



International Summer Conference
Positive Learning in the Age of InformaTion (PLATO)

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Overview of Conference Proceedings

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at the Helmholtz-Institute
Johannes Gutenberg University Mainz



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Abstracts from the Presentations at the PLATO Conference

SESSION 1 "INFORMATION AND COGNITION"

Walter Bisang

On Knowledge Representation and Linguistic Variation – A View from Linguistic Typology

This paper offers a programmatic view from Linguistic Typology on the relevance of structural differences between languages for learning research. Based on the experience of Linguistic Typology with regular patterns of cross-linguistic variation worldwide, the paper will focus on structures that may enhance or inhibit specific cognitive skills. It will start out from some known effects related to differences in the structural complexity of numeric expressions. More concretely, the paper will look at the U.S. Test of Understanding in College Economics and its Japanese translation from the perspective of informational density, i.e. from differences in the extent to which grammars force their speakers to explicitly mark grammatical information or to leave it to the pragmatic inference of the reader/listener. It will illustrate how these differences can serve as a starting point for corroborating differences in learning performance.

Gabriel Wittum, Michael Hoffer, Robert Jabs & Arne Nägel

Quantitative Comparison of Mathematical and Natural Language – A Concept

Starting from the question, if there is a connection between the mathematical capabilities of a person and his mother tongue, we compare natural languages with mathematical language quantitatively. The question arises from empirical studies, showing such a connection. Mathematics is the common language of quantitative theory in Science and Technology. Mathematics is described by a specific language, which has been worked out step by step by generations of mathematicians in the last centuries. The core part is the mathematical formalism, embedded into simple, but specific natural language text. Texts in natural languages can be deconstructed into a dependence graph, in simple cases a dependence tree. The same kind of deconstruction is possible also for mathematical texts. This gives an idea how to compare mathematical and natural language quantitatively. To that end, we need algorithms to define the distance between graphs. In this paper, we restrict the structure to trees. The authors dealt with measuring the distance of trees using the constrained tree edit distance. The algorithms used there, can be used here too, in order to measure a distance between trees. Once a distance matrix has been computed, this matrix can be used to perform a cluster analysis.



Alexander Mehler, Tolga Uslu, Wahed Hemati, Fabian Flöck & Andy Lücking

Language of the “Elite” – How Social Dynamics Imprints on Knowledge Resources

The paper presents multi-layer social-semiotic networks as a framework for modeling biases of knowledge communication by means of web-based Communication and Information Technologies (CIT). The network model is exemplified by a range of language-specific releases of Wikipedia in conjunction with a selected set of Wiktionaries. One focus of the paper concerns the underlying social dynamics of CIT. By example of Wiktionary, it examines the existence of a skewed participation dynamics according to which a small set of authors dominates the content of this open, online, collaborative editing system. The paper analyzes the association of users, topics, and lexical knowledge thereby hinting at the Zipfian nature of their tripartite networking. This is complemented by examining a range of fields of knowledge in multiple languages as being manifested by Wikipedia. Using this data, the paper performs a difference analysis showing how languages deviate from each other in representing the same knowledge networks. To this end, it employs methods of Natural Language Processing (NLP), (social) network analysis and computational linguistics.

Arne Nagels, Spencer D. Kelly, Tilo Kircher & Benjamin Straube

Hand Gestures Alert Auditory Cortices to Process Foreign Language

When acquiring a foreign language, the first challenge is to break into the speech stream to identify basic linguistic units. The present study tested the hypothesis that hand gestures facilitate this process by alerting auditory cortices to attend to and identify meaningful phonemic information. During fMRI data acquisition, participants watched videos of an actor speaking in Russian under three conditions. Sentences were produced with just speech alone or were accompanied by two types of hand gestures: 1) metaphoric gesture and 2) free gesture. The main finding was that there was increased auditory cortex activation when both types of gestures accompanied speech compared to speech alone, but there were no differences between the two speech and gesture conditions (or gesture alone conditions). These results suggest that hand gestures may play a role in focusing attention to auditory processing to increase capacity when listening to novel speech in a foreign language.

Markus Knauff

Effects of Beliefs and Prior Knowledge on Rational Reasoning

Rational reasoning is a core competence of human beings. We are often good in making rational inferences and to come to justified conclusions. However, sometimes people deviate from the norms of rationality. I will talk about five different topics: (1) how people reason with problems which are easy or difficult to visualise; (2) how people deal with problems for which more than one possible solution exists (3) how the trustworthiness of the information sources effects mental reasoning processes, (4) how cognitive reasoning interacts with moral values, and (5) how highly emotional content effect rational reasoning. I will close with some conclusions and an outlook on future research.



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Overview of Conference Proceedings
Positive Learning in the Age of Information (PLATO)

SESSION 2 "INTERACTION AND COMMUNICATION"

Giovanni L. Ciampaglia

Key Speech: Finding Fake News

Two-thirds of all American adults access the news through social media. But social networks and social media recommendations lead to information bubbles, and personalization and recommendations, by maximizing the click-through rate, lead to ideological polarization. Consequently, rumors, false news, conspiracy theories, and now even fake news sites are an increasingly worrisome phenomena. While media organizations (Snopes.com, PolitiFact, FactCheck.org, et al.) have stepped up their efforts to verify news, political scientists tell us that fact-checking efforts may be ineffective or even counterproductive. To address some of these challenges, researchers at Indiana University are working on an open platform for the automatic tracking of both online fake news and fact-checking on social media. The goal of the platform, named Hoaxy, is to reconstruct the diffusion networks induced by hoaxes and their corrections as they are shared online and spread from person to person.

Silvia Hansen-Schirra, Sascha Hoffmann & Jean Nitzke

Acquisition of Generic Competencies through Project Simulation in Translation Studies

Motivated by the research in several international and interdisciplinary initiatives, e.g. P21 Partnership for 21st Century Learning or the Collegiate Learning Assessment instruments, we seek for a scalable and measurable set of generic competencies for translation studies. Up to now the acquisition of competencies in translation studies has primarily been operationalized by implementing authentic projects in higher education classes using socio-constructivist approaches. This results in a hybridization of subject-specific competencies and generic competencies in translator education. Because of the necessity to develop the skills of a translator on a macro-level, the acquisition of generic competencies is often a secondary learning outcome. Due to this strong focus on authentic translator training, an additional teaching approach, the simulated project as a new method for a solid generic competence development within higher education processes will be discussed within this paper.

Mita Banerjee, Margarete Imhof & Oliver Meyer

Positive Learning in Higher Education – Promoting Pluriliteracies Development in American Studies Courses

Deeper learning and the development of transferable knowledge are highly desirable goals in Higher Education programs. However, there are a number of studies which indicate that these goals are rarely achieved. In this presentation we will present a model of deeper learning that promotes the development of disciplinary literacies and transferable knowledge. Based on our joint work we will outline the design of an interdisciplinary literature seminar that aims at putting the principles of deeper learning into practice through a focus on affect, student engagement, knowledge construction, meaning making and active demonstration of understanding as well as reflective practice. Further, we would like to discuss ways of assessing and evaluating learning outcomes and literacies.



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Overview of Conference Proceedings
Positive Learning in the Age of Information (PLATO)

Marcus Maurer, Oliver Quiring & Christian Schemer

Media Effects on Positive and Negative Learning

Media effects research focuses on what the audience learns from media information be it factual or fictional. This research studies what information features (content, form) facilitate positive learning. At the same time, researchers examine the features that impede learning or foster negative learning (abundance, distractors, bias). Much less work focused on the interference of knowledge gain in one domain, e.g., news about politics or the economy, on knowledge in another, e.g., academic knowledge about politics. On the one hand, increased knowledge in one domain can certainly foster learning in another. On the other hand, negative learning in one domain will unvoluntarily undermine knowledge acquisition in another one since information in the latter domain may contradict what learners learned in the first place. Therefore, especially integrating research on media effects on positive and negative learning in established models explaining student's knowledge gain (or loss) might be fruitful.

Aileen Oeberst & Ulrike Cress

The Norm of Neutrality in Collaborative Knowledge Construction – A Comparison between Wikipedia and the Extreme Right-Wing Metapedia

Social media has revolutionized the production of web contents. With the development of the Web 2.0 internet users have risen from passive perceivers to active producers of web contents. Moreover, it has enabled collaboration at unprecedented levels. And while research points to the benefits and potentials of mass collaboration in order to collect and construct knowledge, it has also revealed challenges and problems. We explore the question of biases in collaboratively created knowledge. To this end we focus on two online encyclopedias that both aim at presenting knowledge: Wikipedia and the extreme right-wing Metapedia. Both urge users to present topics from a neutral point of view. We make use of different measures to explore their success. We found Metapedia articles to be significantly shorter, to contain substantially fewer references but more anger- and anxiety-related words. An exploration suggests, however, that there are many more differences in content.



SESSION 3 “ETHICS AND MORALS”

Christian Dormann, Eva Demerouti & Arnold Bakker

Learning Engagement – An Important Facet of Positive Learning

Engagement has been a concept prevailing the positive psychology literature in general and research on positive work experiences in particular during the last decade. Being engaged while carrying out one's tasks is mainly conceptualized as comprising three dimensions including strong vigor, full dedication to the tasks, and deep absorption. Engagement has been consistently linked to antecedents rooted in the personality (e.g., low neuroticism) and the task environment (e.g., autonomy) and to consequences involving creativity, innovation, and performance. In the present study, we focus on students' learning engagement as a new concept for positive learning. We theoretically elaborate several possible antecedents of learning engagement in the study environment, such as high study demands, self-regulation possibilities (autonomy), and self-regulation demands. We also present results of a preliminary study on weekly work engagement (N = 69) across three weeks, confirming the three-dimensional structure of vigor, dedication, and absorption.

Gerhard Minnameier

How to Be Both Moral and Professional?

Moral action should be rational in the sense that it is effective and efficient, here with respect to meeting our moral concerns and intentions. However, morality and rationality are often juxtaposed, so that economic rationality and moral rationality seem to exclude each other. It is shown that this problem can be solved in two steps: first, gaining a proper understanding of moral principles as fundamental preferences, second by understanding morality in the game-theoretical context. The latter is focused in this paper. On this account, moral preferences have to be understood as preferences for certain games. These games have to be established in terms of "institutions" that allow for positive and negative sanctions. And these sanctions have to be used proficiently to uphold morality. This is of special importance for professionals, as they and have to be both morally economically rational. A means for fairly large-scale testing has been developed.

Wanja Wiese & Thomas Metzinger

On Some Conceptual and Empirical Obstacles to Teaching the Ability for Positive Learning

Fostering both positive learning (PL) and the ability to avoid negative learning (NL) presupposes (i) the possibility to distinguish cases of PL from cases of NL and (ii) the possibility to teach how NL can be avoided and PL can be achieved. The aim of this paper is to investigate principled obstacles to (i) and (ii). Are there conceptual or epistemic obstacles to drawing a clear-cut distinction between PL and NL? Are there empirical obstacles to achieving PL? One way to specify the first question is by asking whether an "ideal reasoner" can be defined. Such a reasoner uses information in a rational and ethically responsible way that guarantees PL. The second question then entails the question whether students can be taught to approximate such an ideal reasoner.



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Overview of Conference Proceedings
Positive Learning in the Age of Information (PLATO)

SESSION 4 “OPPORTUNITIES AND RISKS”

Koichi Kise

Key Speech: Deeply Sensing Learners for Better Assistance: Towards Distribution of Learning Experiences

Most of the current e-learning systems rely on shallow sensing of learners such as achievement tests and log of usage of e-learning systems. This poses a limitation to know internal states of learners such as confidence and the level of knowledge. To solve this problem, we propose to employ deeper sensing by using eye trackers, EOG, EEG, motion and physiological sensors. As tasks, we consider English learning. The sensing technologies described in this abstract includes low level estimations (the number of read words, the period of reading), document type recognition and identification of read words, as well as high level estimations about confidence of answers, the English ability in terms of TOEIC scores and unknown words encountered while reading English documents. Such functionality helps learners and teachers to know the internal states and will be used to describe learning experiences to be shared by other learners.

Christoph Igel, Milos Kravcik & Carsten Ullrich

The Potential of the Internet of Things for Supporting Learning and Training in the Digital Age

The rapid progress in the development of information and communication technologies opens new opportunities also in the area of education. As each new tool or media, these chances go hand in hand with new risks that may be difficult to foresee. Our aim here is to focus mainly on the Internet of Things, in order to investigate how it can improve learning and training. We claim a proper analysis and interpretation of the big educational data can make learning and training more effective, efficient and attractive. Nevertheless, it will require new approaches to implement novel personalization and adaptation strategies.

Jochen Kuhn, Pascal Klein & Andreas Müller

Physics Move – Improving Student Understanding with Video-Based Problems in Physics

In this contribution, we discuss the implementation of video-based problems in regular tutorials of introductory physics courses at university level. These problems require students to record videos of motion processes with a mobile device (tablet-PC) which can then be analyzed in terms of physical parameters. Based on a theoretical framework of learning, we assume that students profit from experimental activities in calculus-based courses and from multiple representations offered by the video analysis software tool. In a pre-post design with treatment and control groups, we found significant effects on student understanding and motivation in favour of video-based problems as compared to traditional problems without videos. As one of the first intervention studies of this kind in German introductory physics courses, this pioneer work delivers experiences which can be extended to future collaborations between education researchers and physics faculties.



PLATO



Overview of Conference Proceedings
Positive Learning in the Age of Information (PLATO)

Pascal Klein, Saqib Bukhari, Andreas Dengel & Jochen Kuhn

Student Understanding of Visual Representations at the Intersection between Mathematics and Physics

The interpretation of visual representations is a challenging exercise for students in all STEM disciplines. Students need to understand the general principles about how the visual representation depicts information and which visual features are relevant. Furthermore, they need the ability to connect the visual representation to abstract mathematical concepts. In a very particular case of introductory physics, we use eye tracking to reveal information about students' visual fluency and efficiency in connecting multiple visual representations (equations, vector plot) to one another. Adaptive learning systems will detect gaze behavior of expert problem-solvers and provide individual feedback (visual cues) for novice learners. A central goal is to develop a technological foundation for assessing the fundamentals of positive learning in this field while taking into account the differential factors of learners, information representations, the teaching-and-learning environment, and ethical values of technology use in learning and research.

Shoya Ishimaru, Syed Saqib Bukhari, Carina Heisel, Nicolas Großmann, Jochen Kuhn & Andreas Dengel

Augmented Learning on Anticipating Textbooks with Eye Tracking

This paper demonstrates how eye tracking technologies can understand learners to realize a personalized learning. Textbook traditionally has played an important role in learning and education. However, students sometimes avert their eyes from reading it because it is static and boring. We believe that one of the solutions to this problem is to develop an anticipating digital textbook which displays contents dynamically based on their interests. As the first step to develop the system, we investigate students' reading behaviors with an eye tracker and propose attention and comprehension prediction approaches. These methods were evaluated on a dataset including eight participants' readings on a learning material in Physics. We classified students' comprehension levels into three classes with 100 percent if features of reading behaviors from beginning to end were used, and 70 percent if we utilize features of one minute window.