

Short presentations

Students determining the median for different data sets: a spectrum of responses

JÖRAN PETERSSON

Stockholm University

The present study reports on 359 students' responses to two test items on the median. Among the responses were other measures of location such as the arithmetic mean and the midrange. Moreover, among those who used a median strategy there was a spectrum of sources of confusion in the data set. In one test item the data were given in a table of signed integers and some students ignored the negative signs in the data. In the other test item the data were given in a bivariate diagram. Instead of correctly using the horizontal coordinate of the data, several students used the axis grading or the vertical coordinates as data. A conclusion is that the representation format of the data had a large effect on the achievement on the two test items.

Mot en förklaring av den Nya matematikens framgång och misslyckande i Sverige

JOHAN PRYTZ

Uppsala University

Den Nya matematiken infördes på bred front i den svenska grundskolan då Lgr69 trädde i kraft, vilket var relativt sent i jämförelse med andra länder. I Sverige hade under en stor del av 1960-talet gjorts försök med den Nya matematiken. Läromedel och styrdokument hade testats och utvecklats genom försöksundervisning i ett flertal skolor, i vissa klasser upp till tre år. Resultaten från försöksundervisningen redovisades bland annat i rapporten Nordisk skolmatematik. Vid slutet av 1960-talet fanns det både i och utanför Sverige en tydlig kritik mot den Nya matematiken. I denna presentation redovisas en analys av denna kritik. I analysen prövas kritiken mot de resultat som erhöles från den svenska försöksundervisningen under 1960-talet.

Samhällets olycksbarn – en studie av elever med låga prestationer i matematik

INGEMAR KARLSSON

Lunds universitet

Syftet med studien som ingår i ett avhandlingsprojekt är att genom litteraturanalis av tidigare forskning samt intervjuer av lärare och elever redovisa förklaringar till uppkomsten av matematiksvårigheter. En begränsad forskning har medfört svårigheter att ge en enhetlig definition av begreppet dyskalkyli. Denna term definieras ofta som en biologiskt influerad avvikelse vilken kännetecknas av svårigheter att lära och tillämpa matematik. Sociokulturella faktorer, exempelvis föräldrarnas utbildning och kulturella kapital får istället allt större betydelse för elevernas resultat i skolan.

Framework of linguistic properties to compare mathematics tasks in different languages

CRIS EDMONDS-WATHEN, EWA BERGQVIST & MAGNUS

ÖSTERHOLM

Umeå University

This study aims to construct a framework of linguistic properties of mathematical tasks that can be used to compare versions of mathematics test tasks in different natural languages. The framework will be useful when trying to explain statistical differences between different language versions of mathematical tasks, for example, differences in item functioning (DIF) that are due to inherent properties of different languages. Earlier research suggests that different languages might have different inherent properties when it comes to expressing mathematics. We have begun with a list of linguistic properties for which there are indications that they might affect the difficulty of a task. We are conducting a structured literature review looking for evidence of connections between linguistic properties and difficulty. The framework should include information about each property including methods used to measure the property, empirical and/or theoretical connections to aspects of difficulty, and relevance for mathematical tasks.

Linguistic properties of PISA mathematics tasks in different languages

EWA BERGQVIST, FRITHJOF THEENS & MAGNUS ÖSTERHOLM

Umeå University

The mathematics PISA tasks are primarily supposed to measure mathematical ability and not reading ability, so it is important to avoid unnecessary demands of reading ability in the tasks. Many readability formulas are using both word length and sentence length as indicators of text difficulty. In this study, we examine differences and similarities between English, German, and Swedish mathematics PISA tasks regarding word length and sentence length. We analyze 146 mathematics PISA tasks from 2000–2013, in English, German, and Swedish. For each task we create measures of mean word and sentence length. To analyze if there are any differences between the three language versions of the tasks, we use *t*-tests to compare the three languages pairwise. We found that in average, the German versions have the longest words, followed by Swedish and then English. Average sentence length was highest for English, followed by German and then Swedish.

Teaching mathematics as contribution to interaction

ANDREAS ECKERT

Linnaeus University

The theoretical discourse on students learning has reached a state of maturity over the years whereas the theoretical discourse on teaching has fallen behind. The aim is to open up for a discussion about teaching in terms of contribution to interaction in the mathematics classroom. Symbolic interactionism forms the base of the theoretical discussion and learning is operationalized through the learning metaphor of contribution. The result is a conceptual framework of teachers engaging in social interaction and a negotiation of meaning, they actively contribute to the negotiation as well as they transform their own understanding of prior events. As meanings are derived from and handled in social interaction, it allows us to define the role of the teacher as an active contributor to students' development. By conceptualizing teachers as active contributors, we are one step closer to operationalize teaching within a theoretical frame of symbolic interactionism.

Using mathematical modelling activities to motivate biology students to learn mathematics

OLOV VIIRMAN, SIMON GOODCHILD, YURIY ROGOVCHENKO

University of Agder

This short presentation describes a collaborative project between two Norwegian centres of excellence in higher education in which mathematical modelling tasks are introduced to biology students as a means of motivating students to engage more deeply in mathematical studies. An ongoing mathematics teaching developmental pilot study is described, and some results regarding students' affective responses are presented – their motivation to engage in the tasks and in mathematics. The responses indicated that they found the activities worthwhile, and that similar activities would be of value as a part of their regular course in mathematics. These responses suggest that inclusion of mathematical modelling in authentic situations may have a positive impact on these students' motivation to study mathematics, and we conclude that these results support the continuation of the project on a larger scale.

Nationella prov i matematik: stöd vid betygssättning?

MARCUS SUNDHÄLL, FRIDA WETTERSTRAND, PER NILSSON &

CHRISTIAN LUNDAHL

Örebro universitet

De svenska nationella proven har över tid haft olika syften. I samband med läroplansreformen 2011 tillkom syftet att kontrollera lärares bedömningar. I samband med att Örebro universitet fick i uppdrag av Skolverket att undersöka nationella provens inverkan på lärare och skolans arbete i grundskolans år 6 och 9 under hösten 2014 till hösten 2015 framkom en tydlig problematik kring det kontrollerande syftet, i synnerhet inom matematik. Resultatet av studien visar att lärare i matematik är, jämfört med lärare i andra ämnen, särskilt intresserade av att få sitt bedömningsarbete granskat. Däremot ser vi en tendens till att det fokus som finns, särskilt från media, på diskrepanser mellan provbetyget på nationella proven och slutbetyget har en negativ inverkan på lärares möjligheter att använda provbetyget som stödjande vid betygssättning.

Educational planning in mathematics as a part of macro-sociological structures

HELENA GRUNDÉN

Linnaeus University.

All teachers in mathematics somehow plan for their teaching. They have considerations and make decisions that will influence what is happening in the classroom and thereby also what opportunities their students have to learn mathematics. Considerations and decisions are made in a social practice with power relations operating both within the practice itself and between practices. In a forthcoming study about planning of mathematics teaching these power relations will be explored. In this presentation different methods for exploring the power relations are discussed.

Conceptualizing mathematical reasoning – a literature review

ALEXANDRA HJELTE

Örebro University

Is there a universal conceptualization of mathematical reasoning in mathematics education research? By investigating articles in the three highest ranked journals over the past ten years I have found a scattered picture of how mathematical reasoning is conceptualized. There is a need for a more systematic approach to understanding and analyzing mathematical reasoning.

Discourse analysis as a theory and tool investigating inclusion in mathematics

HELENA ROOS

Linnaeus University

In this paper initial thoughts of research methodology and theory in an upcoming Ph. D. project is presented. This project is an extension of a previous licentiate project regarding inclusion in mathematics from a teacher perspective.

Ett ramverk för att analysera matematiktexter med avseende på relationer mellan textens delar

ANNELI DYRVOLD

Umeå universitet

In order to understand more about difficulties related to the reading of mathematics text it is important to understand the role different features of the task text plays in the interpretation of the text. The proposed framework enables an analysis of particular textual features that make a text stick together, namely cohesive features. The framework is based on theory for cohesion and has been developed to catch important features of a mathematics text. Nine different types of cohesive relations are defined; these relations exist both within natural language, and between natural language and other semiotic resources. The framework has been developed to enable reliable coding of a substantial amount of text for the purpose of statistical analyses.

Mathematics teachers' communication about educational goals – a comparison between students' beliefs, teachers' descriptions and teaching

LENA HEIKKA

Luleå University of Technology

The aim of this study is to explore Swedish upper elementary school students' experiences of mathematics teachers' assessment practices, with a focus on educational goals communicated between the teacher and the class. In this multiple-case study with an ethnographic approach, three cases are viewed from a holistic perspective, by adapting *Visual model of the curriculum policy, design and enactment system* by Remillard and Heck (2014) to a Swedish context.

Results of the study show the complexity and variation of the communication about educational goals in relation to the syllabus in mathematics. Students in all three cases express and show a lack of knowledge of syllabus in mathematics and the textbook is considered as a concretization and visualization of the syllabus content. Teachers' expressed lack of knowledge about the syllabus in mathematics is probably due to insufficient implementation efforts of the curriculum, Lgr11.

The discourse regarding the multilingual student in need of support in test-instructions

ANETTE BAGGER

Umeå University

This paper discusses parts of the discourse on multilingual pupils in need of support in the national test in mathematics in the third grade. A content analysis was done on the test-instructions from the years 2010–2014. A shift in the discourse was seen, from being about students in need to being about students with disabilities. The results show that instructions have moved from a relational towards a more categorical perspective on the student. One implication following this is that teachers receive less guidance in their mission to help pupils who need language support.

A mathematical representation of the heart

DJAMSHID FARAHANI

University of Gothenburg

The research reported here aims at providing possible explanations of how students interpret graphical representations of natural but complex phenomena. Mathematical representations such as diagrams, histograms, functions, graphs, tables and symbols normally make it easier for us to communicate and understand abstract mathematical concepts or other phenomena described in mathematical terms. Our investigation concerns upper secondary school student's understanding and interpretations of mathematical representations of a heart's work. The outcome further indicates that those students' alternative conceptions about graphical patterns and distance-time graph can be explained by ontological categorization of existing concept.

