SIG 5 2020 Pre-Conference – symposia

Symposium 10742

**Belongingness, identity and acculturation and young children's
education and development.**

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Children's immediate environments such as homes and schools constitute the most
primary and influential contexts for their development. Feelings of belongingness,
identity and acculturation can affect families' and children's well-being, as well as
how the home learning environment (HLE) is shaped. In this symposium, we bring
together findings of four studies that were all conducted within the frame of the larger
European ISOTIS project to investigate the role of acculturation and identity from the
perspectives of both parents (survey data and in-depth interviews) and children
(qualitative research methods). In the first presentation, we focus on the role of
acculturation attitudes and experienced inter-group relations of Turkish or
Maghrebian immigrant parents living in different European countries for parental
well-being and self-efficacy. Next, we go a step further by investigating variations in
acculturation attitudes of specifically Turkish immigrant parents and how these are
associated with the HLE that parents create. Following, we will elaborate on the
effects of the linguistic institutional habitus of (pre)schools on Turkish families' sense
of belonging and identity construction in the German context. Finally, we address the
perspective of young children in multicultural classrooms on identity, belongingness,
and well-being in the (pre-)school environment. The findings from these studies will
be discussed in terms of permeability and continuity of children's environments, as
well as implications for multicultural education settings.

Paper 1:   11312
**Acculturation, intergroup relations and well-being of Turkish and Maghrebian
immigrant parents**
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Abstract
The immigrant-native subjective well-being gap (i.e., lower levels of well-being in
immigrant samples) is well documented in Europe (e.g., Safi, 2010; Hendriks &
Bartram, 2016; Arpino & Valk, 2018). Research has identified multiple factors
accounting for this gap, ranging from individual level variables (e.g., immigrant
generation, educational level), to more relational and intergroup factors (e.g.,

perceived discrimination, social support). The current study extends previous findings by focusing specifically on parents with a Turkish or Maghrebian immigrant background with a 3-12 year old child in five European countries (the Netherlands, Germany, Italy, England and France, N = 1744). Both the experienced intergroup relations (i.e., perceived discrimination and intergroup contact with natives), but also parents' acculturation orientations (preference for cultural maintenance, adoption and intergroup contact) are investigated, and how these relate to parental well-being, belonginess and self-efficacy, over and above the impact of traditional demographic variables. Results show that, in terms of acculturation orientations, parents with an immigrant background favor cultural maintenance over cultural adoption, though they do value intergroup contact with natives. In addition, feelings of material deprivation and perceived discrimination were associated with lower levels of well-being and belongingness, whereas experiences of positive intergroup contact were positively related to parental wellbeing and belongingness. For parental self-efficacy, both positive intergroup contact experiences, though also orientations towards cultural maintenance, were important. Follow-up analyses will further examine differential relations within groups by country. Findings will be discussed in light of context-sensitive policies regarding immigrant parents' successful integration in European societies.

Paper 2: 11313

Acculturation Profiles of Turkish Immigrant Mothers as Related to the Home Learning Environment

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Paul Leseman, Utrecht University

Abstract

Turkish immigrants in Europe express relatively high educational aspirations when compared to natives and other minority groups (Salikutluk, 2016; Tjaden & Konkler, 2017), however, several studies show that Turkish immigrant children perform lower in school compared to their native peers (e.g. Arikan, van de Vijver, & Yagmur, 2017). Apart from the fact that it might be structurally challenging to invest in a supportive home learning environment (HLE) for their children (Melhuish et al., 2008), families' acculturation attitudes might influence the characteristics and the quality of the HLE that they create. The aim of the current study is to understand the variations in acculturation attitudes of Turkish immigrant parents living in Europe, and how these differences in acculturation preferences are reflected in the HLE. We conducted latent profile analysis (LPA) (N = 943) to first investigate the within group differences. LPA yielded four distinct profiles of acculturation (integration,

separation, assimilation, and marginalization), overlapping with Berry's model (2005) of acculturation. Preliminary comparisons showed differences between these acculturation profiles and different aspects of the HLE. For example, parents' engagement in oral storytelling activities was higher in the separation profile compared to the other acculturation profiles. These results indicate that families' attitudes towards acculturation might have an impact on specific domains of the HLE. Further analyses will examine the relationships between acculturation profiles and parents' engagement in different aspects of the HLE. The findings will be discussed in terms of using social and cultural resources of families to foster the HLE.

Paper 3   11373
The Isotis Child Study on well-being and inclusion at school

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Abstract
Social inclusion has become a key issue in the academic debate across disciplines and an inescapable priority for the worldwide political agenda, especially in the field of education (UNESCO 2005, 2013, 2014; OECD 2018a, 2018b). Research on the impact of exclusion and discrimination on children and childhood demonstrates that 'the challenge of future inequalities can only be met through child policies for social inclusion' (Cook et al., 2018:16). Children are attributed a central role in the social inclusion policy agenda, yet most initiatives to implement this agenda 'were and are still designed, delivered and evaluated by adults' (Hill et al., 2004). Children are still not enough allowed to express their viewpoints on social inclusion.

The international participatory research 'Feel good: Children's view on inclusion' (authors, 2019) - set within the EU-funded ISOTIS project– examined children's views on inclusion and their proposals on how to make their school and classrooms (more) welcoming and inclusive. The data were collected through a multi-method and participatory methodology, in preschool and primary schools characterized by strong cultural differences and social inequalities of eight European countries in 2018-2019. The paper will present a cross-country analysis on the main results: what children identified as the main factors promoting and undermining well-being and inclusion, and the transformative factors and proposals to ensure inclusion and well-being. Reflections on the main educational and formative impact of the study on children and teachers will be shortly addressed.

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Paper 4   11375

Linguistic Institutional Habitus of German (Pre)schools and Turkish Mothers' Identities

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Abstract

With the rise of multiculturalism in European societies, multilingualism has become a subject of debates in academia and politics addressing the role of educational institutions. Language is an important component of identity as being both a symbol and a tool of membership (Soehl & Waldinger, 2012). Previous research has considered the importance of linguistic practices in (pre)schools (e.g., Gogolin, 2009; Kratzmann et al., 2017). While some studies primarily focused on children's perspective (e.g., Agirdag, 2010; Celik, 2017), parents' perceptions and experiences linked to language use of (pre)schools have not gained enough attention in educational research. This study aims at understanding how language-based practices of German (pre)schools impact Turkish mothers' identities. The theoretical background is rooted in the concept of "institutional habitus" (McDonough, 1997; Reay, 1998) and social identity theory which addresses in-group/out-group boundary formation (Barth, 1969; Jenkins, 1996; Phinney, 1990). The data was collected conducting 22 qualitative interviews with Turkish mothers who have (pre)school aged children. The interviews were analyzed following qualitative content analysis (Mayring, 2014). The findings indicate that when institutions deploy an inclusive habitus, they value families' socio-linguistic resources, support children's bilingualism and encourage parents' involvement despite of linguistic barriers. This affects mothers' identities in terms of strengthening sense of belonging to Germany and educational institutions. In contrast, exclusive practices, e.g. devaluation of families' heritage language, imposition of German monolingualism, lead mothers to (re)construct their boundaries with the majority society and (pre)schools. The research findings support policies addressing inclusive education and contribute effective pedagogies in early childhood education.

Symposium 11104
The developmental of pre-academic skills and kindergarten screening tools

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Recent years have suggested that academic learning in elementary school requires children to develop basic skills in different domains such as linguistic skills and executive functions, as well as to be competent learners of new material based on their developing procedural learning and memory system.

The Procedural learning-and-memory system matures relatively early enabling newly acquired cognitive, motor, and perceptual skills to improve gradually across multiple learning experiences (Censor, Sagi, & Cohen, 2012). Recent data suggest different developmental paths for skill learning mechanisms in different domains. In here, we explore the developmental path of auditory category learning, relevant to the acquisition of language and literacy, and grapho-motor skill learning relevant to handwriting development.

Cognitive processes such as executive functions (EF) were found to predict students' achievement in school. In order to learn and solve problems, children need to use EF skills: to plan ahead, focus attention, remember past experiences and control, supervise, or regulate their own thinking and behavior (Zelazo, 2015). EF are late maturing, nevertheless EF are required for (skill) learning to take place.

Narrative performance has been shown to be a key factor in predicting future academic outcomes of children (Castro, García, & Markos, 2013; Goldenberg, 2008; Spencer et al, 2018.) A coherent narrative contains macrostructure (e.g., story grammar, elements- goals, attempts, and outcomes) and microstructure features (e.g. vocabulary, complex syntax) as well as mental state terms and referential expressions. These features may be used for distinguishing between monolingual and bilingual children with and without Developmental Language Disorder.

Paper 1   11105
Procedural learning in young children: the importance of screening and support

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Abstract
The Procedural learning system matures relatively early enabling newly acquired cognitive, motor, and perceptual skills to improve gradually across multiple learning experiences (Censor, Sagi, & Cohen, 2012).

Cognitive processes such as executive functions (EF) were found to predict students' achievement in school. In order to learn and solve problems, children need to use EF skills: to plan ahead, focus attention, remember past experiences and control, supervise, or regulate their own thinking and behavior (Zelazo, 2015). EF are late maturing, nevertheless EF are required for (skill) learning to take place.

In this talk I will consider the importance of procedural learning and executive function to the development of skills in young children. I will outline a screening and support approach targeting these skills, based on a free intervention designed to support children with difficulties in keeping up with their peers, illustrating this with data from a series of studies with 4-5-year old children in the UK.

Paper 3   11107

Different post-training processes in children's and adults' motor skill learning

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Carmit Altman, Bar-Ilan University

Abstract

Do young children and adults share similar underlying motor skill learning mechanisms? Past studies have shown that school-aged children's speed of performance developed over wake periods of a few hours post-training. Such training-dependent gains were not found in adults. In the current study of children as young as 5-years-old and young adults who practiced a simple grapho-motor task, this finding is replicated and only the children showed faster performance a few hours post-training. These positive gains in performance speed were retained two weeks later. Furthermore, among the children, variations in gains attained a few hours post-training were associated with initial performance level. These behavioral findings indicate different underlying post-training processes in children's and adults' motor skill learning thus, supporting differential tutoring of skills.

Paper 4   11111

The story so far: Narrative analysis of children with typical development and their peers with DLD

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Abstract

While there is general agreement regarding poor performance of children with Developmental Language Disorder (DLD) on microstructure measures of narrative

production, findings on macrostructure are inconsistent. The present study analyzed narrative abilities of bilingual and monolingual preschool children with typical development and their peers with DLD, with a particular focus on story grammar (SG) elements and causal relations, in order to identify macrostructure features which may screen bilingual children with DLD from those with typical development. Narratives were collected from 35 typically developing bilinguals (BiTD) and 14 bilinguals with SLI (BiDLD) in both Russian/L1 and Hebrew/L2 using a retelling procedure. Each story contained three episodes, and each episode introduced a different protagonist with explicitly stated Goals, Attempts and Outcomes. Causal relations between and within episodes were assessed following Trabasso & Nickels (1992). Results show that for causal relations, narratives of BiDLD children contained fewer causal relations, and differed qualitatively from those of BiTD children. For SG elements, BiDLD children referred to fewer SG elements than BiTD children in the first episode, but performed like BiTD children in the second and the third episodes. Story grammar elements in specific episodes along with causal relations distinguish the narratives of children with BiDLD from those with BiTD, which stresses the importance of investigating wider variety of macrostructure features in narratives.

Creativity: Is it an individual trait?

Esther Adi-Japha, Bar-Ilan University

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Shai Cohen, Search Results Web results Bar Ilan University

Creativity is a goal of 21st century education, and is in the focus of many studies, trying to elucidate its origin and ways to promote and enhance its development. There is a debate on whether creative thinking is a trait, may it be practiced as a skill, and is it related to cultural habits or possible whether its novelty reflects solutions to uncommon difficulties. The current symposium will touch upon these topics.

Most creativity research of the past decade has focused on measuring creativity with tests and standardized procedures, and entered the dead-end alley, as some critics maintain. Creativity has appeared as a moderately stable personality trait across situations and tasks. In the first talk, a model is sketched of creativity-as-situated-action upon action affordances.

Creativity is a universal cognitive ability as is the desire to create something novel and unique. Yet, cultural differences in creativity have been repeatedly reported. The majority of the studies documented lower levels of creativity in non-Western as compared to Western cultures. Based on imaging studies, the current study suggests neurocognitive model that characterizes cross-cultural differences in the creative process.

The third study involves music training. It is customary to begin teaching score-reading in early childhood. Through a musical prism, we will observe creativity that could possibly emerge from reading disabilities and difficulty in decoding musical score. Creativity and difficulty will be presented retrospectively through the media itself .Please listen at: https://www.youtube.com/watch?v=-CTbqU_JWvI

Paper 1   11289

Are there alternatives to the creativity-as-trait approach? A first attempt

Paul Leseman, Utrecht University

Abstract

Most creativity research of the past decade has focused on measuring creativity with tests and standardized procedures, and entered the dead-end alley, as some critics maintain. Techniques well-known from research into personality, intelligence and executive functions have been applied, foremost confirmatory factor analysis with multiple indicators of a latent trait. In doing so, creativity has appeared as a moderately stable personality trait across situations and tasks, showing individual

differences and high correlations with intelligence and executive functions, making one wonder what is new here. In this presentation, an alternative approach is outlined. Following leads in perception-action theories, a model is sketched of creativity-as-situated-action upon action affordances. We hypothesize that the process of creativity resembles how people discover a novel way of using an object as a tool to operate on another object. To support the points raised, two sets of data will be presented. First, a qualitative analysis was conducted of examples of creative thinking processes of four-year-olds, collected by a thinking-aloud method, revealing that ideas on using familiar objects in a novel way rely on (mentally) deconstructing and reconstructing the common action affordance structure of objects. Second, in a pilot study using eye-tracking, patterns of children's looking behavior to an array of objects were related to the emergence of novel ideas as expressed verbally on how to use these objects in a novel way.

Paper 2   11297
Emergent Musical Creativity in People Suffering from Dysmusia
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Abstract
In this proposal, I seek to observe, through a musical prism, musical creativity that might emerge from deficiencies in reading and decoding musical score. I will attempt to present the difficulties and creativity that might emerge, via the media itself – the language of music.
One of the central objectives of musical education in the Western world is enhancing literacy and developing the ability to read musical score fluently. It is customary to begin teaching score reading in early childhood, during the years that are often referred to as the "halcyon days" for human creativity.
I will present evidence from research in the field of my own case study: composing original musical works, using computerized technology, that enhances sonar possibilities beyond the acoustic experience similar to the complex internal world of the dyslexic score reader.
Questions to be discussed at the conference:
·   How can phenomena such as blindness, helplessness, blacking-out, sudden confusion, or lack of control be conceptualized through music?
·   How can the audience be provided with a sense of syntactical disruption, the unraveling of a contextual system or distraction?
·   How can we deal with the gap between 'writing' that blocks the nonsense, censorship, creates a hierarchy (much like a classic staging) and music performing that reveals the thoughts in tandem with the tongue?

I'll observe, through a musical prism, creativity that could possibly emerge from reading disabilities and difficulty in decoding musical score. I'll present this creativity and difficulty retrospectively through the media itself .Please listen at: https://www.youtube.com/watch?v=-CTbqU_JWvI

paper 3   11301
The neural underpinning of cross-cultural differences in Creativity

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Abstract
Creativity is a universal cognitive ability as is the desire to create something novel and unique. Yet, cultural differences in creativity have been repeatedly reported. The majority of the studies that compared levels of creativity between cultures documented lower levels of creativity in non-Western as compared to Western cultures. Nonetheless, there is no neurocognitive model that characterizes cross-cultural differences in the creative process.

Neuroimaging and lesion studies link creativity to multiple neural regions. The default mode network (DMN) has a major role in creativity. Recent studies show that damage to left areas, particularly the left inferior frontal gyrus (IFG) may have a releasing effect on creativity, suggesting that these areas may actually inhibit creativity.

Based on these findings and the twofold model, according to which creativity involves idea generation and idea evaluation phases, an integrated neurocognitive model is suggested. While the generation phase is mainly mediated by the DMN, the evaluation phase is mediated by cognitive control network, particularly the left IFG, where ideas are logically tested and may be inhibited. Since in East-Asian cultures uniqueness and originality are discouraged, highly unique ideas are more likely to be inhibited during the "evaluation phase" of the creative process.

Results indicated that cross-cultural differences may be explained by variations in the evaluation phase, which is mediated by the L-IFG. Taken together, an inverted U-shaped relationship between the evaluation and generation phases is suggested, according to which while too lenient or stringent evaluation discourages creativity, moderate evaluation might lead to an optimal creativity performance.

Symposium 11336

Learning mathematics in preschool: between child-initiated and adult-initiated activities

Gabriel Kappeler, Associate professor, University of Teacher Education, State of Vaud /Lausanne, Switzerland

Linda Amrar, PhD student, University of Teacher Education, State of Vaud /Lausanne, Switzerland

In many educational contexts, time spent learning through play is being reduced at the expense of more traditional pedagogical practices, specifically in reading and mathematics (Miller, 2009; Nicolopoulou, 2010). Teachers' beliefs on the knowledge a pupil should acquire during preschool and kindergarten are more focused on formal learning in reading and mathematics (Bassok et al., 2016). Thus, the pedagogical practices implemented in their classrooms (Stipek et al., 1992) are more oriented on individual activities like worksheets (Bassok et al., 2016) rather than play. However, it's a challenge to think dialectically play and curriculum (Pramling Samuelsson & Asplund Carlsson, 2008) and to develop teaching methods which take into account the promotion of the articulation between spontaneous and reactive learning (Vygotski, 1935/1995), between play and learning, and between child-initiated and adult-initiated activity. Learning environments alternate between free to instructional activities for children as well as between discipline-specific to interdisciplinary orientation (Streit, David & Hildebrandt, 2015).

This symposium brings together three research projects that study spatial reasoning and problem solving as well as number construction during play or adult-initiated activities. Discussion of these researches will allow us to discuss more specifically the challenges of learning preschool mathematics in different learning contexts and how to think about the dialectic between child-initiated and adult-initiated activities.

Paper 1   11413
BUILDING SPATIAL REASONING SKILLS AND MATHEMATICS CAPABILITY IN PRESCHOOL CHILDREN THROUGH PLAY

Ha Dang, PhD student, Faculty of Engineering & Conceptual PlayLab, Monash University

Abstract
There is global recognition of the increasing importance of building Science, Technology, Engineering and Mathematics (STEM) capability for future productivity and prosperity. In turn, spatial ability has been found to be correlated with participation and success in STEM fields (Wai, Lubinski, & Benbow, 2009).

Furthermore, a substantial number of studies suggest strong foundational links between spatial ability and mathematical skills (Smith, 1964; Gunderson et al., 2012; Mix & Cheng, 2012; Casey et al., 2015). Using the cultural-historical concepts of demand, motive and turning points, this study will examine how parents create conditions in the home that support preschool children's development of spatial reasoning skills. A cohort of 3-year old children and their families will be observed longitudinally over 3 years in their homes. Data will be collected via video observations and interviews, along with photos, field notes, and children's drawings. The data will be analysed using Hedegaard and Fleer's (2008) three-layer dialectical and interactive analytical framework. This study will contribute to the scant research literature on how family practices support preschool children's spatial skills. In addition, these family practices could potentially be replicated and extended by early childhood educators, who could use books, toys, spatial games, and other activities to guide preschool children's spatial reasoning and mathematical development through play. This could help address the tension between preserving play time for young children and meeting the demand on educators to deliver greater cognitive outcomes in mathematics in early childhood.

Paper 2   11414

The development of the mathematical thinking of children during child- initiated activities

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Abstract
Child-initiated activities contains a lot of mathematical activities (Seo and Ginsburg, 2004) which can become mathematical teaching opportunities (van Oers, 19996) under certain conditions. The aim of this research is to highlight the specific conditions under which a mathematical activity which arise from a child-initiated activity can become a mathematical teaching opportunity. 7 teachers (with ample experience of teaching through play) and 2 researchers (expert in play-based learning) will be part of a Lesson Study (February-May 2020) designed to develop the mathematical thinking of children during child-initiated activities. The research lesson will be given by all the teachers 5 times to make a progression in the mathematical challenges proposed during the play of the 5-6 years old children. Video recordings of the research lessons will be analyzed using the methodology developed by Hedegaard and Fleer (2008). The maturity of the pretend play of children will be assessed using the PRoPELS (Leong and Bodrova, 2012). The hypothesis is that teachers will foster dialectically the mathematical thinking of the children and the maturity of the pretend play of children. The presentation will include the first results. This study will

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contribute to the understanding of the mechanisms involved in the development of the mathematical thinking of children during child-initiated activities.

Paper 3   11415

Which knowledges are mobilized by the pupils during an adult-initiated activity in mathematics?

The research presented at this symposium is interested in understanding some of the prerequisites other than mathematics that kindergarten pupils mobilize during an activity initiated by the teacher in the form of a game and during which the aim is clearly the construction of numbers. Margolinas and Laparra (2011) have demonstrated that some knowledges are made "transparent" based on learning activities. These prerequisites are sometimes of the order of the hidden curriculum (Jackson, 1968) and are strongly related to the language that pupils mobilize, which often manifests itself in school inequalities (Bourdieu, 1966). In the tradition of francophone didactics, these knowledges, which is not directly related to the discipline in question, are also called para or proto-disciplinary knowledges (Chevallard, 1985; Nonnnon, 2004; Reuter 2005).

Based on the model of Streit, David and Hildebrandt (2015), we proposed a math game activity instructed by the teacher on number construction in a class of 19 kindergarten pupils (4-5 years old). Using GoPro cameras, we captured the pupils' interactions and group work. In addition, a camera was also installed on the teacher and the researcher in order to take into account the guidance of experts. This game has been repeated systematically over one month.

The analysis of the data allows us to identify all the prerequisites and knowledges that the pupils have to mobilize to solve the game, often at the detriment of the construction of numbers. We can also better describe adult scaffolding during this type of game-activity in mathematics.

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Mindfulness based interventions in educational settings

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Mindfulness is "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003). It's origins stem from Buddhist philosophy, but the practice has been secularized and adapted to Western society. Mindfulness based interventions within educational settings have shown to be effective in enhancing self-regulation, pro-social behaviors, academic performance and decreasing aggression among school aged children from western societies. Potentially these beneficial effects may be extended to additional developmental stages and different cultural contexts.

This symposium will present a sequence of studies that have created and tested the efficacy of Mindfulness Based Interventions adapted to unique contexts. Specifically, the first presentation will focus on a program adapted for the early developmental stage of pre-school aged children. The second presentations will present a program conducted with teachers and the third presentation will show a holistic school based program combining pupil and teacher intervention.

Following the presentations, the benefits and limitations of applying Mindfulness practices across different educational settings will be discussed.

Paper1:

Enhancing pro-social behavior and compassion among pre-school children through a mindfulness and compassion-based social-emotional program.

Benatov Joy, Berger Rony, Tarrasch Ricardo

Abstract

This study evaluated the effectiveness of a mindfulness and compassion-based social-emotional intervention, Call to Care-Israel (C2C-I) adapted for pre-school children. The C2C-I program combines social-cognitive and social-emotional driven mindfulness and compassion practices adapted for young children aimed to create a community of care and cultivate compassion toward the self and others. Seventy four pre-school children from three pre-schools in central Israel were assigned by partial randomization to the C2C-I or an active control or wait-list control groups. Children's pro-social and disruptive behaviors were assessed via observations and parents' and kindergarten teachers' ratings. Compassion was evaluated using the compassionate response task. Measures were obtained before, after and six months following

termination of the program. Results showed a significant decrease in disruptive behaviors and an increase in pro-social behavior and compassionate response compared to the control groups. Importantly, the significant effects found in the C2C-I group were maintained at the 6-month follow-up. These results have significant implications for implementing C2C-I mindfulness and compassion-based practices with pre-school children in order to promote pro-social skills and self-regulation.

Paper 2:

Studying the effects of a mindfulness intervention among Arab teachers

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Abstract

While mindfulness-based interventions (MBIs) in educational setups are becoming wide spread in the world, especially USA and Europe, the exploration of mindfulness effects in the Arab education system is still scarce, and there is no report on the effect of MBIs for Arab teachers to the best of our knowledge. This study investigated the effectiveness of an MBI for Arab teachers in an elementary school in Israel.

Our participants were 20 teachers who underwent the MBI (but only 12 completing it), and 19 teachers from another Arab school who underwent another cognitive intervention as a control group. In a pre-post design, the participants completed several questionnaires, testing for Mindfulness, Decentering, Emotion regulation, and Stress.

We hypothesized that for the MBI group, the levels of Mindfulness, Decentering, and Emotional Regulation will enhance, while reducing Stress. For the control group no such differences were hypothesized.

The comparison between post and pre intervention showed that the MBI training raised the level of Mindfulness in three subscales (Acting with awareness, Non-reactivity, and Observe) only among the MI group, and similarly the Decentering scores, and for Emotion Regulation – only the Cognitive Reappraisal strategy. No such changes were seen in the control group, as hypothesized. In addition, only the MI group reported reduced Stress, in contrast to the control group.

This study provides initial support to the feasibility and efficacy of MBI in the Israeli Arab teachers.

Paper 3:

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The impact of mindfulness and compassion-based program on pupils inter and intra-personal abilities

Rony Berger , Ricardo Tarrasch, Tel Aviv University

Abstract

Several mindfulness and compassion-based programs have been implemented in the educational system, during the last decade. The practice of these programs in the education system could follow three approaches: a direct approach, in which the intervention is delivered directly to students; an indirect one, in which the teacher develops a personal mindfulness practice, or a combination of both. It our assumption that a whole school program will be more effective in utilizing a combined approach to delivering these interventions. In the present study we compared the effects of indirect and combined approaches as compared to a control group, implementing a mindfulness and compassion-based intervention. Two-hundred students were allocated into three experimental groups. They filled self-report questionnaires before the intervention, after its end and six months later, and performed a behavioral measure assessing pro-social behavior, before and after the intervention. Hierarchical Linear Models revealed that both the indirect and combined approaches were effective in improving anxiety, well-being, attention and teacher availability and acceptance, while only the combined approach was effective in somatization, mindfulness, classroom atmosphere and pro-social behaviour. Our results support the benefits of the combined approach, however, given its scalability and cost drawbacks, we will discuss how an whole-school program can also benefit from an indirect approach.

Symposium 11346

<u>**Investigating professionals' multicultural and multilingual beliefs and practices using scenarios**</u>

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Pauline Slot, Utrecht University

Culturally responsive pedagogies are important to create classroom cultures where all students,
regardless of their cultural and linguistic background, are provided with the best opportunities to learn. School practices are shaped by the beliefs teachers hold about the children in their care (Nelson & Guerra, 2014). These beliefs often reflect values of mainstream society and are influenced by social and cultural experiences of teachers. (Schultz, Jones-Walker, & Chikkatur, 2008). However, the relationship between beliefs and practices is not straightforward as several studies show that explicitly expressed beliefs on cultural and linguistic diversity not always match teaching practices or more implicit belief systems (e.g., Álvarez Valdivia & González Montoto, 2018; Creese & Blackledge, 2011). To overcome this issue, this symposium uses short realistic classroom scenario's to provide a more nuanced understanding of multicultural classroom practices. International survey data of professionals working in early childhood and primary education in three European countries is used to investigate the relationship between multicultural and multilingual beliefs and practices. The first presentation addresses a scenario on the use of children's home language in the classroom and reports mainly on the Dutch data. The second presentation focusses on the Italian data addressing a scenario on the complexity of cultural identity. The final presentation addresses a scenario on parental involvement using Norwegian data. A comparative country perspective will be addressed in all presentations as well. The discussion will highlight the importance of addressing teachers' beliefs when trying to enhance teachers' intercultural competences and culturally responsive classroom practices.

Paper 1   11347
<u>**The Netherlands: Multilingualism in the classroom**</u>

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Abstract

Research is increasingly recognizing the value of a multilingual perspective in which all languages of education (i.e., national and local language, home language, academic language) contribute to children's' development. Yet, many western

European countries have a weak model of enhancement of multilingualism in the school system and tend to emphasize monolingualism (Aguiar, Pastori, Camacho, Guerra, & Rodrigues, 2017). This is also apparent in the Dutch schooling system with many (pre)schools adopting Dutch-only policies and practices. The current study investigates how professionals ($N = 71$) would respond to a scenario in which two Turkish-Dutch preschoolers use the Turkish language in their play. Our results confirm the national language discourse and show that professionals tend to respond from a monolingual perspective (i.e., *I would encourage them to use the Dutch language*). Moreover, this perspective seems more dominant in primary schools compared to early childhood education and care. Also, cross-country comparisons indicate that these monolingual teacher behaviors are much more apparent in the Dutch setting compared to the Italian and Norwegian context. Furthermore, preliminary analyses on the Dutch data indicate strong relations between teachers' multilingual beliefs and their intended teacher behaviors. Professionals more supportive multilingual beliefs are more inclined to respond to the scenario in ways that acknowledge and support the children's L1 (i.e., I would play along and show interest in their home language). Multicultural beliefs on the other hand appear unrelated to the response patterns.

Paper 2   11349

Italy: Supporting cultural identity development

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Abstract

Cultural identity refers to the feeling of belonging to a group and is related to many factors such as nationality, ethnicity, religion and social class (Broekhuizen et al., 2019). As a result of ongoing globalization, the development of a cultural identity has become more complex (Jensen, Arnett, & McKenzie, 2011). Supporting children in the development of their cultural identity is important as recent studies show that cultural identity can be a positive factor for promoting well-being (e.g., Pastori, Sarcinelli & Pagani, 2019). The current study investigates how Italian teachers ($N = 111$) would respond to a scenario in which two children argue about their cultural identity. The results show that teachers are most likely to use such an event to discuss the concept of identity with all children in the classroom and Italian teachers score somewhat higher on these behaviors compared to Dutch and Norwegian professionals. Moreover, Italian teachers are less likely to respond in ways that focus on a single cultural identity (i.e., *I would value the child's claim to identify as*

Italian or *I would help the child understand he is Moroccan*) compared to behaviors that express the complexity and duality of cultural identity (i.e., *I would accept the child's claim to identify as Italian and simultaneously help him value his Moroccan roots*). Furthermore, preliminary analyses show that there is a positive relation between multilingual beliefs and teacher behaviors that address the complexity and duality of cultural identity. However, these relations are only apparent for primary school teachers.

Paper 3   11351
Norway: Parent-teacher relationships and teacher outreach practices

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Abstract

The relationships between parents and teachers are widely acknowledged as important for children`s learning (Epstein, 2018). For parents, lower socioeconomic backgrounds are associated with lower levels of involvement and satisfaction with their teacher relationship (McWayne, Campos, & Owsianik, 2008). Practices promoting parental involvement is found to be associated with higher levels of parental involvement (Calzada et al., 2015). However, little is known about the relationship between teacher`s views of their relationships with parents and their outreach practices. The present study (N=194) investigates how professionals working in Norway, Italy and The Netherlands would respond to a scenario where parents with a lower socioeconomic background do not participate in (pre)school meetings or communicate with them about their child`s progress. The study further investigates how their responses relates to their views on their relationships with parents. Teachers report medium levels of satisfaction with their relationships, and the patterns of preferred outreach practices are similar across countries. However, significant differences between the countries where found regarding their prevalence to use a mediator to reach out to the parents. Both Dutch and Italian teachers report that they would probably choose to use a mediator for parental outreach, whereas Norwegian teachers answer that this is something they would probably or definitely not do. For Italian teachers, choosing to use a mediator was associated with the view that they, as teachers, where responsible for making contact with parents. For the Norwegian teachers, using mediators was associated with a lack of shared beliefs with the parents.

Creativity: A developmental perspective into underlying processes.

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Creative thinking comprises of divergent and convergent thinking. It is not clear how these processes develop and whether similar processes are involved in children and in young adults.

Study 1 examined the divergent thinking (DT) processes of four-year-olds. Following a similar approach used in a study with adults, children were encouraged to report their thinking processes through interactive dialogues while performing a DT task, the Alternative Uses Task. Content analysis of children's utterances revealed uses that are mostly based on automatic, bottom-up associative processes and occasionally based on effortful, top-down executive processes. These results suggest that increasing originality depends on increasing involvement of effortful executive processes.

The Remote Associates Test (RAT) was designed to examine the ability to form associative elements into new combinations, however it is widely used as a general creativity measure, without sub-dividing it to its components. The goal of study 2 here presented was to explore the sub-components of the RAT, using transcranial direct current stimulation (tDCS). The findings of the experiment argue that the RAT measures automatic rather than creative abilities.

In their everyday life, children often need to adapt their thoughts and behaviors to changing situations. A lack of cognitive flexibility has been associated with several neurodevelopmental disorders. Contradictory findings were reported for developmental language disorder (DLD). Study 3 tested cognitive flexibility in kindergarten children with/without DLD, requesting children to draw an X that does not exist. The findings suggest that children with DLD show deficits only in complex types of flexible representations.

Paper1 11420

Divergent Thinking in Four-Year-Old Children performing the Alternative Uses Task

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Abstract

Creativity is a goal of 21st century education, and is in the focus of many studies, trying to understand its origin and ways to promote and enhance its development. The

present study examined the divergent thinking (DT) processes of four-year-old preschoolers. Following a similar approach used in a study with adults, the present study encouraged children to report their thinking processes through interactive dialogues while performing a widely used DT task, the Alternative Uses Task (AUT). Content analysis of children's utterances revealed that children generated uses mostly based on automatic, bottom-up associative processes and occasionally based on effortful, top-down executive processes. Using (multilevel) regression analysis, we found that (1) both associative and executive processes predicted children's fluency scores on the AUT, whilst only the executive DT process *Performing mental operations on the stimulus* uniquely predicted children's originality scores; (2) children at four years of age already showed a serial order effect in the originality of their responses, indicating that the originality of uses increased over time; and (3) similar serial order effects characterized the occurrence of executive processes. These results suggest that increasing originality depends on increasing involvement of effortful executive processes. Especially the executive process of mentally isolating properties or parts of objects and the subsequent recombination of these parts and properties into a new structured whole might be a key characteristic of DT to generate original ideas.

paper 2   11421

Modulation of automatic and creative features of the Remote Associates Test

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Abstract

Creative thinking comprises of divergent and convergent thinking. The Remote Associates Test (RAT) was designed to examine the ability to form associative elements into new combinations, however it is widely used as a general creativity measure, without sub-dividing it to its components. Our goal here was to explore the sub-components of the RAT, aiming to link them to the angular gyrus (AG) activation. The AG is a good candidate to host both aspects of the RAT, as neuroimaging studies observed deactivation in the AG while participants were engaged in creative tasks, however it also seems to play a role in arithmetic solution retrieval and automatic knowledge retrieval. Our objective was therefore to test whether transcranial direct current stimulation (tDCS) of the AG will influence creative and automatic performance in the RAT. In Experiment 1, we administrated cathodal right AG stimulation in order to deactivate the AG to improve divergent features of the RAT in the creative group. In the automatic group, we administrated double anodal AG stimulation to improve convergent features of the RAT. Experiment 2 activated the AG by stimulation and arithmetic training. We

hypothesized that anodal stimulation of the AG and arithmetic training will improve automatic convergent features. In experiment 1 deactivation of the AG enhanced creative abilities reflecting divergent thinking while in both experiments, activation of the AG enhanced automatic abilities reflecting convergent thinking. Experiment 2 resulted in higher automatic performance after arithmetic training. We argue that the RAT measures automatic rather than creative abilities.

Paper 3   11423

Cognitive flexibility in children with Developmental Language Disorder: non-existent object drawing

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Abstract

In their everyday life, children need to adapt their thoughts and behaviors to changing situations. A lack of cognitive flexibility has been associated with several neurodevelopmental disorders. Contradictory findings were reported for developmental language disorder (DLD). Cognitive flexibility was here studies using the non-existing object drawing (NOED) task. In NOED tasks, children are asked to draw "an X that does not exist," such as an X that they invent, that they have never seen before, a strange X, an X with something funny or odd about it. When solving the NOED task, children can make size, shape or deletion changes, but they can also change the location of elements, and add or insert elements. The former three categories were classified as representing simpler changes, and the remaining three as representing more complex changes, as they are more frequent among older children.

In the current study 23 children (11 girls) with DLD and 50 typically developing (TD) peers (26 girls) draw non-existing house and man. Children were also assessed for the visual-motor skills, verbal short-term memory (STM) and inhibition.

Children with DLD scored lower on all these measures, but not on non-verbal intelligence assessed using the Raven test.

The findings revealed that children with DLD more often made no modifications than children with TD. Furthermore, they were less likely to make more complex changes to their drawings. The difference between DLD and TD children disappeared when verbal STM or inhibition were added to the regression model, stressing their role in flexibility.

Symposium 11401

Dual Language Development within the Context of Family and Early Childhood Education and Care (ECEC)

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Growing populations of dual language learners (DLLs) in Europe are exposed to different languages in educational and home contexts. For example, reports on young children's enrollment in German preschools show that about 38 % are DLLs, with a high proportion coming from families who speak a minority language at home (Bildungsberichterstattung, 2018). How to establish multilingual practices at schools and homes is subject of current debates. The quality and quantity of language input at home and within ECEC are major determinants of DLLs overall language development. However, the conditions in which DLLs can grow up successfully are not fully understood. This symposium brings together evidence from different studies and examines a variety of family, demographic, child- and school-level correlates of attainment of (second) language proficiency among samples of European DLLs: The examination of family and child care characteristics in preschool children in the first study shows that mother's advanced German language knowledge and very early child care experience were positively related to children's second language skills. When taking socio-emotional competencies within ECEC into account in the second study it was found, that these skills have a significant effect on the relative increase of children's second language vocabulary skills. A study on teacher ratings of DLLs communication behaviour within ECEC revealed different associations with formal language abilities. The fourth study presents data on the family language policies from five European countries and identified distinct underlying bilingual profiles with substantial within-group differences families and related these to family linguistic and acculturation attitude

Paper1   11466

The influence of family and child care characteristics on second language acquisition

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Abstract
The study focuses on the influence of different characteristics of the child, the family and the child care institutions on second language acquisition of German preschool

children. With a sample of 163 bi-/multilingual children (with a mean age of 46 months) enrolled in preschools in Germany, it could be shown that family language, mother's advanced German language knowledge, amount of language learning activities and very early child care experience were positively related with children's second language skills. the influence of familial variables (e.g., acculturation) faded when preschool environment was taken into account. Results highlight the importance of early child care experience on second language acquisition.

Paper 2   11468

The Interplay between Language and Socio-emotional Competencies in Young Dual Language Learners

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Abstract

The second study examines the socio-emotional competencies and their interrelations with the second language competencies of German dual language learners, aged between three to six years. Language skills in L2 (German) were assessed once a year at three measurement points by standardized tests addressing expressive and receptive vocabulary, socio-emotional competencies wre assessed via parent and teacher reports. The results show that our sample consists of children with age-appropriate socio-emotional competencies. Using cross-lagged panel analyses (based on a sample of 216 children), it could be demonstrated that early socio-emotional skills have a significant effect on the relative increase of children's second language vocabulary skills, particularly for expressive vocabulary.

Paper 3   11469

Dual language learning children's communication behaviour

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Abstract

This study focuses on dual language learning children's communication behaviour within the context of ECEC centres. In a sample of 3 to 6 year old children (n=165 – 348) teacher ratings of different strategies of children's communication behaviour

within classrooms and their associations with more formal language abilities (measured via standardized tests for expressive and receptive vocabulary as well as grammar) are explored. Whereas appropriate wording and initiating conversations are highly dependent on current language abilities, communication behaviors like interest in conversations and the successful expression of intentions only show mild to moderate associations to language abilities. The study aimes to identify possible predictors of further language development.

Paper 4   11470
The Family Language Policy Profiles of Migrant Families in Europe

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Abstract

The study addresses the language input dual language learners receive, especially in the home environment. Data on the family language policies of migrant families from five European countries (England, Germany, the Netherlands, France, and Italy) are presented. Data from a large scale interview study from the EU-funded ISOTIS project (www.isotis.org) are used. Latent Class Analyses, conducted with a sample of mothers with either a Turkish (N = 877) or a Maghrebian (N = 858) migrant background, identified distinct underlying bilingual profiles with substantial within-group differences in DLL families. These family language profiles are differentially related to family linguistic and acculturation attitudes.

Symposium 11416

Novel Approaches for Promoting Scientific Thinking and Inquiry Capabilities in Early Childhood

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Scientific inquiry and learning provide stimulating contexts for the development of cognitive capabilities. Therefore, it is essential to introduce science to children in developmentally appropriate ways for them to explore the world through sensory and cognitive investigations (NRC, 2012; NSTA, 2014). This should begin by observing children and offering them appropriate support to improve their thinking and inquiries (Legare, 2014).

In this international symposium, we present various perspectives and methodologies investigating different means to promote young children's scientific thinking and capabilities. All the studies examine children ranging in age from pre-school to the first grades of elementary school.

The first paper investigates the relations between exploration and knowledge acquisition under different instructional conditions, exploring the relation between an object's distance to the light and the size of the shadows. The second paper assesses the ability of children to apply the control of variables strategy in the physics context of the inclined plane. The third paper presents a longitudinal study investigating the relations between scientific reasoning and physics understanding (melting and evaporation) during the 5 years from kindergarten to 4th grade. The fourth is a pre-post intervention study examining how enriching preschools' Nature Centers and providing multiple opportunities for exploration affects preschoolers' inquiry behaviors and skills.

These studies present novel approaches for examining and promoting scientific thinking and skills in young children. The accrued results show that children possess a basic understanding of experimentation and can improve their capabilities. Therefore, it is necessary to provide them with multiple opportunities to explore.

Paper 1   11418

Preschoolers' Exploration and Knowledge Acquisition under Different Instructional Conditions

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Abstract

A recent line of work has demonstrated systematics and rationality in preschoolers' exploration. Specifically, uncertainty about an event's causal structure was shown to promote the duration (Schulz & Bonawitz, 2007) and the quality (Van Schijndel et al, 2015) of preschoolers' exploration. A specific case of uncertainty arises when children's theories conflict with the evidence they observe (e.g. Berlyne, 1960; Bonawitz et al., 2012; Legare, 2012; Van Schijndel et al., 2015). For example, Bonawitz et al. (2012) demonstrated that 'conflicting evidence' affects the duration of young children's play on balance. While the above-mentioned line of work has mostly focused on how 'conflicting evidence' affects children's exploration, other work has investigated how 'conflicting evidence', and the (self-)explanation of this evidence, affects young children's conceptual change (e.g. Siegler & Chen, 2008; Stahl & Feigenson, 2017). For example, Siegler and Chen demonstrated that children who were encouraged to explain not only evidence that was in line with their predictions, but also 'conflicting evidence' learned more on water displacement. With the present study we aim at bringing together these lines of research by investigating the relations between preschoolers' exploration and learning under different instructional conditions ('conflicting evidence' by itself, and combined with self- and test-leader explanation) in a shadow-size task. Preliminary results show positive relations between the quality of children's exploration and their learning. In contrast, children who did not perform an informative experiment on the relation between an object's distance to the light and shadows size, profited from 'conflicting evidence' with test-leader explanation.

Paper 2   11419

Young Children's Implicit Learning of the Control of Variables Strategy

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Abstract

This study assessed the ability of 6- to 7-year-old children ($N = 145$) to apply the control of variables strategy (CVS) in the physics context of the inclined plane. In a pre-post-follow-up design, we investigated children's CVS learning gains from a 60-minutes guided-inquiry lesson they received in groups of 5 children. Trained research assistants carried out the intervention in children's classrooms. In the lessons, children conducted conclusive experiments but received no explicit teaching of CVS rules. However, the experiments' setting encouraged the children to make assumptions, compare experimental settings, observe and interpret results. 1/3 of the children conducted conclusive experiments in the context of the inclined plane, 1/3 in the

context of building blocks' stability and one-sided levers as force amplifiers and 1/3 served as a control group. The results of a group-based paper-and-pencil test (multiple-choice) support previous findings that 6- to 7-year-old children hold a basic understanding of experimentation and are able to identify the variable that has to be varied. Moreover, as has been shown in previous studies, the 6- to 7-year olds show difficulties in controlling for confounding variables. Growth-curve analyses suggest that some children succeeded in building a superordinate representation of the CVS principle independent of the lesson's guided-inquiry context. However, the majority of the children who conducted structured and guided experiments did not learn the CVS principle from the 60-minute lesson. Limitations of the study as well as theoretical and practical implications are discussed.

Paper 3   11422

The impact of children's scientific reasoning on physics understanding: A longitudinal study

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Abstract

The contribution of early scientific reasoning skills on academic and real-life achievement is in the focus of developmental, educational and science education research. Recently, Koerber and Osterhaus (2019) found that even before elementary school starts, kindergarteners' scientific reasoning skills predict their physics understanding. Longitudinal results on the impact of early skills in scientific reasoning on physics understanding in elementary school, however, are missing. In this longitudinal study, we investigate the relation between scientific reasoning and physics understanding from kindergarten to 4th grade with 91 children, who participated in all five years (mean age at the end of kindergarten = 6 years, 2 months (SD = 3.49)). Scientific reasoning was assessed with a 30-items instrument (Science-K inventory, Koerber & Osterhaus, 2019) covering different aspects of scientific reasoning; physics understanding was assessed with four physics tasks on melting and evaporation (adapted from Steffensky et al., 2012). We found significant development from kindergarten to 4th grade for scientific reasoning $F(2.75,288)=112.21$; $p<.001$ partial $\eta^2 = .517$ and physics understanding $F(4,360)=87.79$, $p<.001$, partial $\eta^2 = .494$. In all grades (but the second), scientific reasoning predicted physics understanding one year later--independent of the effect of children's physics understanding one year earlier. Taken together, our results highlight the importance of scientific reasoning for science understanding. More importantly, our results concerning the early relation between scientific reasoning and physics understanding at the very beginning of

elementary school show that it is necessary to promote both skills together at once in early elementary school.

Paper4   11424
Multiple Encounters with Scientific Exploration - Enhancing Preschoolers' Inquiry Capabilities

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Abstract

Studies show that children possess cognitive abilities enabling them to understand scientific concepts and implement inquiry processes. Policy and standards' documents (NGSS, 2013; NRC, 2012; NSTA, 2014) recommend bringing young children to a level of open, independent inquiry. To this end, skills and knowledge should be fostered by offering opportunities to engage in scientific inquiry processes on a regular basis. Therefore, this intervention study included the enrichment of preschools' Nature Centers for 5-months of daily, free-play, scientific experiences, with a wide range of natural objects (e.g. shells, stones); liquids and solid materials; and tools, including measuring spoons, scales, measuring tapes, textbooks, and field guides. The study examined the effect of this intervention on preschoolers' inquiry behaviors and skills. The 200 children, mean age 66.49 (SD 5.18), were randomly divided into intervention (enriched Nature Center) and comparison groups (unchanged, exhibition-like Nature Center). An open-ended pre-post- scientific exploration task with a detailed scoring scheme was developed to assess inquiry behaviors and skills. All children were video recorded and their verbal and behavioral responses were analyzed and coded. Results show the intervention group scored higher in their level of questions, hypothesizing, and drawing conclusions. Significant main effect of group was found in the number of questions asked and ability to plan $[F(1,197) = 7.67, p = .006, \eta p^2 = .04$ and $F(1,197) = 13.60, p = .000, \eta p^2 = .06$, respectively]. Our findings show that providing preschoolers with multiple daily encounters with free-play scientific exploration, enhances their inquiry capabilities and scientific thinking.

Problem solving - effects of children's interindividual competencies and pedagogical approaches

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Problem solving results in the transition from one state to another through the use of higher mental functions such as planning and reasoning and relate to problems with a single solution or problems with multiple solutions (Reed, 2017). Few studies have investigated the way young children solve problems with a single solution, and even fewer examined young children's processing of problems with multiple solutions. Interindividual competencies such as language, executive functions and intelligence may affect young children's problem solving processes and outcomes. Moreover, pedagogical approaches are of interest when considering fostering problem solving competencies of young children.

Paper 1 examines differences in problem solving between monolingual and bilingual children in a problem with a single solution. Paper 2 reports children's problem solving competencies in a problem with multiple solutions and its relation with intelligence and content-knowledge. Paper 3 investigates the impact of an enriched preschool environment on children's emerging problem solving performance.

These perspectives expand our understanding of how young children solve problems and what competencies and pedagogical factors influence their problem solving competencies.

Paper 1   11458

Grammatical understanding predicts planning task performance in monolingual and bilingual children

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Abstract

In problem solving, transitioning from one state to another can be accomplished by mentally planning ahead. Planning can thus be seen as an important part of problem solving. Requiring the integration of several executive function components, planning performance is also an important predictor for academic success. Prior research suggests that planning performance itself may be influenced by the use of self-directed speech and language competencies. Another line of research revealed that children growing up with more than one language differ from monolingual children

with respect to language competencies, the use of self-directed speech, and performance on tasks requiring executive functions. In the present study, we thus aimed at examining whether or to what extent monolingual and bilingual children differ in planning performance and in the role of language during planning. German speaking monolinguals ($n = 38$, $M_{age} = 9.00$, 47.4% girls) and German-Russian speaking bilinguals ($n = 36$, $M_{age} = 8.87$, 38.9% girls) completed the *Tower of London* task which was preceded by a planning phase. We found that monolingual students' but not bilingual students' planning performance was impaired by an additional verbal task relative to a motor control task, suggesting a differential use of self-directed speech in both groups. A linear regression further revealed that after controlling for nonverbal intelligence, grammatical understanding predicted solution accuracy and planning efficiency in the bilingual group. However, when including only children of comparable language proficiency in our analyses, grammatical understanding predicted planning accuracy in both groups. Further results and implications will be discussed.

Paper 2   11460

The Engineering Design Process in Kindergarten – An Exploratory Study of Children's Problem Solving

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Abstract

Introducing children to the *engineering design process* (EDP) is an important objective of early STEM education. The EDP is the main problem-solving strategy engineers use to identify problems, generate and evaluate solutions by building and testing prototypes, and optimize those solutions. Studies on the EDP show that kindergarten children often neglect testing and optimizing. In an exploratory study, we aimed at learning if and how kindergarten children test and optimize their solutions during problem-solving, and how this relates to solution quality, children's domain-specific content-knowledge, working memory performance, intelligence, and self-regulation.

N=41 children (aged 51-91 months) solved two engineering problems with gears in a standardized 1:1 procedure. We videotaped the problem-solving processes and rated children's testing and optimizing, self-regulation and solution quality using a standardized category system. Domain-specific content-knowledge of gears' functioning was measured with a standardized interview-procedure containing 24 items (α>.80). As an indicator of working memory performance, we used children's

ability to recall the given problem after 3 minutes of problem-solving. As an indicator of intelligence, we used the figural reasoning sub-scale of the CFT 1-R.

Initial analyses show that testing and optimizing positively correlated with solution quality. Moreover, testing and optimizing were positively associated with the recall of the problem and self-regulation, but not with domain-specific content-knowledge and intelligence. The results indicate that testing and optimizing are process competencies that are independent of intelligence and content-knowledge. Limitations of the study, as well as theoretical and practical implications, are discussed.

Paper 3   11461

Do Preschool Environments Encouraging Construction Play Enhance Problem Solving and Self-Regulation?

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Abstract

Children spend much time constructing and solving problems while studying their environment. These behaviors can be considered precursors of engineering thinking (Bagiati & Evangelou, 2011, 2015; Brophy et al., 2008; Lippard at el., 2018). There are myriad opportunities for engineering processes in children's play. The objective of this intervention study was to examine how enriching the preschool learning environment with diverse construction materials for six months (intervention group) impacts the performance of problem-solving (one of the six Engineering Habits of Mind–EHoM ;Lucas, Hanson, & Claxton, 2014)and self-regulation capabilities of preschoolers (aged 5–6 years) in a problem-solving construction task.

The study, compromising 228 children (108 girls), applied a mixed-method approach. The main research tool was an open-ended LEGO® problem-solving (bridge building) construction task. All participants' responses (verbal and non-verbal) and their problem-solving processes (pre-post) were video-recorded (after obtaining parental consent). Micro-analyses of the videos using a detailed scoring scheme were conducted. Data were also collected from classroom observations and semi-structured in-depth interviews with the preschool teachers.

Results show significant improvement of the intervention group compared to the control group in the quality of problem-solving and the product (bridge length, height, stability, complexity), total measure of EHoM, self-regulation capabilities, and problem-solving in a transfer task (construction task with unfamiliar material). The

qualitative data were consistent with the quantitative results. Therefore, our findings show that preschoolers improve their problem-solving, EHoM, and self-regulatory capabilities when actively engaged, daily, with construction in their learning environments enriched with diverse and inspiring construction materials.