culture of problem solving in mathematics education. In school mathematics, problems are often used as a tool for assessment of if and what the students have learned, and only rarely as an opportunity to learn mathematics. We try to approach problems in the latter perspective, i.e. to give chance to learn mathematics, to re-centre teacher’s and students’ activity towards problems as such. We look for tools for developing a “culture of problems”, changing learners’ relationship towards problems; we give them the opportunity to look at problems as something they can build and work on. Our main aim is to find out to which extent this approach can be beneficial in terms of the student’s ability to solve problems and to learn.

Text

Framework

In school mathematics, problems are often used as an instrument to check if and what the students have learned, and more rarely as the opportunity to learn mathematics. Consequently, students understand problems as a tool used for assessment (grading), not as a tool helping them to learn something applicable in different contexts. Errors are considered to be manifestations of students’ lack of knowledge, or signals of failures. Consequently, students often see problems only as a tool for evaluation – to the detriment of mathematics learning. Therefore, problems are seen as tools by the means of telling successful students from those who fail.

The research is carried out in the framework of the Theory of Didactical situations in mathematics (Brousseau, 1997). The basic concepts of this theory used are: didactical situation, didactical contract and meta-didactical shift.
Connaissances/savoirs: “Les savoirs” and “les connaissances” are generally both translated as “knowledge”. Isolated parts are acquired as savoirs and are connected by connaissances. Connaissance arise spontaneously on the basis of interaction with the situation and are context and situation based. Savoirs are general and formalized. If savoir is anchored in the pupil’s cognitive structure, it becomes connaissance in construction of further savoir. Without connaissances, savoirs have no context and are easily forgotten. Without savoirs, connaissances are merely episodic and not very useful.

The didactical contract is the result of an often implicit "negotiation" of the mode of establishing the relationships among a student or group of students, a certain milieu and an educational system. It can be considered that the obligations of the teacher with respect to the society which has delegated to him his didactical legitimacy are also a determining part of the "didactical contract".

Meta-didactical shift: When a teaching activity has failed, the teacher can feel compelled to justify herself and, in order to continue her activity, take her own formulations and heuristic means as objects of study in place of genuine mathematical knowledge. This effect can be iterated several times; it can concern a whole community and constitute a veritable process escaping from the control of its actors. It may have different forms: as a heuristics, mnemotechnic instruments, use of metaphors, teaching the algorithms etc. (Sarrazy, 1997).

Research

In our research, we re-centre teacher’s and students’ activity towards the problems as such. We look for tools for development of a “culture of problems”, changing the learners’ relationship towards problems; tools that give them the space for looking at problems as something they can build and work on. Our main aim is to find out to which extent this approach can be beneficial for the student’s ability to solve problems and to learn. It means we try to develop a less didactically narrow relationship towards mathematical problems in students, to lead them to see problems as work to be done. Moreover, we concentrate on eliminating meta-didactical shift in mathematics teaching.

Hypothesis

This attitude to and understanding of problems could develop a sort of mathematical culture in the students that would be manifested, among others, by the student's more homogeneous behaviour during the lessons.
Main concern

How much is this approach beneficial not only for students’ attitude to problems but, obviously, also for their knowledge and capacity to solve problems? And what would be the price of this?

In the contribution I will present and analyse situations aimed to extension and transformation of the meaning the students attribute to problems. To be more specific, I focus on the organization of didactical situations that may change the attitudes both of students and teachers.

Discussion and concluding remarks

Our research shows that any change in students’ attitude to problems and development of “problem culture” requires a more technical insight into problem solving than traditional approaches can offer. Even though our results are encouraging, there are many questions to be answered, e.g. What can we measure/evaluate? What is the relationship of this kind of activity to previous mathematical knowledge of the students? What is the influence of the language used?

The reasons for differences in cultures across classes and their didactical impact both on the teachers and the students ask for further exploration. However, the set of obtained results seem to be promising. They show that it does not suffice to tell or demonstrate any direct method to students who are not able to tell the needed variables and patterns. They need to understand the usefulness of a certain method, which cannot be transmitted unless they are aware of the importance and significance of similarity of mathematical models of the problems. At the same time, even students who already know how to solve a problem can make progress in and develop their understanding.

The overall design of the project is demanding for the teacher: explaining the task, selection and preparation of the problems, evaluation... It is necessary to be aware of the risk of meta-didactical shift and, more generally, other effects related to the paradoxes of the didactical contract. The importance of institutionalization of discoveries must also be always born in mind.

Even though this project is aimed at improving the students’ culture of problem solving, the research shows that the presented activities can be useful for designing new didactical situations (namely a-didactical situations) also in other areas of school mathematics and should be spread in the teaching community.
References (selected samples)


Acknowledgement

The research was supported by the project CAČR P407/12/1939.
Paper Title: Navigating teaching from beginning: Two cases of first teachers accessing and utilizing resources

Abstract

This study reports on the first stage of a longitudinal set of case studies focused on how new lower-secondary mathematics teachers navigate their first years of teaching. I discuss the cases of two teachers working in similar lower secondary schools who went through the same teacher preparation program, completed their field experiences at the same upper secondary school, and are having fairly different first-year teaching experiences. Analyses of interview transcripts reveal many of these differences can be traced to the teachers’ varying access to and uses of four types of resources: colleagues as resources, knowledge resources, beliefs as resources, and physical resources.

References


SYMPOSIUM
Abstract

This paper will discuss declining math results of Czech students in international assessments, like PISA and TIMSS, with main emphases given to TIMSS 8th graders (population 2) assessments. The paper will present briefly few available interpretations of Czech declining math results provided by researchers (based on literature review) and then go on to teachers’ interpretation of this negative trend shown in our data. Using online questionnaire we have asked 1126 math 8th-grade teachers about their interpretations of the causes of the negative trends in math results and the about their views on various policy options to intervene and reverse the negative trends. Questions were asked using both, open-ended and multiple-choice format items and options of interventions were including both internal (within school factors, factors that could be influenced directly by school) and external (societal, macro-level) factors. The data show support for both internal and external factors, as will be shown in this paper.
Abstract
The presentation briefly describes Czech students’ performance in mathematics including trends in the two large scale studies – TIMSS and PISA. TIMSS is an international assessment of mathematics and science at the fourth and eighth grades that has been conducted every four years since 1995 and is organized by IEA.

PISA is an international study that was developed by the OECD. It evaluates education systems every three years by assessing 15-year-olds’ competencies in the three subjects: reading, mathematics and science. The Czech Republic participated in all cycles of PISA.

Between 1995 and 2007 Czech students declined the most compared to all participating countries in mathematics in TIMSS. Since 2007, fourth grade students have shown statistically significant improvement.

Also PISA average mathematics achievement of the Czech Republic was decreasing from 2003 to 2009.

References


Abstract

There has been substantial interest in estimating the contribution of teachers to the amount that students learn during an academic year of instruction. A popular method for doing such estimation is to use statistical regression analysis methodology to determine the predictive weight of a teacher for the level of achievement of students after a year of instruction. The value of the weight is considered as a measure of the value-added of the teacher to students learning. The models that are used produce estimates that tell how well a teacher is performing relative to the average teacher, but it does not give any information about how well the average teacher is doing. This presentation describes an alternative method that considers the level of challenge that students pose to the teacher as an important variable and then determines the level of performance relative to the level of challenge of students that they can bring to a desired level of achievement. This approach directly connects indicators of teacher performance to desired standards of achievement. The approach is demonstrated using actual data from a group of teachers working to help students reach a desired level of performance on a reading test.
POSTERS
Abstract

14-15 years old students posed problems based on two situations from two different mathematical environments – a geometrical environment (a grid with two polygons) and an arithmetical environment (a real-life situation from a boutique). They posed two problems for each situation – an easy and a difficult problem for the students of the same age. The posed problems were analysed from the perspective of different problem variables. This paper shows some results of the analysis of variables linked with the mathematical model of a problem, especially the types of numbers used in the problem, numbers that are necessary to solve the problem and the variables of comparison of the mathematical model of an easy and a difficult problem posed by a student for one of the situations.

References

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Paper Title: Exploring the Achievement and Attitude of Selected Filipino Students towards Algebra using Transfer Approach

Abstract

The study explored on the effectiveness of a designed teaching and learning approach, called the “transfer approach”, on the Mathematics achievement and attitude of selected Grade 10 Filipino students. With the same set of topics, the traditional lecture method of teaching was used in the control group, while the transfer approach where the students were given real-life tasks was used in the experimental group. The scores of the students in the pen-and-paper achievement test showed that transfer approach and traditional approach are equally effective; however, their scores in the performance-based assessment revealed that transfer approach can better improve students’ achievement. On the other hand, students’ attitude remained the same as determined by their scores in an attitudinal questionnaire before and after the experiment. Journal entries and interviews revealed that the students who were exposed to transfer approach had improved perception on the subject. Hence, transfer approach is an effective way of improving students’ mathematics achievement and attitude.

References


Abstract

In teaching pupils aged 11-15 years, we can use various tools to support the teaching of mathematics. One of the most versatile tools is dynamic mathematics software GeoGebra. The program, which as the name suggests, provides to link the geometry to algebra is an interesting wide possibility of application. Depending on the type and method of use the applet can also change its function in the math curriculum (e.g. Preiner 2008).

Poster presents individual features that can program GeoGebra in teaching take. The program can be used for example like a graphical interpretation of the definition, geometric sketches, creating new jobs and as a production tool motivating examples, generation of new jobs. Finally can assist in solving problems with parameters and may also bring an entirely new type of tasks (e.g. Iranzo 2009).

References


Abstract

The integrated form of education for intellectually gifted children dominates in Czech schools. Teachers are trying to find appropriate educational provisions for the gifted in mixed ability classes. Psychologists from specialized departments write reports for parents of a gifted child and his/her school. From these reports, there is an obvious emphasis on enrichment versus acceleration in the education of gifted children in primary school. The poster brings some examples of tasks and findings from an empirical probe of work with a gifted pupil at a primary school level. This pupil shows a noticeable talent just in mathematics. Characteristics of mathematical tasks that are suitable for independent work of such pupil were studied. Especially a difficulty, a topic, a divergent or convergent character of a task, a level of using direct manipulation and also evaluation feedback to the learner seemed to be very important in this matter.

References


The analysis a priori is an important instrument of the Theory of the Didactical Situations. It is conducted before the lesson. In a didactical situation, the teacher makes the students accept the responsibility for a learning situation or for a problem, and accepts the consequences of this transfer of this responsibility (devolution). In order to manage this situation (s)he tries to foreshadow the course of the lesson: to reveal the steps of the lesson, to predict possible reactions and attitudes of pupils and his/her reactions, to discover possible solving strategies, to determine what previous knowledge pupils will need for successfully apply their solving strategy and what „new” knowledge they may discover. On this poster, an analysis a-priori of one concrete task will be shown.
Abstract

During this age of accountability, where emphasis is placed on research-based practices, there is a need for professionals to be able to consult as well as interpret research in their workplace. Consequently, during the last decade, special attention has been paid to exposing college students to research experiences and research courses. In the field of education, drawing teachers into the research process appears to provide a vital foundation for the development of teaching as an evidence-based profession (Papanastasiou & Karagiorgi, 2012). Teacher research has been viewed as a tool enabling the transformation of educational practice, while making important contributions to the knowledge base in education. In an attempt to study the links between research coursework and research involvement, the Attitude Towards Research Scale (ATR) has been developed (Papanastasiou, 2005). This purpose of this poster is to present the results of the confirmatory factor analysis of the ATR scale with a sample of college students from Cyprus.

References


Abstract

Problem posing is a large topic where various aspects can be studied. The main approaches go through examining the characteristics of posed problems (e.g. Leung & Silver 1997) or through examining the problem posing process (e.g. Pelzer & Gamboa 2009). The poster shows the second approach – examining problem posing process according to idea types. Three idea types that proved to be useful for finding differences between problem posing trajectories of experts, specialists and beginners are introduced: trial-error, semi-intentional and intentional ideas.

Trial-error ideas don’t show any sign of intent. Intentional ideas are the opposite – the poser knows exactly what he/she wants. (This idea type is usually connected with backward computation.) Semi-intentional ideas are all ideas that are either trial-error nor intentional ones.

The main of the research results is that the more skilled the problem poser is, the more likely an intentional idea occurs in his/her problem posing process.

References


The poster was presented at ICME 2012.
The contribution is supported by grant GAUK 303511.
Paper Title: **Fairy Tale World as an Environment for Development of Pupil’s Thinking**

**Abstract**

In didactical subjects at Faculty of Science, Humanities and Education in Liberec, which are focused on task solving methods we create different model of real environments. Within them, problems, which are thematically connected and supposed to put the pupils in a real situation, are being solved. If we take the Fairy tale world (as a natural environment for kids of younger school age) into account, we can connect some of the themes (e.g. shopping, transport, nature, travelling) with typical fairy tale characters and their stories. In poster we illustrate some of elaborated topics of students of primary school education. First one deals with Building topic (connected with characters of PAT and MAT), second one with Postal (mail) service topic (connected with characters Postman PAT and his friend ALEX). We focus on motivation, diversity of problems, correctness, feasibility and currency of data, solving methods, overall elaboration and methodical remarks as well.

**References**


Seminar works of students of primary school at PF TUL.
Development of attitudes towards problem solving of third, forth and fifth graders in Czech primary school

Abstract

The poster focuses on research of inclusion of integrated word problems into mathematics lessons at the primary level of Czech school. Integrated word problem (IWP) is one of the types of word problems. IWP integrates goals of many subjects to one – integrated goal. The research experiment focuses on IWP across particular school subjects. The influence on pupils’ attitudes towards problem solving is analyzed. Research results proved that pupils’ attitudes toward problem solving above all depend on organization of content. The paper includes these points of view: ways of content arrangement contributing to development of attitudes towards problem solving; integrating goals of subject matter into the IWP; sorting word problems by subjective difficulty; statistically analysis of results (semantic differential and method of unfinished sentences).

References


Paper Title: **Pupils’ model based problem posing**

**Abstract**

The poster describes an activity that has been applied at 8th grade at lower secondary school in Prague. Pupils cut a sheet of A4 paper to create a model of two congruent triangles and a small rectangle. They expressed the area of these two shapes. Then, they assembled the parts of the model to compose various geometrical objects. During this activity, pupils were encouraged to pose their own mathematical problems based on the model and to offer possible solutions. The activity gives an actual example of connecting practice and theory in geometry teaching and learning. The practical part is represented by the experimental manipulation with the model, which enables the pupils to pose the problems. On the other hand, the solutions to the problems are communicated to other pupils with the help of the theoretical concepts underlying them.

**References**


Paper Title: **Studying Nebraska’s New Mathematics Teachers**

**Abstract**

In Nebraska, two grants from the National Science Foundation are funding professional development for and research related to new mathematics teachers. Nebraska does not have any type of state policy regarding new teacher induction, so teacher support varies widely, and in some cases is non-existent. What we are finding about supporting new teachers centres on three types of support: ongoing professional development, instructional mentoring, and induction into professional learning communities. Currently, we are collecting interview and observation data from 6 new secondary mathematics teachers as they navigate their first year of teaching in a high-need Nebraska school to develop case studies of new teachers. Preliminary analyses show that teachers’ varying uses of resources (colleagues as resources, physical resources, knowledge resources, and beliefs as resources) are connected to teachers’ differing experiences as they begin their first year teaching.

**References**

Abstract

In our contribution we describe learning trajectories of two pre-service teachers, one from England and one from Slovakia, during their student teaching. Based on the two cases, we address the possible way of implementing reform pedagogy into their teaching through intervention and reflection. At the beginning, pre-service teachers needed to adapt to already designed lesson plans and chosen tasks. Based on their teaching, they needed to redesign it according to their own practice. To do that, the teacher needed to reflect on their teaching in relation to students' learning, understanding, and active involvement. This realization caused pre-service teachers' learning in several domains (Clark & Hollingsworth, 2002). We focused our attention on the learning in special content knowledge (Ball & al., 2008). As a direct outcome is their ability to redesign their own teaching units according to new realization.

References

