Conference 2017
‘Empowering Creativity in Education’

Thursday 30th March

09.00 – 09.30	Registration
09.30 – 09.35	Opening by Dr. Evelyn Kroesbergen
09.35 – 10.35	Keynote by Prof. Dr. Todd Lubart
10.35 – 11.00	Coffee Break
11.00 – 12.00	Keynote by Prof. Dr. Maciej Karwowski
12.00 – 12.45	Poster sessions
12.45 – 13.30	Lunch
13.30 – 14.30	Keynote by Dr. Giovanni Emanuele Corazza
14.30 – 15.30	Oral presentations by Eva Hoff, Simone Ritter, and Maike Schindler
15.30 – 16.00	Coffee Break
16.00 – 16.45	In-depth discussion led by Dr. Vlad Petre Glaveanu, with a panel of Dr. Giovanni Emanuele Corazza, Prof. Dr. Maciej Karwowski, Prof. Dr. Mark Runco, and Prof. Dr. Todd Lubart
16.45	Closing by Dr. Vlad Petre Glaveanu
	Social activity & dinner

Friday 31th March

08.30 – 09.00	Registration
09.00 – 09.05	Opening by dr. Evelyn Kroesbergen
09.05 – 10.05	Keynote by Prof. Dr. Mark Runco
10.05 – 10.30	Coffee Break
10.30 – 11.30	Keynote by Dr. David Cropley
11.30 – 12.15	Creativity Market
12.15 – 13.00	Lunch
13.00 – 13.10	Gather for workshops, walking to Ruppert Building
13.10 – 13.55	Workshop session 1 (Workshops by Dr. David Cropley, Prof. Dr. Mark Runco, & Prof. Dr. Kiene Brillenburg-Wurth).
14.00 – 14.45	Workshop session 2
15.15 – 16.15	Keynote by Prof. Dr. Roni Reiter-Palmon
16.15 – 16.45	In-depth discussion session led by Prof. Dr. Kiene Brillenburg-Wurth, Prof. Dr. Roni Reiter-Palmon, Dr. David Cropley, and Prof. Dr. Todd Lubart
16.45	Closing by Prof. Dr. Kiene Brillenburg-Wurth & drinks

Abstracts of the keynotes

- **Keynote by Prof. Dr. Todd Lubart**

Title: The measure and mismeasure of creativity

Abstract: Issues concerning the measurement of creativity in educational settings will be examined. Examples of several well-known measures of creativity will be presented and discussed. Then a new comprehensive approach to creativity measurement will be presented. Accordingly, measures of creative thinking in several domains of activity, with both divergent-exploratory and convergent-integrative facets of the process will be described. International studies using the EPoC battery which illustrates this approach will be presented.

- **Keynote by Prof. Dr. Maciej Karwowski**

Title: Creativity and Education: beyond the myths.

Abstract: Mark Twain, one of the most eminent prose writers of all times, once said: “I have never let my schooling interfere with my education” (as quoted in Harnsberger, 1972, p. 553). These words perfectly capture the attitude that both creators and many creativity scholars have towards school. Briefly speaking: school has a bad reputation. Millions of views of Ken Robinson's critical speech on TEDx, examples of creators who did badly at school and truly hated it (including Albert Einstein), as well as numerous studies conducted over a few decades reported in the creativity literature show that school is (too) often not a place where students' creative potential can flourish unimpeded.

But is it really as bad as critics say? Apart from brilliant creators who did badly at school, there are others, who did well: Sigmund Freud, John Locke, August Comte, or Karen Horney were excellent students. Apart from studies showing teachers' biases against creative students, there are ones showing that the image of a good student is close to that of a creative student. Findings to the effect that teachers are unable to recognize students' creative potential appear in the same scholarly journals as results showing that teachers increasingly appreciate creativity and that creative abilities are positively related to school achievement.

In this talk, I will try to present a more balanced overview of the relationships between creative potential and school functioning; studies conducted in our lab, including the latest meta-analysis and several large investigations.

- **Keynote by Dr. Giovanni Emanuele Corazza**

Title: *Creativity in Education: A Recursive Exercise in Estimation Ability*

Abstract: Can anyone see the full value of a creative idea? According to a recent dynamic definition of creativity (Corazza, 2016), the answer to this fundamental question is negative. In fact, this is a consequence of the pragmatist maxim, according

to which our conception of an idea requires the imagination of all possible consequences which may have practical bearing on reality: an exercise in meta-creativity which we identify as *estimation*. It is indeed a never ending exercise, as immediately one is challenged to estimate all of the possible consequences of the estimated imaginative application scenarios of a creative idea. The realization of the recursive nature of estimation of creativity has consequences in education which are both fundamental and dramatic. There is a need to go beyond the mere contraposition between activities with one correct answer and those with multiple possible outcomes, still being judged by "experts". How can the arrogance of expertise be overcome in favour of creative guidance? The essential element is to progress in the understanding of how educators can be good estimators of creativity, and how they can foster the development of estimation ability in their students, an essential part of their creative mindset.

- **Keynote by Prof. Dr. Mark Runco**

Title: Will follow soon
Abstract: Will follow soon

- **Keynote by Dr. David Cropley**

Title: Creativity Research in Australian Schools – Systematic Approaches to Understanding Creativity in the Classroom
Abstract: A resurgence of interest in creativity in education in Australia has seen the planning and implementation of a range of public and private sector research projects since 2015. The reasons behind this interest seem to be a combination of economic factors, government policy, broader interest in innovation as a driver of growth, and national curriculum policy. Regardless of the reasons, serious and systematic efforts are now emerging, both in private sector (independent) schools, and in state government departments of education, responsible for public sector education. This paper will review several significant examples of research programs that have been designed, not merely to add to the body of knowledge of creativity in education, but to provide evidence-based answers to questions like: how do teachers assess the creativity of student outputs, and, how do teachers embed the development of skills in creative problem solving in their classroom teaching?

- **Keynote by Prof. Dr. Roni Reiter-Palmon**

Title: Training to Understand Creativity: Can Individuals Be Trained to Recognize Creative Ideas
Abstract: An important issue in the study of creativity and its application is whether people are able to recognize creative ideas. When asked to develop creative ideas, individuals will not bring up ideas they believe are not creative. In addition, if ideas presented by others are not recognized as creative, these ideas will not be pursued.

There is limited work on idea evaluation for creativity, and it suggests that individuals are not very good at identifying creative ideas. The purpose of this study was to evaluate the effect of training on idea evaluation. To examine this, we trained undergraduates about how to evaluate and rate creativity and manipulated whether or not their training included practice ratings and feedback, as well as the quality of the rating rubrics they received. We compared their ratings of creative solutions with expert ratings to assess rating accuracy. Results showed that rating practice and more descriptive rating rubrics increased the accuracy of participant ratings. However, this relationship was true only for quality rating accuracy, not originality rating accuracy.

Abstracts of oral presentations

- **Presentation by Simone Ritter, PhD**

Title: Creativity: Scientific Insights and Practical Tools to Prepare our Younger Generations to Become Creative Change-makers and Lifelong Innovators

Outline: Creativity is one of the most important cognitive skills in our complex and fast-changing world[1], yet few schools teach this important 21st century skill[2]. Creativity was long considered a topic not open to scientific investigation[3]. However, in recent years, increasing insights have been gained into how creative ideas arise in the brain, and it is now understood that creative thinking skills are inherent to normative cognitive functioning rather than an innate talent available to only a few genius minds[4]. Importantly, my research[5-13] and that of other labs[14], has provided evidence that creative thinking skills can be enhanced.

In the current talk, I will present two well-developed and scientifically tested means to stimulating creativity that can be implemented easily in schools. In Project 1, we developed and tested a 1.5 hours creativity training that employed a cognitive approach (i.e., students were shown how to apply creative thinking techniques in a systematic fashion). The creativity training improved performance on a variety of well-validated creativity measures[6]. In Project 2, we investigated schema-violations (Study 1: violation of the laws of physics in a Virtual Reality setting; Study 2 and Study 3: violation of the sequence of a well-known activity) as a means to enhance students' creativity. Schema-violations significantly enhanced students' creativity[8,11]. In Study 4, the brain activity during schema violations was explored by means of fMRI research, and revealed increased activity in the temporal parietal junction (TPJ), a brain region that is associated with violation of expectations[8].

These well-developed and scientifically tested means to enhance creative performance are highly promising. They enhance our understanding and theory-development of how to empower creativity in education, and provide valuable tools for the educational field to prepare our younger generations to become creative change-makers and lifelong innovators.

- **Presentation by Maike Schindler**

Title: Eye-Tracking Mathematical Creativity

Outline: Mathematical creativity as a key ability in our automated and interconnected, high-technology based society is increasingly in the focus of mathematics education research. Recent research has turned towards understanding the whole *process* of mathematical creativity, rather than considering only end *products* of creative problem solving (cf. Cropley, 1992; Haylock, 1997). Correspondingly, methods to observe and analyze creative processes are needed and under investigation.

Following previous work of Muldner and Burleston (2015) and Schindler et al. (2016), we use eye-tracking for investigating mathematical creativity. In particular, we use portable eye-tracking where eye-movements are captured in an unobtrusive way through cameras mounted on a pair of goggles. Portable eye-tracking is a promising technology to gain deeper insights into students' creative processes. I draws on the so-called eye-mind hypothesis, which posits that persons' eye movements are tightly related to their cognitive processes (Jang et al., 2014). In our project "Eye-Tracking Creativity (ETC)", we aim at "tracing" creativity processes among secondary school students. We analyze gaze tracks obtained while the students are working on Multiple Solution Tasks (MSTs); problems that can be solved in different ways.

In the talk, we will show examples of our data and present results of ongoing research. We will show and discuss videos of eye-tracking overlaid student views engaged in an MST (see link for an example). We will furthermore show dual eye-tracking videos. Here, we display joint eye tracks of two students, both wearing eye-tracking goggles, in one video. This potentially reveals their collective creativity (cf. Levenson, 2011).

The results presented in this talk comprise both: opportunities/limitations of eye-tracking as a method in creativity research and insights about students' mathematical creativity processes. Our results indicate, e.g., that the students' creativity process resembles the creativity process described for mathematicians (Sriraman, 2009), comprising the phases of incubation, illumination, and verification.

- **Presentation by Eva Hoff**

Title: Creative classroom climate as a means to promote mastery oriented motivation

Outline: Researchers (Amabile, 1996, Ekvall, 1996) assert that a work climate characterized by freedom, openness, playfulness, mastery, idea support, but low conflict level is conducive to creativity. Creativity encouraging classrooms have been described with similar characteristics (Beghetto, 2010; Beghetto & Kaufman, 2010; Cremin, Burnard, & Craft, 2006; Cropley, 1997; Hoff & Lemark, 2012; Jeffrey & Woods, 2009). However, in the school area, studies are often qualitative descriptions of climates instead of measured statistical relations. Several measurements exist in the organizational field, however, only some attempts exist to measure classroom climate (e g, Soh, 2000; review by Peter-Szarka, 2012). Furthermore, there is a lack of studies verifying these measurements. The aim of the present study was to relate a newly constructed Creative Classroom Climate Questionnaire (CCCQ) to motivational orientation. CCCQ has 30 questions and four subscales (Creativity and mastery support; Trustful collaboration; Supportive climate; Independence and influence). With 95 participants (5^{th} graders), we tested its association to motivation (achievement

goal motivation). Intrinsic motivation, self-determination and mastery motivation are seen as prerequisites of or a part of creative performance (Amabile, 1996; Hennessey, 2000; Hennessey, 2010). Results confirmed the link between mastery motivation and CCCQ (medium sized relation, $r = .50$). The other motivational orientations (avoidance, performance) lacked a relation to creative climate. The finding of a relationship between mastery motivation and the questionnaire is of importance as a validation of the instrument. The questionnaire can be a way for teachers interested in creative development to investigate their classroom climate. By using the CCCQ as diagnostic tools teachers will get an indication what to change in their classrooms. There is a need for practical tools to help teachers understanding what a creative environment is and how to promote creativity in students (Hoff & Carlsson, 2011 shows that teachers do not fully recognize students' creativity).

Overview of workshops

- **Workshop by Dr. Mark Runco**

Title: Something Old, Something New: A workshop on Fulfilling Creative Potentials
Outline: This workshop starts by describing why the most important topic for creativity may be the fulfillment of potentials. The concept of "potential" is briefly explored, along with the "standard definition of creativity" and 1-2 alternatives to it.

Then we dive into methods. Some of these are old; these involve divergent thinking. Come to find out, divergent thinking is often targeted and exercised incorrectly. A good example of this involved timing examinees as they take the tests, or to imply in any way that the tasks are serious tests. They should be treated as games or examinees will not be very original.

The new methods are based on the theory of personal creativity, and in particular on the idea that creativity is largely a matter of decision making. In this light it is not skill, capacity, ability, or personality, but is instead a choice. Actually, there are various choices, and the individual can make choices such that they behave in a creative fashion and perform at the highest level of their potentials. There are exercises, which will be presented, that can encourage creative choices and decision making that leads to creative behavior.

- **Workshop by Dr. David Cropley**

Title: Fostering Creativity in the Classroom: Devising Exercises that Develop the 12 Habits of Creativity
Outline: Declining creativity test scores (Kim, 2011) have renewed interest in mechanisms to stimulate and foster creativity both at home and in schools. There are many comprehensive discussions of the factors that must be addressed to develop the "habit" (Sternberg, 2007) of creativity. However, parents and teachers may struggle in turning these *descriptive* guidelines into practical *action*. To assist in developing creativity, especially in a school environment, teachers may benefit from a combination of: (a) general *explanatory guidelines* that outline the principles of fostering creativity (i.e. WHAT?) and, (b) specific *implementation guidelines* that detail the creation of practical activities to achieve the desired outcome (HOW?). This workshop will address each of Sternberg's (2007) "12 keys for developing the creativity habit in children" (p.8), and show how these can be applied in the classroom. The workshop will also present statistical evidence from a small-scale, pilot study to support the hypothesis that this approach can lead to an increase in student creativity.

- **Workshop by Prof. Dr. Kiene Brillenburg-Wurth**

Title: Creativity Unbound

Outline: In this workshop I will use an illustrative case study to show that creativity goes beyond the brain. Therefore, we should study creativity as a cultural phenomenon to fully understand it. Creativity does not only apply to learning, but also to institutions and cultural changes. How this works, I will show during this workshop.

Abstracts of poster presentations

- **Presentation by Marije Stolte, MSc**

Title: Creativity, Mathematics, and Executive Functions

Outline: This poster discusses the research project regarding the hypothesis that creativity acts as a mediator between executive functions, mathematical problem solving and mathematical knowledge. Creativity is necessary to solve complex problems that cannot be addressed with routine or learned approaches. However, creativity is hardly stimulated in the educational environment, especially during mathematical lessons. Additionally, the cognitive abilities that underlie the link between creativity and mathematics remain unknown. The goal of the current project is to create a theoretical model on how creativity, executive functions (domain-general cognitive skills), and mathematical problem solving (domain-specific performance) are related and to investigate how these skills develop over time. The project will consist of one large scale study, one longitudinal study, and one experimental study, in which eye-tracking and EEG measurements will be used to measure the underlying cognitive factors of creativity. The longitudinal study will follow 200 children from grades 3-5 (age 9 – 11) over a two year period. This will lead to a major contribution to our understanding of creativity in mathematics and education. Creative problem solving in mathematics will be studied in typically developing, mathematically gifted, highly creative children, children with mathematical difficulties, and children with attentional problems. This makes it possible to investigate the role of creativity and executive functions on the specific strengths and weaknesses of these groups. The hypothesis is that early inhibition and leaky attention underlie successful problem solving, mediated by creativity.

- **Presentation by Honghong Bai, MSc**

Title: Emerging Strategies of Divergent Thinking in Early Childhood: A Pilot Study across Different Ages.

Outline: Divergent thinking is viewed as an estimate (Runco, 2010, 2011) or an indicator (Preckel, Wermer, & Spinath, 2011) of the creative potential. It is important for innovation and problem solving (Bijvoet-van den Berg & Hoicka, 2014), especially for ill-structured problems. Early childhood is particularly important for developing divergent thinking. Previous studies have included divergent thinking in their overall creativity training programs (Cheung, 2010; Chronopoulou & Riga, 2012; Craft, McConnonb, & Matthewsa, 2012; Rasol Abdullah, Faridah, & Ashraf, 2009; Riga & Chronopoulou, 2014; Gupta, 2009; Smogorzewska, 2012, 2014). But none of them has explained how their activities facilitate divergent thinking from a cognitive perspective. However, Gilhooly, Fioratou, Anthony, and Wynn's (2007) has found that divergent thinking strategies can influence the quality of divergent thinking

among adults. This study will investigate which strategies young children demonstrate, and compare it to Gilhooly et al.'s findings about adults. As the broadly-used think-aloud method is in doubt for children (van Someren, Barnard & Sandberg, 2014), another aim of this study is to evaluate whether interactive dialogue is a better method regarding to children's strategy research. Ten children from 55 to 83 months were recruited. Interactive dialogue and think-aloud method were alternatively used while children were finishing an alternative uses task (Gilhooly et al., 2007). The exploratory analysis of protocols proves the interactive dialogue a better technique for retrieving information about children's strategies. Furthermore, adults and young children share some similarities in strategy use, but also have differences. Imagination is an important strategy for children.

Apart from this specific exploratory study, this presentation will also include a brief introduction of the whole project – 'Improving divergent thinking in preschoolers through strategic knowledge enhancement: A microgenetic study'

- **Presentation by Mare van Hooijdonk, MSc**

Title: Exploring Creative Problem Solving Indicators of Primary School Children in Two Domains

Outline: Creativity is regarded as the production of both a novel and useful product, as defined within a social context (Plucker, Beghetto, & Dow, 2004). This 'product' may be an artistic expression such as a painting or a poem, but can also be a creative solution to a daily problem at stake. The latter is regarded as an expression of little-C creativity (Craft, 2001), and is seen as the core outcome of the Creative Problem Solving (CPS) process (Isaksen, Dorval, & Treffinger, 2011). CPS requires both knowledge and creativity in cycles of divergent and convergent thinking. It is exactly CPS that contemporary society demands us to assess, to find out what students can – creatively – do with their knowledge. Few studies have scientifically investigated effective ways to embed a deliberate creative process in a primary school context. This in-depth explorative study focuses on the measurement of Creative Problem Solving (CPS) indicators (e.g., fluency, originality, completeness) in the science and social domains. Two questions are central: (1) How do different indicators (both within and between aspects) of the CPS process relate to each other? And (2) What CPS indicators did the primary school children apply across two domains? We will evaluate correlations and conduct a Maximum Likelihood Exploratory Factor Analysis to assess relationships. Additionally, we regress CPS scores in one domain on scores in the other to explore domain-generality of CPS processes across domains.

- **Presentation by Marloes van Dijk, MSc**

Title: The Influence of Bilingualism on Creativity

Outline: This study investigates the relationship between bilingualism and creativity. Previous research predominantly found a positive influence of bilingualism on

creativity (e.g., Hommel et al., 2011, Kharkhurin, 2011, & Lee & Kim, 2011), which was mainly explained by bilinguals' enhanced executive functioning compared to monolinguals, and their experience with multiple cultures. It was found that most previous research examined the relationship between bilingualism and creativity from a cognitive perspective, which - in our view - does not reflect the important influence of the environment in the development of children. Cognitive processes should be seen as being situated; creativity emerges in the interaction between children and their environment. Therefore, this study was aimed at providing a more process oriented description of the relationship between bilingualism and creativity. We are interested in what happens when a creative thought arises. An environment offers affordances (i.e., action possibilities) upon which a child could act. Creativity can be seen as the process of combining affordances in a novel way (also see Glăveanu, 2012). People perceive different sets of affordances. Bilinguals may need separate concepts for objects or actions. These concepts might also differ in affordances. For example, when hearing the English word bread, this might evoke the image of a loaf of sliced bread at bought at the supermarket, whereas the French word pain evokes the image of a baguette that you buy at the bakery (Adams, 2016). In this view, bilinguals might perceive more affordances upon which they could act, and, therefore, be more creative than monolinguals.

- **Presentation by Eveline Schoevers, MSc**

Title: Enhancing Creative Problem Solving In An Integrated Visual Art And Geometry Program: A Pilot Study

Outline: In current primary mathematics education, there is little room for creative problem solving. Students learn to solve routine problems (exercises), but often do not learn to solve mathematical (non-routine) problems, which requires creative thinking because the student has no learned solution to solve the problem (Leikin & Pitta-Pantazi, 2013). Furthermore, teachers are often not used to teach for creativity. To change current educational practices in primary schools, the MathArt project was started. The MathArt program has the aim to increase students' creative problem solving skills in geometry and visual art and to increase students' geometrical ability. To achieve these goals on a student level a teaching sequence for fourth, fifth and sixth grade students was designed in which geometry and visual art are integrated. Since it was expected that Dutch teachers were not sufficiently equipped to support students' creative problem solving in geometry, a professional development (PD) program for teachers was designed. From September 2016 – February 2017 the MathArt program was piloted. This pilot study has the aim to evaluate the effects of the teaching sequence and the PD program and to evaluate the (implementation of) the MathArt program. Tests (e.g. geometrical creativity test, Epoc figural, tct-dp, geometrical ability test), observations (e.g. teaching for creativity observation

instrument (TCOI)) and surveys were used to evaluate the effect and implementation of the program. On the UPCE conference initial results of the pilot study are presented.

- **Presentation by Astrid de Blecourt**

Title: High performing students: Perfectionism and Creativity

Outline: High performing students are often believed to be more creative than others (Miller, Lambert & Neumeister, 2012). However, there are also studies suggesting that high performing students are more perfectionistic (Parker & Adkins, 1995). This combination of characteristics seems to be at odds because perfectionism could be hindering creative abilities (Boice, 1993). An explanation for these seemingly contradictory findings could be that different types of perfectionism can be distinguished (Parker, 1997). Parker (1997) suggest that perfectionists are a heterogeneous instead of a homogenous group and distinguishes healthy perfectionists, dysfunctional perfectionists and non-perfectionists. These different types of perfectionism are probably associated differently with divergent and convergent creativity. By taking different types of perfectionism into account, the proposed study aims to provide more insight into the relationships between perfectionism and creativity in high performing students.

The proposed study will include approximately 160 VWO-students who will be selected based on their CITO scores of 545 and higher who are in year 1 of secondary education. To measure perfectionism the Frost Multidimensional Perfectionism Scale (Frost, Marten, Lahart & Rosenblate, 1990) will be used which consists of 6 subscales. A two-step procedure using both hierarchical and nonhierarchical cluster analyses, will be used. Based on previous literature we expect that three clusters can be extracted: healthy-, dysfunctional- and non-perfectionist. The Alternative Uses task (Guilford, 1967) and the Remote Association Test (Mednick, 1962) will be used to measure divergent and convergent creativity, respectively. To identify the relationship between the types of perfectionism and both the kinds of creativity a MANOVA will be used.

By comparing groups of students with different types of perfectionism, the proposed study aims to create a better understanding of the complex relationship between perfectionism and creativity in high performing students.

- **Presentation by Alice Chirico**

Title: Enhancing creativity through awe: an experimental study

Outline: In recent years, a growing number of studies have focused on the relationship between emotions and creativity. Generally, results have indicated that positive emotions increase creativity while negative emotions have no effect on it. Here, we investigated the effects of awe – a complex emotion characterized by feelings of vastness, surprise and a need to accommodation [4] – on a subsequent

creativity task. Our main hypothesis was that awe would enhance creativity because of its ability to expand and restructure people' mental frames, showing new relations among objects. To test this hypothesis, a total of 52 university students (M=26, F=26, mean age = 24,9; S.D. = 2,14) were either exposed to an awe-inducing video or a neutral one, in a within-subject design (the order of content was counterbalanced within the sample). After exposure, participants reported the intensity and type of perceived emotion and completed the 4° and 5° activity of the Torrance Thinking Creative Test – TTCT [5]. We carried out a Wilcoxon test for each of the creativity dimensions and regarding each condition (awe and neutral). Results showed that (i) awe-inducing stimuli were able to generate more intense awe feeling than neutral stimuli; (ii) awe-inducing stimuli significantly increased each dimension of creativity (i.e., fluency, originality, flexibility, elaboration) compared to the neutral video.

- **Presentation by Merel van Goch**

Title: Educating creative problem-solvers: quantitative and qualitative assessment of students' creativity

Outline: Creative traits are crucial in today's society. Students need to develop creativity for job success, and higher education programs should find ways to foster students' creativity. Creativity, defined as the ability to produce something novel and valuable as defined within a social context, involves skills such as divergent thinking, problem solving and perspective taking. Liberal education is hypothesized to foster students' creativity through interdisciplinary program characteristics. This study assessed students' creative potential quantitatively as well as qualitatively. Before and after commencement of an interdisciplinary liberal undergraduate program, two creativity tasks (i.e., the unusual uses subtest of the Torrance Test for Creative Thinking, and the Test for Creative Thinking – Drawing Production) were administered to 181 students. In between measurements, students followed a course in connective thinking through creative reading and writing. The results showed that students' creative potential developed over time. Additionally, students answered open questions on creativity and its role in (liberal) education. Societal and educational implications of these assessments will be discussed.

- **Presentation by Paulo Gomes de Sousa Filho**

Title: Use of historical-critical methodology in an online course for the development of creativity for elementary school teachers in Brazil

Outline: This work describe the methodology used in an online course that is part of a study that investigated the effects of a creativity program administered in the form of distance education for teachers of the initial years of the basic teaching, compared with a face-to-face group and a control group. The development of the program was grounded on the historical-critical method, a methodology in which social interaction as well as student reflection activity are basic. This methodology is an alternative to

the constructivists theories that have been used with most of online courses and it is in line with the socio-historical theories and with the Systems Perspective, theories that underpin the study. The method of historical-critical pedagogy that bases this work, is constituted of five stages (Gasparin, 2007): (1) Social practice; (2) Problematization; (3) Instrumentation; (4) Catarse; (5) New social practice. The implications of the results are discussed based on Vygotsky´s Socio-historical Theory and Myhalyi Csikszentmihalyi´s Systems Perspective.

- **Presentation by Hanne Oberman & Jante Janssens**

Title: Assessing Adaptive Expertise in Higher Education Student

Outline: Higher education needs to prepare students for the high demand for flexibility in the workplace; therefore students must learn to deal effectively with novel situations and problems1 . To reach this, students need to develop a broad set of skills useful in applying experience to changing circumstances: adaptive expertise (AE)2 . The term AE was coined by Hatano and Inagaki in 1984. Since then, several studies have been conducted to develop an instrument to measure AE. However, none of these instruments are applicable to measure AE in a wide range of undergraduate higher education students1,3 , as was the aim in this study. Based on a questionnaire by Fisher and Peterson3 , four constructs within AE were presumed: multiple perspectives, goals and beliefs, epistemology, and metacognitive self-assessment. For each construct, ten questions were included in the questionnaire. The questionnaire was filled out by 190 first year interdisciplinary bachelor students. The reliability of the questionnaire (Cronbach's alpha =.767) was acceptable4 . However, there was no sign of convergent construct validity with creativity tasks (TTCT-V and TCT-DP) that were conducted simultaneously (rs=.031, p=.669 with TTCT-V, and rs=.079, p=.297 with TCT-DP). Several factors could account for this result, for example underdevelopment of AE in first year students; the potentially inappropriate inclusion of the construct epistemology5 . It is also possible creativity was not a good measure for convergent construct validity with AE. Another study (Dutch students, N = 38) conducted with a subset of the AE questionnaire and the construct innovativity, suggests convergent construct validity with innovativity (r=.52, p<.01). Assessment of AE can lead to a better understanding of AE and the development of AE. This research contributes to the measurement of AE which is a key feature in students' flexibility in future workplaces.

- **Presentation by Mônica Souza Neves Pereira**

Title: Creativity in Children Education: A Sociocultural Research On Teachers´ Ideas And Practices

Outline: The objective of this study was to investigate in microgenetic level, teachers' ideas and practices of early childhood education and its relation to the promotion or inhibition of creativity in the classroom context. To better understand these practices,

it was necessary to also investigate the conceptions of these teachers about creativity and in which way their pedagogical practices complied or not with their ideas on promoting creative potential. The data construction process included direct observations in the classroom, video recordings of structured activities promoted by two preschool teachers, interviews and ethnographic notes of the school environment. For data purposes, the following analysis were carried out: (a) microgenetic analysis of structured activities by each teacher, recorded on video, with the support of Creativity Indicators (CI), methodological tool built specifically for this study; (b) interpretative analysis of direct observations in the classroom; and (c) analysis of interviews with the teachers. The study was developed in two early childhood schools in Brasilia/DF, Brazil, both from the private education system, with children between 5 and 6 years old and their teachers. From the analysis of structured sessions of direct observations and interviews it was noted that the views of teachers on creativity reflected in their practices, (re) defining their actions in the classroom. The number of ideas submitted by the teachers showed an inadequate concept of creativity that influenced their practices, both in the structured session as well as in the classroom. The study showed that the overall teacher training is essential for the development of creativity in the classroom. Investing in a holistic and wide comprehensive teacher training, that goes beyond the instrumentation in the field of knowledge of creativity, consists in a fundamental step when one intends to develop the creative potential of children in the school environment.

- **Presentation by Herie de Vries**

Title: High Versus Low Tolerance of Ambiguity: It's Impact on the Creative Product
Outline: Within a multivariate theory of creativity, personality traits, and conative factors like tolerance of ambiguity (TA) of individuals, are known to influence the creative process, and also the level of creativity of products. Few studies however, relate personality traits to features of the creative product itself. The present study investigates if there is a reflection of TA in features of a product. In what way are products resulting from an individual with a low or high level of TA different? Creative products used in this study are divergent answers of a newly developed measure of potential for scientific creativity, EPoC Science (Lubart et al, in press). Answers are distinguished, using a categorisation based on theory of TA: 1) 'Surface' answers, focused on observable properties, 2) 'Process' answers, focused on processes, and 3) 'Core' answers, focused on unobservable, core properties. Answers also represent a combination of these categories. Results of a study (n=120) conducted in France with primary school children (ages 9 to 12) will be presented. Results are analysed with non-parametric tests. It shows that the level of TA was significantly different for 'core-surface' answers compaired to 'core-process-surface' answers ($r = .014$, $p < .01$) The TA score for 'core-process-surface' answers was furthermore

significantly different for boys compared to girls ($r = .24$, $p < .01$). Results and implications for the evaluation of creativity will be discussed.