



Improvising within a Lesson Study process: Israeli teachers' perspectives

Galit Nagari-Haddif, Ronnie Karsenty and Abraham Arcavi

Abstract

Lesson Study is a process of meticulous and collaborative lesson planning, spanning from a detailed definition of the lesson's objectives and overall structure to specific aspects such as anticipating student responses and designing teacher actions according to various scenarios. In contrast, improvisation is perceived as an entirely opposite process, fundamentally involving spontaneous responses to unforeseen circumstances. This paper presents a study that examines the tension between planning and improvisation in lessons developed within Lesson Study teacher communities in Israel. As background to the study, we review the phenomenon of improvisation across different fields and its cultural and social foundations. Then, through case studies, we explore four patterns of improvisation that emerged and analyze the relationship between improvisation and planning within each such pattern. Additionally, we examine expert teachers' perceptions of improvisation and planning in the context of teacher-student interactions during lessons planned through the Lesson Study process. Finally, we discuss potential implications of improvisation for the ways in which teachers in Israel engage with and implement Lesson Study.

Keywords: improvisation; planning; lesson study; professional development of mathematics teachers; professional learning communities.

Enhancing mathematical verbal problem-solving and production through fostering self-regulated learning in elementary school students

Inbal Koloshi-Minsker

Abstract

This study examines how fostering self-regulated learning, through an integrated model based on two theoretical frameworks—Self-Regulated Learning (SRL) to enhance cognitive and metacognitive orientation, and Self-Determination Theory (SDT) to support motivational-emotional orientation—can improve students' ability to solve mathematical verbal problems and facilitate their transfer from problem-solving to problem-production.

The research involved 383 third- and fifth-grade students from three public elementary schools with similar nurturing indices. Each school implemented a distinct intervention program designed according to the principles of self-regulated learning: (1) SRL-based intervention, (2) SDT-based intervention, and (3) a combined SRL+SDT intervention.

Findings indicate that students who participated in interventions integrating both cognitive/metacognitive (SRL) and motivational-emotional (SDT) components (SRL+SDT), or in the SRL-only program, showed significant improvement in problem-solving and successfully transferred their skills to problem production. In contrast, students exposed only to SDT-based intervention exhibited a decline in problem-solving performance but nonetheless demonstrated improved ability to transition to problem production. Additionally, fifth-grade students were found to generate more quantitatively structured and mathematically complex problems compared to third-grade students. This study's model and intervention programs offer valuable insights for mathematics educators, providing structured and integrated self-regulated learning strategies to enhance students' problem-solving abilities and support their progression toward mathematical problem production.

Keywords: mathematical verbal problems; Self-Regulated Learning (SRL); self-determination theory (SDT); elementary school students; problem solving; problem production.



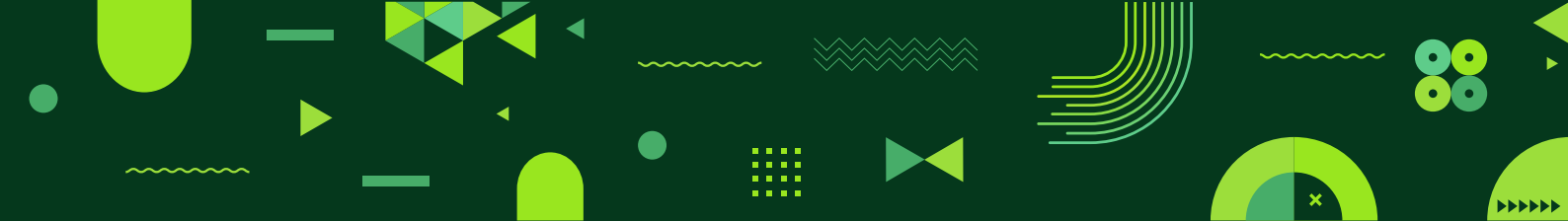
Opportunities and challenges reflected in the teaching and learning of mathematics on WhatsApp on the background of the national project Bagroup

Ruti Segal and Yaniv Biton

Abstract

In the current study, we examined teachers' perspectives on the learning and teaching opportunities that can be created through WhatsApp as a social network to help students prepare for mathematics matriculation exams within the Bagroup project. The project was launched by the Ministry of Education and the Center for Educational Technology three months before the matriculation exam to serve as an additional environment for mathematics learning. The study involved 24 mathematics teachers who guided the learning processes in WhatsApp groups, each containing approximately 100 students. They implemented blended learning that included both synchronous and asynchronous instruction, presented mathematical problems to solve, and provided solutions to problems that students found difficult. Using quantitative and qualitative research tools, the teachers' perspectives on learning and teaching opportunities that emerged alongside challenges were analyzed. The mixed-method research approach enabled a comprehensive understanding of the reasons behind teachers' attitudes toward learning and teaching via social networks in the Bagroup project. Quantitative and qualitative data were collected through three tools: a questionnaire including Likert-type closed questions and open-ended questions, semi-structured interviews, and observations in four WhatsApp groups conducted over a three-month period. Factor analysis revealed three categories of the Bagroup environment: factors contributing to the emotional needs of the learner, factors promoting learning, and factors inhibiting learning. The findings of the current study may influence learning and teaching opportunities in social networks and distance teaching.

Keywords: social networks; communication; social-emotional learning; mathematics teachers' knowledge; secondary school mathematics teaching.



The contribution of collaborative learning to mathematical problem solving among students learning to teach mathematics

Tsurit Elitzur

Abstract

Working in a collaborative group setting, and its contribution to dealing with complex mathematical problems, has been of interest to the research world in recent years, and is increasingly penetrating mathematics curricula as part of 21st century skills.

The following article is a summary of extensive research I conducted, which examined the contribution of collaborative learning to complex mathematical problem solving among students learning to teach mathematics.

As part of the study, two separate classes of were compared, who studied the same course on 'Mathematical Problem Solving Strategies'. In one class, a great deal of emphasis was placed on collaborative learning, with problems being solved in small collaborative groups. In the second class, the class was conducted without this emphasis, and the students solved the problems individually. The analysis of the findings in the two classes made it possible to examine whether there were differences between the two groups, and whether collaborative learning contributed to the students' skills in solving mathematical problems.

The main findings were based on a comparison between the pre-test that all students took at the beginning of the course, compared to the post-test at the end. The tests tested the students' mathematical skills and their argumentative skills in solving problems. The findings showed that both courses started from a similar starting point, and in both courses there was an improvement in both mathematical skills and problem solving skills. However, in the course which emphasized cooperative learning, the improvement in both indicators was significantly greater.

.and teaching opportunities in social networks and distance teaching

Keywords: cooperative learning; problem-solving strategies; mathematical argumentation; problem-solving skills.



Professional identity exploration of mathematics teachers through body mapping: Perspectives of mathematics education students

Ariel Levin

Abstract

The present study's premise lies in the significance of examining mathematics teachers' professional identity as perceived by students in the field as part of their professional preparation. This exploration of professional identity was conducted, for the first time, using body mapping methodology combined with interviews. This tool provides participants with a means to communicate and express ideas, meanings, and emotions, while offering opportunities to explore and realize professional identities related to teacher education. The examined components of professional identity included the intrapersonal component—how teachers view themselves, and the interpersonal component—how society views both the teacher and the profession. The findings reveal aspects characterizing the profession, such as the development of creative thinking, establishing order and boundaries, and the importance of investment; characteristics of mathematics teachers as accepting and containing while maintaining boundaries; and society's perception of mathematics as a challenging and important discipline. The study's contribution to teacher education lies in providing students with opportunities to develop reflective processes in teaching in general and mathematics in particular, concerning their identity as teachers.

Keywords: professional identity; mathematics teacher education; body mapping.

Misconceptions of relational symbols among pre-service teachers for early childhood and grades 1–2

Dina Hassidov and Bat Sheva Ilany

Abstract

This study examined the understanding and use of the mathematical relational symbols ($<$, $>$, $=$) among 158 pre-service teachers for early childhood (pre-primary) and Grades 1–2. Participants included prospective kindergarten and early primary school teachers, some of whom had completed a dedicated course on the topic, while others had not. The research employed a mixed-methods design, combining quantitative and qualitative approaches through a 25-item questionnaire and semi-structured interviews. The analysis focused on the “quantity” dimension and compared three groups: Grade 1–2 pre-service teachers who had studied the topic, Grade 1–2 pre-service teachers who had not, and pre-primary pre-service teachers.

Findings indicate varied, and often incorrect, uses of relational symbols, with a tendency to rely on visual features or everyday contexts (e.g., number of items, size, shape) rather than their formal mathematical meaning. A statistically significant advantage was found among those who had studied the topic, who demonstrated higher rates of correct answers and consistent mathematical reasoning. Among those without prior instruction, three main categories of misconceptions emerged: (1) the belief that relational symbols refer to any visual attribute rather than solely to numerical value; (2) interpreting graphical objects as numbers; (3) using contradictory relational symbols for the same pair of numbers.

The discussion highlights the necessity of systematic training for early childhood educators in the language and rules of mathematical representation, as well as the development of activities that generate cognitive conflict to promote the distinction between everyday and formal mathematical uses of relational symbols. The results underscore the importance of strengthening formal symbol comprehension during teacher preparation to prevent the transmission of misconceptions to future learners

Keywords: early childhood mathematics education; relational symbols; misconceptions; teacher education; symbolic thinking.



The added value of a Wiki environment in creating learning opportunities for prospective mathematics teachers : The case of a percentage problem

Dorit Cohen

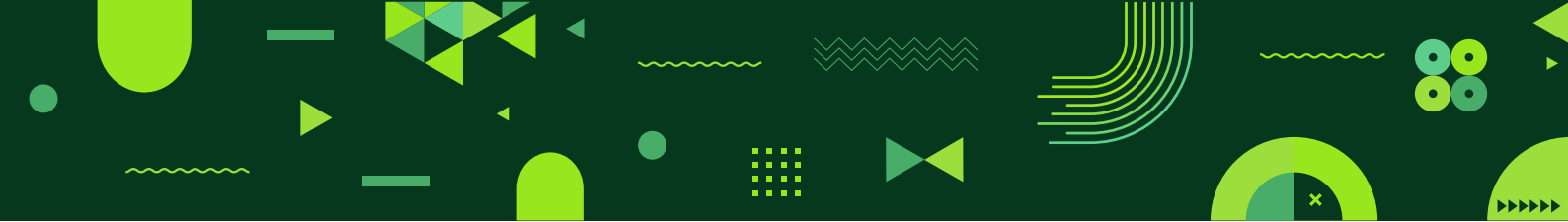
Abstract

The study focused on the learning and teaching of pre-service mathematics teachers in a wiki-based environment during a teacher training course as part of a mathematics teaching certificate program for secondary education. The wiki environment was integrated into the regular course instruction in an attempt to address the "telling/not-telling" dilemma and was intended to provide additional learning and teaching opportunities. The aim of the study was to identify the learning and teaching opportunities afforded by such an environment and to examine differences among learners in terms of their utilization of these opportunities. This, in turn, aimed to offer solutions for the instructor in promoting student learning while transferring learning responsibilities to them.

The present article presents one of the three different teaching sequences examined in the broader study. The teaching sequence described here focused on the "Father and Son Problem," a word problem involving percentages that students were required to solve using two different approaches, thereby creating a cognitive conflict. The study followed the methodology of design-based research. To identify the added value of integrating the wiki environment, a comparison was made between learning in the course without the environment and learning and teaching with the environment in the teaching sequence focused on the "Father and Son Problem."

The findings indicate that the main contribution of this environment to the "Father and Son Problem" was in the collaborative phase that took place at the end of the teaching sequence. This phase provided an opportunity to summarize the problem-solving process and the overall teaching objectives. Differences were found among learners in their interactions with the environment, which may affect the extent to which they utilized these opportunities.

Keywords: Mathematics teacher training; cognitive conflict; wiki; collaborative learning; percentages.



Clinical simulations with actors in a mathematics teacher training course, and their impact on participants' knowledge and self-efficacy

Iris Schreiber

Abstract

This article describes part of a study that integrates simulation workshops with actors in a mathematics teacher training course. This article presents the findings of interviews with six mathematics teaching students who participated in this process. The findings of the interviews shed light on the process that the students went through in the workshops and the impact that these workshops have on the student's knowledge: what knowledge component is expressed in the workshops, do students feel that they have acquired knowledge during the workshops, and whether this workshop affects their sense of self-efficacy. Findings on knowledge indicate that specific knowledge components are not expressed in simulation (whether by choice or due to lack of knowledge) and that the students feel they are acquiring knowledge in the workshops. Findings on the student's sense of self-efficacy in their knowledge indicate that the process does not increase the degree of self-efficacy for some of them and may even undermine it.

Keywords: pedagogical-content knowledge; self-efficacy; simulation.



Mentoring in times of crisis: Fostering emotional awareness to strengthen the educational resilience of preservice mathematics teachers

Galit Nagari Hadif, Mirela Widder, Ilana Waisman and Anna Prusak

Abstract

Academics play a dual role in educating and nurturing the educational resilience of their students. On one hand, they are subject-matter lecturers whose role is to teach and follow course syllabi. On the other hand, they serve as mentors to students in crisis, providing emotional and professional guidance and fostering their educational resilience. Embracing these dual roles, lecturers become mentor-teachers—or, as coined by Prof. Avi Levy, President of the Shaanan Academic Religious College, morentors (a portmanteau of “moreh” [teacher] and “mentor”).

Strengthening educational resilience is particularly vital in times of national crisis, such as the ongoing “Iron Swords” war. The national crisis in Israel has further emphasized the urgent need to retain potential mathematics teachers in academia, making the educational resilience of future math teachers a pressing concern—especially given the existing shortage of both qualified teachers and teacher candidates in the field of mathematics.

Emotional self-awareness is known to influence individuals’ ability to pursue their goals and therefore plays a critical role in promoting educational resilience. Mentorship can contribute to the development of emotional self-awareness and support the coping processes of students returning to mathematics education studies after active military reserve service.

This article presents a case study that explores the emotional journey of a preservice mathematics teacher who returned to his academic studies during the Iron Swords war, following a period of active reserve duty. The study focuses specifically on changes in the student’s emotional awareness, as reflected in his spoken accounts during a workshop and follow-up interviews. The findings demonstrate how a mentoring process can foster emotional transformation in the mentee and help support a more positive and resilient mindset.

Keywords: mentoring; morentor; emotional self-awareness; educational resilience; the emotion tree (blobtree); “correspondence with the Professor”