CICERO Workshop on Learning, Brain, and Technology

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Minerva Plaza, K2 floor (basement), Minerva building, Siltavuorenpenger 5A, University of Helsinki

Abstracts

Oral Presentations

Pirjo Aunio, University of Helsinki
Lola's World educational game's effects on low performing children's mathematical skills

The aim of this study was to look for the effects of Lola´s World educational game on children´s early numeracy skills. Previous studies have shown that early numeracy skills are important for the development of later mathematical skills and it is important to support these skills already in kindergarten. The previous studies have also showed that computer-assisted instruction can have positive results. Four preschools and 33 children aged 5.5 years took part in this study. From 33 children 23 children were split randomly into two groups: an intervention group played Lola´s World and the other formed an active control group playing a game practicing language skills (Lola´s ABC party). There was also one preschool as a passive control group, following regular preschool activities. Intervention phase was three weeks, children played games every day about 15 minutes. Childrens mathematical skills were measured with Early Numeracy Test. Children´s general intelligent was assessed with Raven test. The other variables used in analysis were parental education level, home language and time played. There were some positive developmental trends in early numeracy skills during the intervention phase.

Minna Huotilainen, CICERO Learning, University of Helsinki
Embodied processes of drawing and forming are reflected in physiological signals

Marianne Leinikka, Pirita Seitamaa-Hakkarainen, Camilla Groth, Mimmu Rankanen, Maarit Mäkelä
Physiological studies of learning and creativity have mainly focused on mental processes. The embodiment of tools and experiential knowledge of materials gained over time lies at the heart of both skill learning, design and craft practices. However, the empirical studies combining the study of mind and body in relation to design and craft practice is in its infancy. In the Handing Mind project, we conducted psychophysiological experiments in order to illuminate the relationships between making and feeling, handling creative situations and the embodied mind in thirty participants, both students and professionals representing expertise in various design fields, working with visual (drawing) or material (forming clay) tasks of 1) copying, 2) creating novel designs, or 3) freely improvising. We focused on ECG changes, especially parameters of the heart-rate variability. Our findings highlight both the importance of the embodiment with respect to the material and the different physiological states observed in tasks differing in requirements related to following orders or creativity. We conclude that the embodied activities are both supported and altered by bodily and mental processes.

Anna Parpala, University of Helsinki
HowULearn - a tool for learning

HowULearn is a research-based digital tool for enhancing student learning and the quality of teaching in education institutions. All the contents of HowULearn, the inventory and the feedback, are based on the theories of learning and teaching. HowULearn enables individual study counselling for large student groups by giving written feedback for individual students about their learning. The feedback, developed by the experts in student learning, is dependent on student's answers, in other words, the feedback is different for students scoring higher or lower than their peers. In addition, the system produces information on students' perceptions of the teaching-learning environment which can be used, for example, when designing the curricula. The information is easy to use with the system's reporting tool. Furthermore, there is a possibility to use group level data for research purposes. If a student has given his/her consent, the system automatically gathers students' credits and study success from the registrar and combines this information with the data. HowULearn has therefore three different tasks: making students more aware of their learning processes, giving education institutions information regarding student learning and the quality of their teaching, and finally, supporting research on student learning.

Jyrki Reunamo, University of Helsinki
Progressive feedback in early years

Research Aims: A large amount of money in the evaluation of ECEC. However, reliable tools and methods to measure and develop abstract processes in ECEC are difficult to construct. Instead of speculating and using the method of trial and error it is important to create research-based tools to develop ECEC. Relationship to previous research works: Our project (http://blogs.helsinki.fi/orientate/) has been conducted in the University of Helsinki, Finland since 2007. Taiwan and Hong Kong are also active participants. Theoretical and conceptual framework: The educational activity and the child are discussed in the continuum of accommodation-assimilation and adaptation-agency, based on Piaget and Vygotsky. Paradigm, methodology and methods Children's and educator's orientations influence the learning environment. Through collecting, combining and analyzing large amount of quantitative data we have been generating tools for developing ECEC by progressive feedback in practice. Ethical considerations: The observers' and interviewers' training included aspects of respecting children's rights and feelings. The permits for the children to participate in the research were collected from the guardians. The personal details were not collected. Main findings or discussion: The Orientate project main development tool can be describes as progressive feedback, by which societies, municipalities, ECEC personnel and children can get hold of the dynamics of the ECEC processes. Implications, practice or policy:
The tool of Progressive feedback in ECEC is designed for easy application to allow global use.

Pirjo Suhonen, Satakunta University of Applied Sciences
The Finnish Double Flip Coding Lessons

Technology can be a great tool in education. Flipped classroom-pedagogy can provide a solution to the use of education technology in a classroom environment. The flipped classroom-pedagogy means that the lecture and homework change places. Less lecturing and more interaction during the lesson is the main point in the pedagogy with the help of learning videos. (Khan 2012.) In the coding lessons, videos were not given as homework, but a coding video was shown at the beginning of lessons. An easily repeated lesson plan for coding was created and instead of asking the teachers to teach the lesson for other children, the responsibility was given to the pupils. Thus, the playful term the Finnish double flip. Currently 4th year pupils

have taught in less than a year nearly 200 other pupils to code with the help of the lesson plan, a video about coding and the hour of code-website. Pupils play the key role during the lesson. The coding lesson supports phenomenal learning, which is introduced in the new national curriculum. Pupils do the presentation together and they help other classes together. They can practice their English language, IT, team-work, communication and presentation skills.

Heidi Syväoja, LIKES Research Center for Sport and Health Sciences
The negative association of screen time and academic achievement mediated by late bedtime

Purpose: To examine the associations of objectively measured sedentary time and self-reported screen time with academic achievement. Methods: Study population consisted of 970 children (grades 47, 52.4% girls) from nine schools throughout Finland. Sedentary behaviour and moderate to vigorous physical activity were measured objectively by using an accelerometer, and subjectively with a self-reported questionnaire. Aerobic fitness, body composition and self-reported bedtime were assessed. Academic achievement scores (grade point average, GPA) were provided by the education services. Structural equation modeling was applied to examine the associations. Confounding factors such as gender, age, physical activity, mothers educational level, and childrens learning difficulties were taken into account. Results: Self-reported screen time had a negative indirect association with GPA, which was mediated by late bedtime ($B=-0.071$, $p<0.001$) and poor aerobic fitness ($B=-0.039$, $p>0.001$), but not by body fat percentage. Objectively measured sedentary time from which the variation explained by the screen time was excluded, had a direct positive association with GPA ($B=0.193$, $p<0.0001$). Conclusion: In this study, children who had higher levels of screen time, went to bed later, had weaker aerobic fitness, and had weaker academic achievement. However, the sedentary time also included behaviours, which seemed to be beneficial to school performance.

Minna Törmänen, University of Helsinki
Playful learning in the brain

Minna Törmänen (University of Helsinki, Department of Teacher Education, Special Education), Nina Sajaniemi (University of Helsinki, Department of Teacher Education, Early Education) & Minna Huotilainen (University of Helsinki, CICERO, Brain, Learning and Education)
The aim of this multidisciplinary research project between early education, neuroscience and special education is to bring new information on the use of brain and physiological research methods in day care centers and school environments in tasks relevant to playful learning. Project compared the brain and physiology functions with children aged 4-5 years (N=24) in two learning situations: An adult-guided training of executive functions and a free play situation. In the project we compared a set of portable devices: activity measurement devices and heart-rate-variability measurement devices. The aim was that chosen devices were easy to use, reliable, and comfortable. In addition to this there was cortisol measurements from saliva. Another aim is to compare different data analysis methods for the sets of data. The project gathered information from children on their experiences in using the devices and physical measurements in general. Importantly, project will produce new knowledge on children`s cognitive and behavioral development.

Sanna Vahtivuori-Hänninen, CICERO Learning, University of Helsinki
Pedagogical Principles in Designing Digital Learning Solutions

Experiential learning and collaborative learning models are often emphasized when using of information and communication technologies (ICTs) in education. How can characteristics of these pedagogical principles be realized and seen in practice in learning solutions? The designing principles of futures inspirational learning solutions and environments have been analyzed in the research project of Systemic Learning Solutions value

network. The SysTech learning solutions developed by Finnish companies, ranging from a math game aimed at primary school children to a business simulation, were experimented in practice in the joint R&D project. Altogether 17 companies participated in developing 13 learning solutions. All the participating companies aim at innovative concepts and prototypes in their product development. The data of the study consisted of expert evaluations and developers interviews. In addition, data was gathered from students and teachers from different school levels in trial experiments with theme interviews and web-based questionnaires. Based on the qualitative content analysis it can be stated that students and teachers expect the learning solutions to provide them with target-orientation, student-centered thinking, motivation and engagement. 21st century skills, such as skills related to collaborative working and creative thinking were also emphasized. Role of feedback was also considered significant. Teachers wish the learning solutions to offer them versatile tools for evaluation and assessment. The pedagogical characteristics emerged from the data can be seen as being limited and they are tightly interconnected. Keywords: Pedagogical models and principles, learning solutions, educational use of ICTs.

Sari Ylinen, University of Helsinki
Computer-based learning of foreign words with and without feedback

Previous studies have shown that the probability of occurrence of a word and a picture among many alternatives is enough to establish the link between them. This is called cross-situational statistical (CSS) learning. Here we aimed to determine the effect of feedback on CSS learning of foreign words. The experiment had a training phase, a test phase immediately following training, and a re-test with one week delay. In training, a computer program was used to present Finnish-speaking adults (N=20) with unfamiliar spoken Russian words combined with their written Finnish translations in a CSS learning paradigm with or without feedback. Listeners always heard two spoken Russian words and saw two written Finnish words in random order, so that the meaning of each word could not be known without cumulative statistical information about co-ocurrences of spoken and written stimuli. The results suggested that CSS paradigm enabled the learning of word-referent mappings with 80-90% accuracy, which persisted one week delay. Test phase indicated that feedback in the learning phase facilitated and speeded up learning. However, in the re-test with one week delay, the words learned without feedback were recalled slightly better. This suggests that effortful learning may sometimes produce longer-lasting effects.

Poster presentations

Syawal Amran, National University of Malaysia
The use of humour in mathematics teaching and its relationship with students' concentration and motivation

Fun learning through the use of humour in teaching mathematics can create an effective learning atmosphere. The purpose of this study is to identify students' perception on the use of humour in teaching mathematics and its relationship with students' concentration and motivation. The data was collected using a 5 point Likert scale instrument to measure students' perception and their preferences on the use of humour by their Mathematic teachers. The instrument also measure students' endorsement on the effect of humour to their concentration and motivation to learn in Mathematics class. The respondents were 278 form four students from secondary schools in Malaysia. The findings were analysed using descriptive statistic. The findings indicate that there is a gap between students' preferences on the use of humour with teacher's practice of humour in Mathematic class. The findings also showed that students reported humour does

enhance their concentration and learning motivation. The study recommends teachers to create a fun learning environment through the use of humour to motivate studentsto be engaged in Mathematics class.

Eva Durall, Aalto University
Feeler: supporting reflection in learning through EEG data

The increase of smart and wearable technologies that make use of sensors to monitor physiological data has enabled people access data about their mental and physical states and therefore, gain better understanding about themselves. In education, the use of physiological data is low since teachers still have difficulties in identifying the educational affordances of the technologies currently available in the market. We argue that smart objects and wearable devices that monitor electroencephalographic activity (EEG) offer opportunities for fostering reflection, a skill which has been recognized as key in learning. We present Feeler, a prototype that seeks to foster awareness and reflection based on the visualization of students' electroencephalographic data when performing academic activities. Feeler design makes use of different design strategies for supporting reflection, such as time, personal experience, the display of hidden information and incompleteness. To date, Feeler proof-of-concept prototype has been tested with 6 higher education students. In the session, we will share the results obtained after the data analysis of the tests as well as its implication for next design iterations. Through Feeler research we aim to discuss the possibilities and challenges of EEG data in learning and education.

Satu-Maarit Frangou, University of Lapland
Writing Methods, Memorizing and Embodiment of Cognition

Our hands are tools with which we can do countless things from opening a door to painting a portrait. However, technology has generated a multilevel metamorphose not only of the educational field, but also of the usage of hands in learning, and remembering. This study investigates how different writing methods affect memory retrieval. The Wechsler Memory Scale (WMS) is used with experimental within subjects' research-design to measure memory functions of 20 participants by writing down a story with the means of pen, computer keyboard, and touch screen virtual keyboard and consequently measuring the degree of recollection of each writing method. The data collection and analysis is conducted in spring 2016. Experiences, actions and senses all play part in learning process with the co-operation of brain, mind and body. Learning and memorizing is not simply information processing in vacuum. This applies also to writing. The embodiment of cognitive processes cannot be overlooked. The results of this study will be of interest due to the rapid and constant increase of digitalization of learning environments. Moreover, it will elicit valuable information that is beneficial when evaluating the impending changes in the Finnish curriculum, from which cursive handwriting will be removed.

Katja Junttila, University of Helsinki
The effect of task on spoken foreign language learning in children

This study investigated the effectiveness of four different kinds of tasks on learning foreign language words in children. During the tasks, the children practiced English words for animals using a tablet. In each task they heard the spoken English words through headphones and saw corresponding pictures on the tablet. In explicit active task they were instructed to imitate the words they hear and to memorise them. In incidental learning task they were instructed to name the animal they see in Finnish. The explicit passive task was to memorise the animals in English without imitating. In statistical task the children were presented with pictures of two different animals and were instructed to guess which one corresponds to the word they heard. After practicing the words, the learning of the word form and meaning were assessed. According to preliminary results, the children learned the word forms and meanings of some of the words in each task.

The incidental learning task seemed to be less effective in learning the meaning of the words than the explicit active task

Ge Wei, Marianna Vivitsou, Veera Kallunki, University of Helsinki
Developing Teachers' Practical Knowledge by Using Digital Storytelling as a New Didactics

So far, previous research (e.g., Niemi et al. 2014) has focused on digital storytelling as one way for students to better understand the curriculum and share their knowledge with peers and teachers. However, in this study we consider digital storytelling as a new didactics (i.e., teaching as reflective practice; Westbury, Hopmann & Riquarts, 2000) that can create a third space for teacher professional development as well. Since September 2015, a comparative research has been conducted on the development of teacher practical knowledge through digital storytelling between Finland and China. Both Chinese and Finnish schools participate in the study. As a manifestation for the development of teachers' professionality, many didactical changes take place during digital storytelling integration in classroom settings (e.g., classroom management, content delivery, etc.). This presentation will introduce our international collaborative project. Some intermediate reflection and initial findings on the cooperation will be discussed as well. The authors argue that digital storytelling as a new didactics can help teachers to find a new approach to reach students' invisible understanding of the curriculum. This leads teachers to deeper reflection and a new landscape of their practical knowledge. From an international perspective, this collaborative project creates a dialogical space between east and west, increases teachers' understanding of multi-cultures and divergent contexts, which is also an important part of teachers' practical knowledge in the globalized era.