The Second Personal Epistemology and Learning (PEL) Conference Program Book

National Taiwan University of Science and Technology
Taipei, Taiwan, 13-15, December, 2016.

Sponsors:
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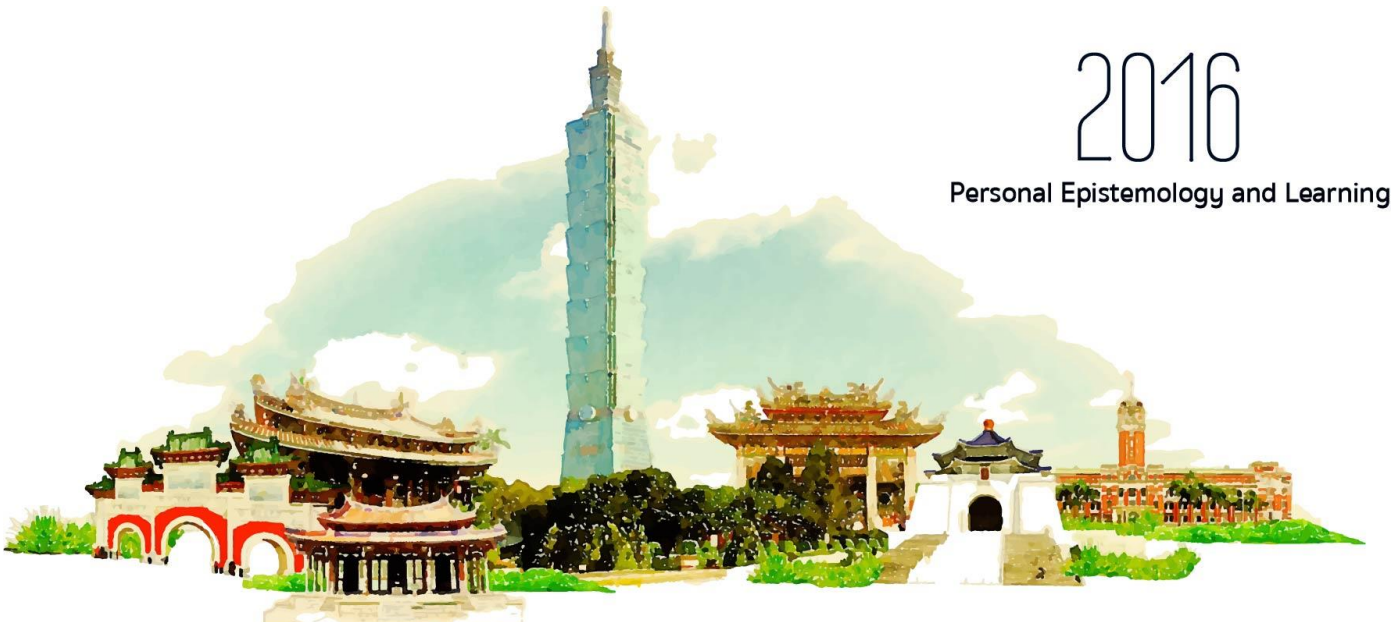

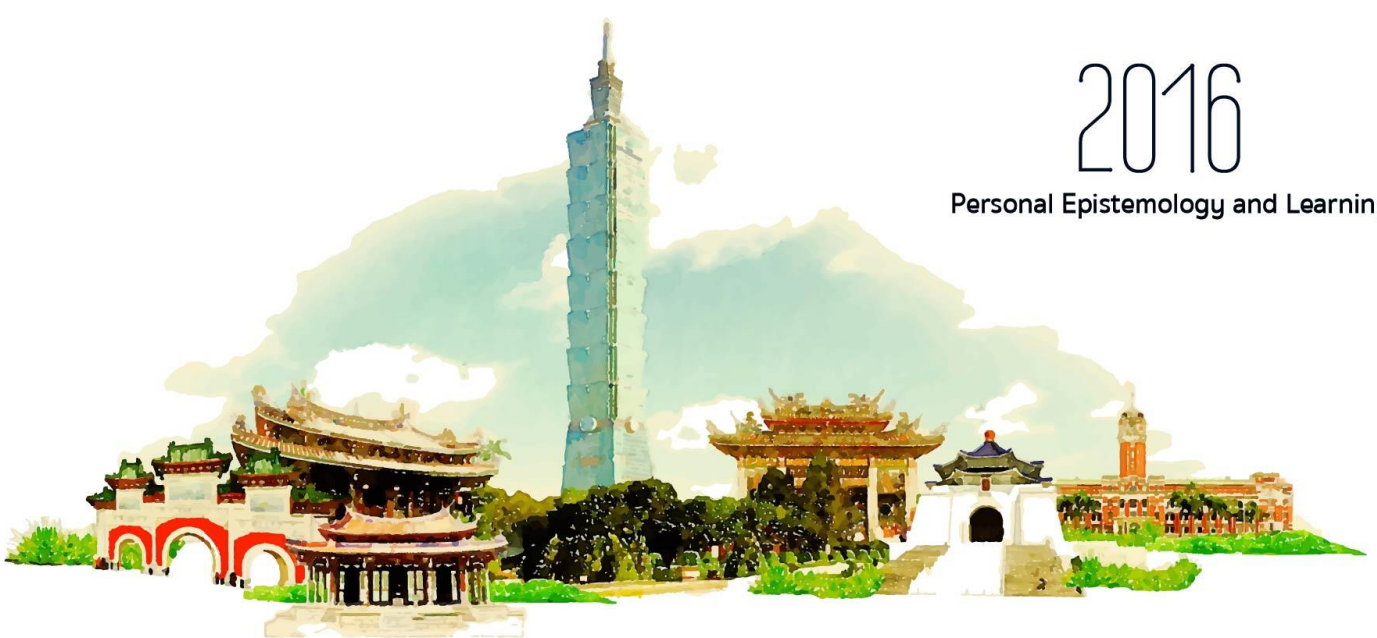

2016

Personal Epistemology and Learning

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National Taiwan University of Science and Technology
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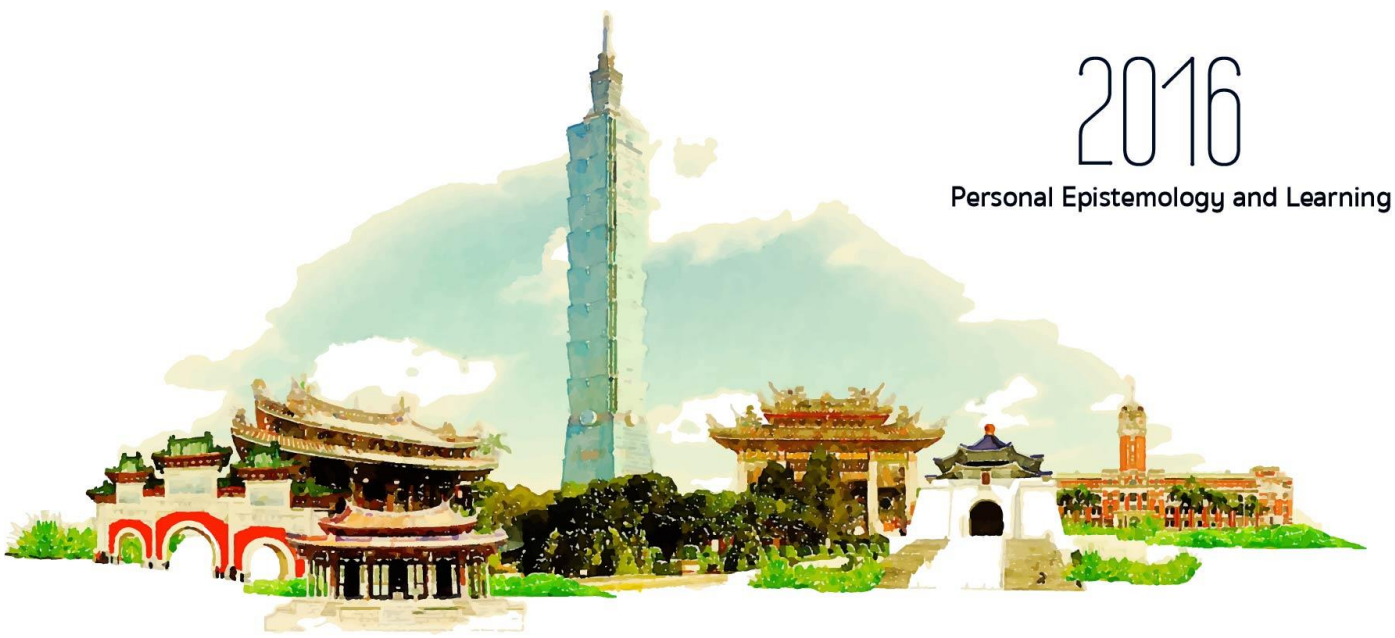
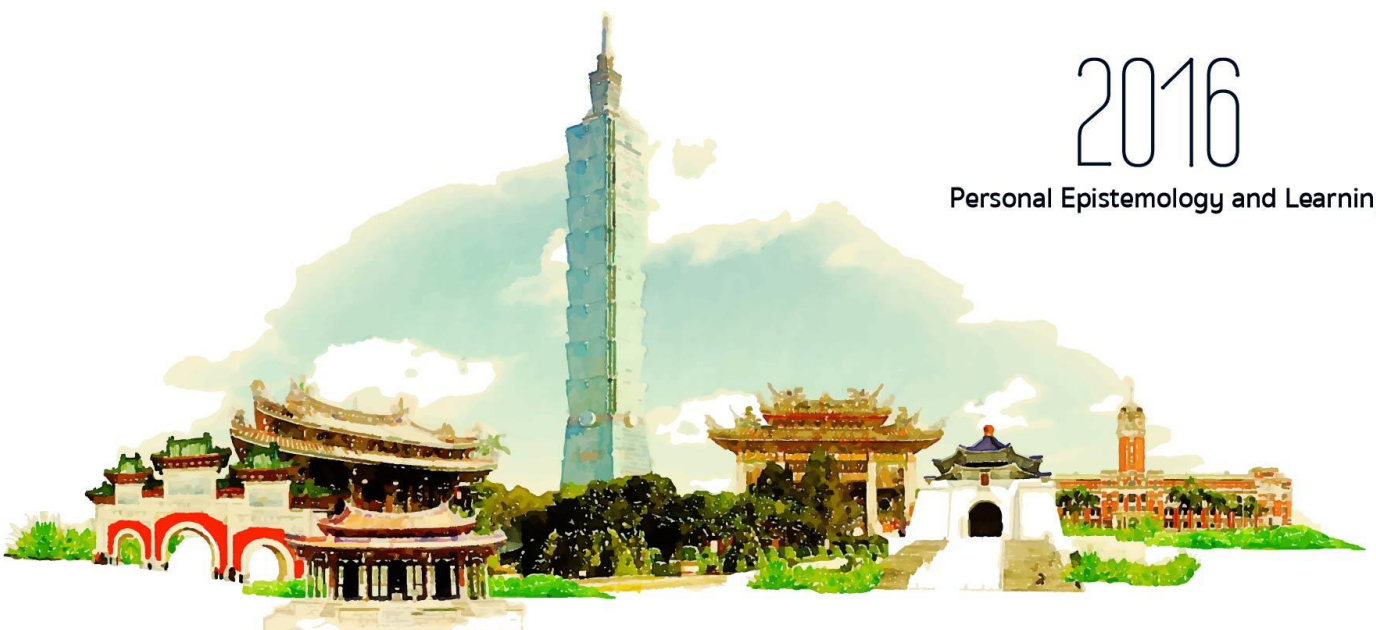


Conference Purpose:

Personal epistemology refers to individuals' beliefs about the nature of knowledge and knowing. This conference, with the theme of "Personal Epistemology and Learning (PEL)," is devoted to elaborating the interplay between personal epistemology and learning. This conference will discuss how personal epistemology may play a role in the learning process and outcome. In addition, instruction, curriculum design, emerging technologies, and the cultural impacts on the development of personal epistemology have received growing interests among researchers. It is encouraged that international researchers and practitioners contribute papers for presentation at the 2nd PEL conference to share their research findings and best practices, as well as exchange updated views of recent development in the field.

Conference Chair:

Chin-Chung Tsai holds a B.Sc. in physics from National Taiwan Normal University. He received a Master of Education degree from Harvard University and completed his doctoral study at Teachers College, Columbia University in 1996. He currently serves as a co-editor in the journal of *Computers & Education* (indexed in SSCI, SCI) and is one of the editors of *International Journal of Science Education* (indexed in SSCI). From 1996 to 2006, he joined the faculty of the Institute of Education and Center for Teacher Education at National Chiao Tung University, Taiwan. He is currently a Chair Professor at the Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taipei, Taiwan. His research interests deal largely with constructivism, epistemic beliefs, and Internet-based instruction related to science education. In the last five years, he has published more than 100 papers in English-based international journals. His research work has been published in *Computers & Education*, *Computers in Human Behavior*, *Educational Research Review*, *Instructional Science*, *International Journal of Science Education*, *Journal of Engineering Education*, *Journal of Research in Science Teaching*, *Learning and Instruction*, *Science Education*, *Teaching & Teacher Education* and other important educational journals.



Program

Day 1 (Dec. 13, 2016) Tuesday			Location
	09:30-10:00	**Registration**	**IB-101**
	10:00-10:15	**Opening Ceremony**	**IB-101**
Forenoon 1	10:15-11:20	**Keynote Speech (I)** ***Epistemologies in Action*** **Keynote Speaker: Professor Kirsti Lonka** **University of Helsinki, Finland** **Chair: Professor Sufen Chen** **National Taiwan University of Science and Technology, Taiwan**	**IB-101**
	11:20-11:35	**Break**	
Forenoon 2	11:35-12:25	**Paper presentation (Session A1)** **Presider: Professor Shiang-Yao Liu** **National Taiwan Normal University, Taiwan** *University students' conceptions of learning and knowledge - How are they related to mental models of learning?* **Elina E. Ketonen, University of Helsinki, Finland** **Niclas Sandström, University of Helsinki, Finland** **Kirsti Lonka, University of Helsinki, Finland** *Two scientists' epistemological beliefs about Mathematics and Physics* **Po-Hung Liu, National Chin-Yi University of Technology, Taiwan** **Shiang-Yao Liu, National Taiwan Normal University, Taiwan**	**IB-201**
	12:25-13:30	**Lunch**	
Afternoon 1	13:30-14:35	**Keynote Speech (II)** ***Cultural Differences in the Epistemic Predictors for Science Reading*** **Keynote Speaker: Professor Fang-Ying Yang** **National Taiwan Normal University, Taiwan** **Chair: Professor Meng-Jung Tsai** **National Taiwan University of Science and Technology, Taiwan**	**IB-101**
Afternoon 2	14:40-15:30	**Paper presentation (Session A2)** **Presider: Professor Hsin-Yi Chang** **National Taiwan University of Science and Technology, Taiwan** *Exploring high school students' scientific epistemic beliefs towards learning science in Belgium* **Hannelore Montrieux, Ghent University, Belgium** **Tammy Schellens, Ghent University, Belgium** **Chin-Chung Tsai, National Taiwan University of Science and Technology, Taiwan**	**IB-201**

		Experts' epistemic understanding of metavisualization while visualizing the concept of carbon cycling **Jung-Yi Hung, National Kaohsiung Normal University, Taiwan** **Hsin-Yi Chang, National Taiwan University of Science and Technology, Taiwan** **Jeng-Fung Hung, National Kaohsiung Normal University, Taiwan**	
	15:30-15:45	**Break**	
Afternoon 3	**15:45-17:00**	**Paper presentation (Session A3)** **Presider: Professor Christian Brandmo** **University of Oslo, Norway** *Epistemic cognition and topic interest as predictors of science knowledge* **Christian Brandmo, University of Oslo, Norway** **Ivar Bråten, University of Oslo, Norway** **Helge I. Strømsø, University of Oslo, Norway** *Students' epistemic beliefs concerning Internet environments in the online argumentation activities: Conception differences* **Pei-Shan Tsai, National Taipei University of Science and Technology, Taiwan** **Chin-Chung Tsai, National Taiwan University of Science and Technology, Taiwan** *The determinants of Taiwanese students' intrinsic motivation in science learning based on the self-determined theory* **Cheng-Lung Wang, National Central University, Taiwan** **Pey-Yan Liou, National Central University, Taiwan**	**IB-201**

Day 2 (Dec. 14, 2016) Wednesday			Location
	08:30-09:00	**Registration**	**IB-101**
Forenoon 1	**09:00-10:05**	**Keynote Speech (III)** ***Comparing Personal Epistemology of Science, Literature and Design*** **Keynote Speaker: Professor Ching Sing Chai** **Nanyang Technological University, Singapore** **Chair: Professor Huang-Yao Hong** **National Chengchi University, Taiwan**	**IB-101**
	10:05-10:25	**Break**	
Forenoon 2	**10:25-12:05**	**Paper presentation (Session A4)** **Presider: Professor Sue Walker** **Queensland University of Technology, Australia** *Epistemic beliefs and the theory-practice gap in teacher education. A preregistered study* **Samuel Merk, University of Tübingen, Germany** **Tom Rosman, Leibniz Institute for Psychology Information (ZPID), Germany** **Julia Ruess, Humboldt University, Gemany** **Marcus Syring, Ludwigs-Maximilians-University, Germany** **Jürgen Schneider, University of Tübingen, Germany** *Teachers' personal epistemologies and practices: Promoting moral learning for active citizenship in elementary education* **Joanne Lunn Brownlee, Queensland University of Technology, Australia** **Laura Scholes, Queensland University of Technology, Australia** **Sue Walker, Queensland University of Technology, Australia** **Eva Johansson, University of Stavanger, Norway** *How ready are teachers for change in Finnish schools – Their epistemological beliefs, work engagement, burnout and perceptions of physical school environment* **Lammassaari, H., University of Helsinki, Finland** **Sandstrom, N., University of Helsinki, Finland** **Jarvinen, J., University of Helsinki, Finland** **Lonka, K., University of Helsinki, Finland/North West University, South Africa** *Exploring the relationship between preservice chemistry teachers' scientific epistemological beliefs (SEB) and their technological pedagogical content knowledge (TPACK)* **Feng Deng, South China Normal University, China** **Ching Sing Chai, Nanyang Technological University, Singapore** **Hyo-Jeong So, Ewha Womans University, South Korea**	**IB-201**
	12:05-13:20	**Lunch**	

Afternoon 1	**13:20-14:25**	**Keynote Speech (IV)** ***Epistemic Cognition Concerning Sources of Knowledge: Antecedents, Consequences, and Educational Implications*** **Keynote Speaker: Professor Ivar Bråten** **University of Oslo, Norway** **Chair: Professor Ching Sing Chai** **Nanyang Technological University, Singapore**	**IB-101**
Afternoon 2	**14:30-15:45**	**Paper presentation (Session A5)** **Presider: Mahbubul Hasan** **University of Memphis, USA** *Exploring relationships between students' computer-supported collaborative knowledge building activity and their view of the nature of science (NOS) as well as their scientific inquiry processes* **Pei-Jung Li, National Chengchi University, Taiwan** **Huang-Yao Hong, National Chengchi University, Taiwan** *Explore epistemological foundation of think- pair-share with iPad Math application* **Mahbubul Hasan, University of Memphis, USA** **Denise L. Winsor, University of Memphis, USA** *Characterizing and fostering epistemic cognition through computer-supported knowledge building* **Carol K.K. Chan, University of Hong Kong, Hong Kong SAR, China** **Ivan C.K. Lam, Open University of Hong Kong, Hong Kong SAR, China**	**IB-201**
	15:45-16:00	**Break**	
Afternoon 3	**16:00-16:50**	**Paper presentation (Session A6)** **Presider: Eric Hosman** **University of Memphis, USA** *An initial investigation of Taiwanese high school students' scientific epistemic beliefs and goal orientations* **Tzung-Jin Lin, National Taiwan University of Science and Technology, Taiwan** **Chin-Chung Tsai, National Taiwan University of Science and Technology, Taiwan** *Examining the situated epistemic cognition of secondary mathematics teachers in a technology-driven teaching methods professional development session* **Eric Hosman, University of Memphis, USA**	**IB-201**

Day 3 (Dec. 15, 2016) Thursday			Location
	08:30-09:00	**Registration**	**IB-101**
Forenoon 1	**09:00-10:05**	**Keynote Speech (V)** ***Epistemic Cognition: What Is It, Why Does It Matter, and How Do We Make It Relevant?*** **Keynote Speaker: Professor Barbara K. Hofer** **Middlebury College, USA** **Chair: Professor Chin-Chung Tsai** **National Taiwan University of Science and Technology, Taiwan**	**IB-101**
	10:05-10:25	**Break**	
Forenoon 2	**10:25-11:15**	**Paper presentation (Session A7)** **Presider: Professor Li-Ching You** **National University of Tainan, Taiwan** *Epistemic cognition developed in an elementary classroom culture* **Li-Ching You, National University of Tainan, Taiwan** *Relational analysis of primary school students' epistemic beliefs, thinking process and outcomes in knowledge building* **Pei-Shan Tsai, National Taipei University of Science and Technology, Taiwan** **Ching Sing Chai, Nanyang Technological University, Singapore**	**IB-201**
Forenoon 3	**11:15-12:00**	**Special Talk** **Presider: Professor Ivar Bråten** **University of Oslo, Norway** ***The intellectual trajectory of epistemology research in education: Past, present, and future*** **Speakers:** **Professor Chin-Chung Tsai** **National Taiwan University of Science and Technology, Taiwan** **Assistant Professor Kai-Yu Tang** **Ming Chuan University, Taiwan**	**IB-201**
	12:00-13:20	**Lunch**	
Afternoon 1	**13:20-14:35**	**Paper presentation (Session A8)** **Presider: Dr. Tom Rosman** **Leibniz Institute for Psychology Information (ZPID), Germany** *The differential development of epistemic beliefs in psychology versus computer science students: A four-wave longitudinal study* **Tom Rosman, Leibniz Institute for Psychology Information (ZPID), Germany** **Anne-Kathrin Mayer, Leibniz Institute for Psychology Information (ZPID), Germany**	**IB-201**

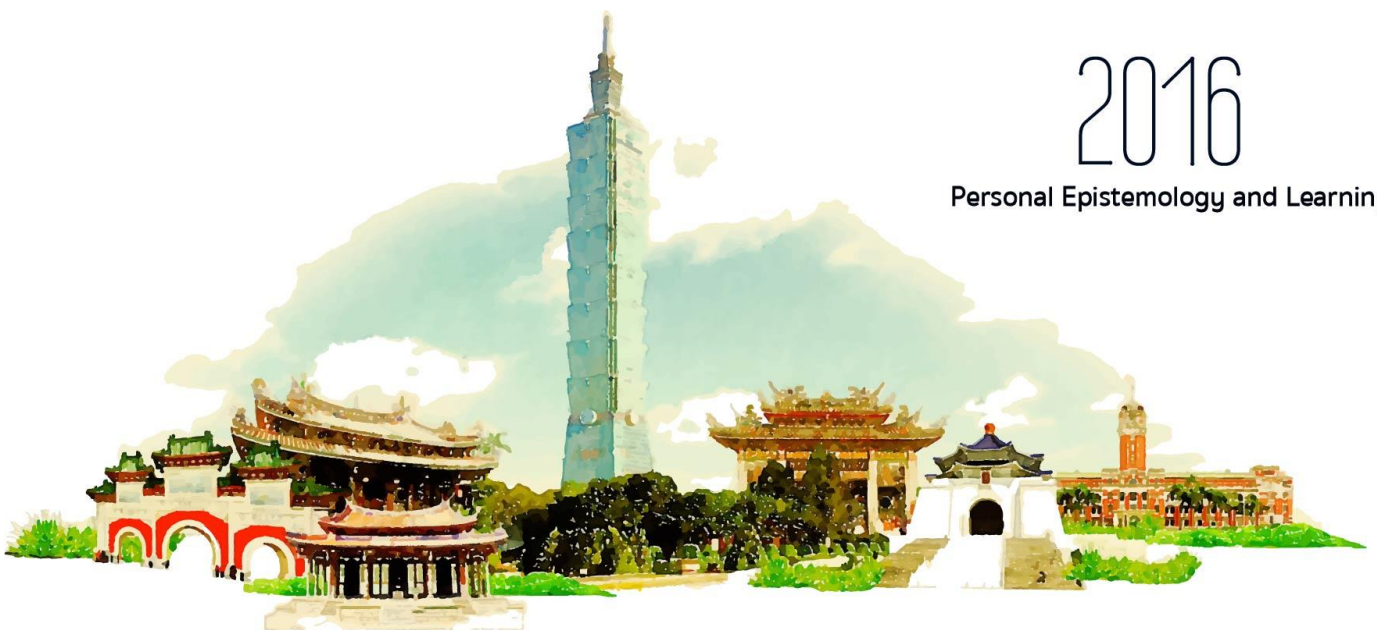
		Martin Kerwer, Leibniz Institute for Psychology Information (ZPID), Germany **Gunter Krampen, University of Trier & Leibniz Institute for Psychology Information (ZPID), Germany** *Teachers' epistemological theories: Are they related to their ideas of assessment?* **Lonka, K., University of Helsinki, Finland/ North West University, South Africa** **Järvinen, J., University of Helsinki, Finland** **Makkonen, J., University of Helsinki, Finland** **Hietajärvi, L., University of Helsinki, Finland** *Nested ecology: Examining high school students' belief systems regarding epistemic beliefs of science, learning science, and science assessment* **Min-Hsien Lee, National Sun Yat-sen University, Taiwan** **Chin-Chung Tsai, National Taiwan University of Science and Technology, Taiwan**	
Afternoon 2	**14:35-15:45**	**Panel Discussion** ***Research trends in Personal Epistemology and Learning*** **Presider: Professor Chin-Chung Tsai** **National Taiwan University of Science and Technology, Taiwan** **Discussants:** **Professor Barbara K. Hofer, Middlebury College, USA** **Professor Ivar Bråten, University of Oslo, Norway** **Professor Kirsti Lonka, University of Helsinki, Finland** **Professor Ching Sing Chai, Nanyang Technological University, Singapore** **Professor Fang-Ying Yang, National Taiwan Normal University, Taiwan** **Professor Chin-Chung Tsai, National Taiwan University of Science and Technology, Taiwan**	**IB-201**
	15:45-16:00	**Closing Ceremony**	**IB-201**

中文論文發表議程

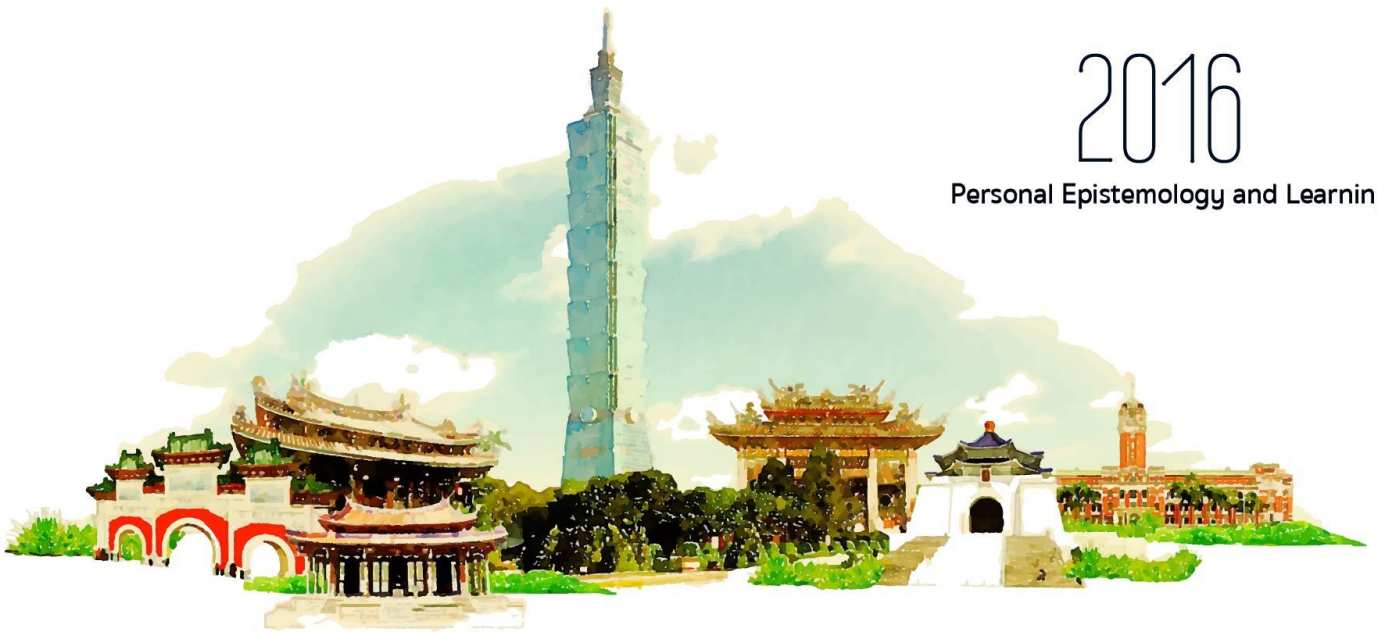
第一天 (12月13日)			地點
下午2	14:40-15:30	中文論文發表（一） 主持人：翟雪松 安徽建築大學智能建築研究院 探究知識翻新教學對大學生科學家意象之影響 *楊家睿，國立政治大學教育學系* 初探個人科學認識信念與科學學科表現及知識結構的關係—以天文主題為例 *陳怡君，國立臺灣師範大學科學教育中心* *楊芳瑩，國立臺灣師範大學科學教育研究所*	IB-202
	15:30-15:45	休息	
下午3	15:45-17:00	中文論文發表（二） 主持人：盧春 華中師範大學國家數位化學習工程技術研究中心 探究科學認識信念與生物學文本閱讀歷程之關係 *鄭嘉惠，國立臺灣師範大學科學教育研究所* *楊芳瑩，國立臺灣師範大學科學教育研究所* 臺灣研究生之特定領域知識信念：以生物與物理學科為例 *蔡祐翔，國立臺灣科技大學數位學習與教育研究所* *葉恒儀，國立臺灣科技大學應用科技研究所* *張欣怡，國立臺灣科技大學數位學習與教育研究所* *林宗進，國立臺灣科技大學數位學習與教育研究所* 台灣與香港高中學生在網路課業知識觀點與網路課業搜尋行為之差異研究 *呂珮甄，國立臺灣科技大學應用科技研究所* *莊紹勇，香港中文大學課程與教學系* *梁至中，國立臺灣科技大學數位學習與教育研究所*	IB-202

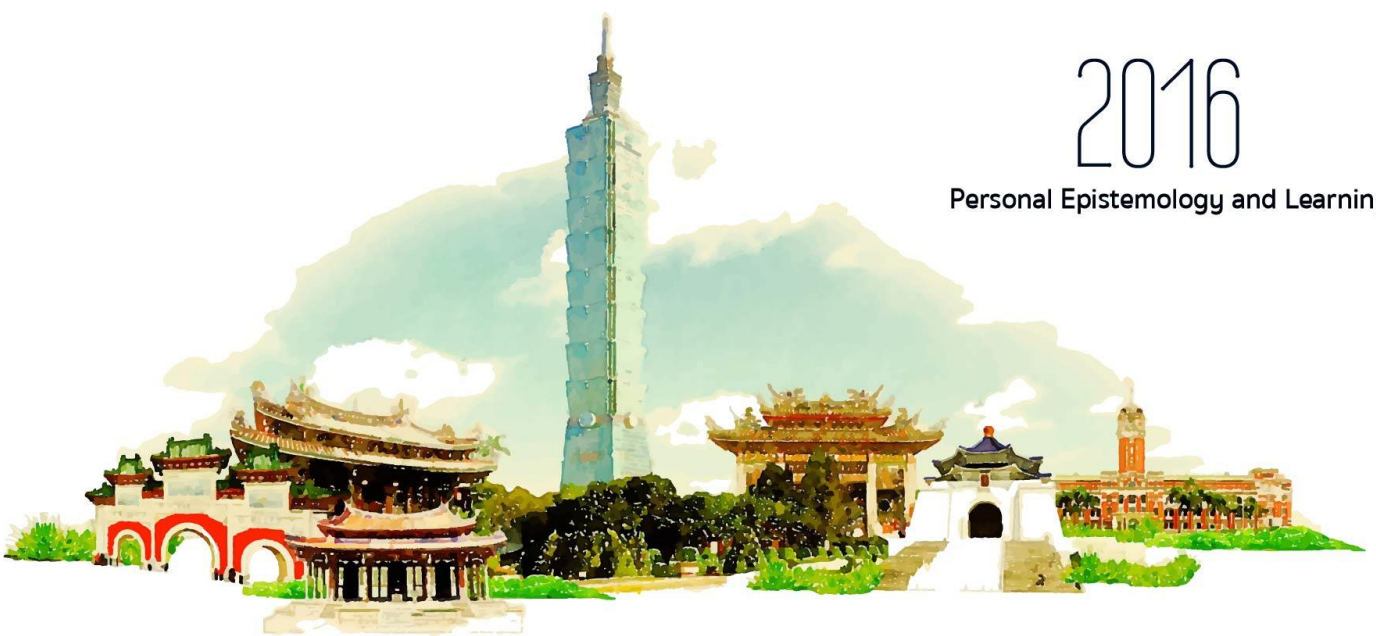
Program session format

In a paper session, the presider introduces the presenters and monitors the time used for each presentation. Each paper will be allocated a total of 25 minutes, including 17 minutes of oral presentation and 8 minutes of questions or discussion. The presider and audience will use any time remaining in the session for additional discussion, general review, and suggestions for further research.



Keynote Speech




2016
Personal Epistemology and Learning

Day 1 (Dec. 13) / 10:15-11:20 / IB-101

Keynote Speaker

Prof. Kirsti Lonka (Educational Psychology, Faculty of Behavioural Sciences, University of Helsinki, Finland)

Kirsti Lonka is a professor of Educational Psychology at University of Helsinki, Finland (2005-). She currently serves as an associate editor in a renown international journal of *Learning and Instruction*. She is also a founding member of the Teachers' Academy of University of Helsinki since 2013 and also the first President (2013-2014). She is the Director of Research Group of Educational Psychology and also the Principal Investigator of the Project "Mind the Gap–between digital natives and educational practices" (Funded by the Mind Program of Academy of Finland (2013-2106). She is a popular keynote speaker around the world. She has published numerous refereed articles, conference papers and book chapters. She has also published plenty of text books and popular writings. The languages of her publications are Finnish, English, and Swedish (also translated in Estonian and Spanish). Her specialties are higher education, medical education, teacher education, and postgraduate education (PhD students). In the area of academic writing, her work has focused around conceptions of writing, note taking, process writing, portfolios and writing across curriculum (writing as a learning tool). At the moment, she is working on innovations in higher education and engaging learning environments (ELE). She was the Vice Dean of Faculty of Behavioural Sciences (2011-2013). Before that, Kirsti Lonka was Foreign Adjunct Professor at the Department of LIME, Karolinska Institutet, Sweden 2007-2011. She was also J.H. Bijtel Visiting Professor, University of Groningen, The Netherlands (2007-2008). She was working as professor of medical education at the Department of LIME (Learning, Informatics. Management and Ethics), Karolinska Institutet in 2001-2005. In 1996-2001 she worked as the Director of Development and Research Centre, Faculty of Medicine, University of Helsinki, Finland. During that time the medical program became problem-based.

Epistemologies in Action

Kirsti Lonka
University of Helsinki, Finland

People have varying conceptions of learning that play a role in how they approach learning tasks (Lonka, 1997). They are closely related to students' beliefs about the nature of knowledge, referred to as personal epistemologies (Hofer & Pintrich, 1997; Hofer, 2000; Lonka & Lindblom-Ylänne, 1996; Nieminen, 2011; Perry, 1968; Perry, 1970; Ryan, 1984). Conceptions of learning also provide a window for looking at epistemologies, because they implicitly include conceptions of the origin and nature of knowledge. For instance, students who express a dualist epistemology may be more likely to prefer rehearsal strategies than do students categorized as relativists (Lonka & Lindblom-Ylänne, 1996). Our recent research has looked at epistemologies in different contexts and different domains, indicating that epistemologies do play a role in how people act in varying learning situations. This keynote addresses our latest findings in higher education, doctoral studies, and leadership training. We have identified epistemic profiles that appear to be domain-specific. Also epistemic growth and conceptual change are addressed.

Day 1 (Dec. 13) / 13:30-14:35 / IB-101

Keynote Speaker

Prof. Fang-Ying Yang (Graduate Institute of Science Education, National Taiwan Normal University, Taiwan)

Fang-Ying Yang is a professor at National Taiwan Normal University in the Graduate Institute of Science Education. She received her doctoral degree from Teachers College, Columbia University in 1999. She served as the deputy dean of the Office of Research and Development at National Taiwan Normal University between 2013 and 2015, and was a visiting scholar at University of California, San Diego in 2012. She received Ta-You Wu Memorial Award in 2007 by Minister of Science and Technology in Taiwan, and has been granted many research awards by National Taiwan Normal University over her academic years. Her main research interests include development of scientific reasoning and personal epistemology, conceptual and epistemological development in science, effects of academic and social motivation on learning, process of science-text reading, and multimedia learning. She is now the coordinator of an eye-tracking laboratory in Graduate Institute of Science Education at National Taiwan Normal University. By employing various types of eye trackers, the eye-tracking laboratory aims to explore the processes of science learning in various learning environments, and probe the relations between learning processes and individual characteristics. Her research work is well recognized and has been continuously publishing papers in major international journals in science education and educational research such as International Journal of *Science Education, Computers & Education, Educational Studies, Instructional Science, and Educational Research Review*.

Cultural differences in the epistemic predictors for science reading

Fang-Ying Yang
Graduate Institute of Science Education, National Taiwan Normal University

In the research of psychology, the epistemic cognition has been identified as the highest level of cognition mediating human activities. In science education literature, the significant role of epistemic cognition in guiding science learning has also been well documented. However, as shown in our literature review, the tracks of development and the effects of epistemic cognition were not the same across different countries. The phenomenon suggests the existence of cultural difference. An in-depth examination on the cultural difference in epistemic cognition will help educators understand why learners cultivated in different education systems develop different abilities over time. In this talk, I would like to address the issue of cultural difference by comparing epistemic beliefs and reader beliefs in science of learners from India and Taiwan. The reader beliefs in science, defined as a reader's implicit model of reading reflecting his/her motivation to read, reading goal and strategies used for reading (Schraw & Bruning, 1996), is a psychological construct that was found to predict science text understanding in our recent study. Since reader beliefs in science by definition reflect a reader's way of knowing from science texts, and in our previous study the construct was found to correlate significantly with epistemic beliefs in science, we regarded reader beliefs in science as a part of epistemic cognition. In the talk, I will present how epistemic beliefs and reader beliefs in science are interacting with each other and affecting science reading behaviors of learners in different cultures.

Keynote Speaker
Prof. Ching Sing Chai (National Institute of Education, Nanyang Technological University, Singapore)

Ching Sing Chai is an Associate Professor at the Learning Sciences and Technologies Academic Group of the National Institute of Education in Singapore. He served as a school teacher and head of department after he completed his overseas study in Taiwan with scholarship from the Ministry of Education. He joined the National Institute of Education after completing his Master degree in Nanyang Technological University 2001, and subsequently finished his Ed. D with the University of Leicester in 2006. His research interests are in the areas of Technological Pedagogical Content Knowledge (TPACK), teachers' beliefs, design epistemology and students' learning with ICT. He has published more than 50 journal articles in reputable journals listed in the Social Science Citation Index. He has also co-authored several monographs including the recently published "Design Thinking for Education: Conceptions and Applications in Teaching and Learning", a Springer-published book. In the past few years, he has been actively involved in a Future School project funded by the National Research Foundation and the evaluation of ICT Masterplan 3 commissioned by the Ministry of Education. Currently, he works with schools in designing ICT integrated lessons for various subjects including Chinese language, primary science and social studies.

Comparing Personal Epistemology of Science, Literature and Design

Ching Sing Chai
Nanyang Technological University, Singapore

The field of personal epistemology has been investigating individuals' views about the nature of knowledge and the process of knowing both in a domain general manner and in subject specific context. Common factors surveyed under personal epistemology are certainty of knowledge (whether knowledge is certain or developmental) and the source of knowledge (whether knowledge are transmitted from authority or justify through personal or disciplinary ways of knowing) (see for example, Conley et al., 2004). To date, it seems that the domain general perspective has been gaining grounds (Wong & Chai, 2010) while the domain specific investigation has been focused on the investigation of the Nature of Science. This study is an initial attempt to survey individuals' personal epistemology about how knowledge creation of Science, Literature and Design happens. It deviates from previous studies of personal epistemology and look into epistemology from knowledge creation perspective as knowledge creation is considered the most important competency for the knowledge age (Bereiter, 2002). Science, literature and design are considered as dealing with different realm of reality corresponding to Popper's (1978) postulation of World 1 (the physical world), World 2 (the subjective world) and World 3 (the artificial world). Separate questionnaire were design for each of the discipline and undergraduate and postgraduate students' epistemic beliefs about the ways the discipline create knowledge. The survey was validated and differences among students from different disciplines (science, engineering, design and literature) were compared. While the findings indicate students from different disciplines hold different understanding of how knowledge were created, the survey seems to require further fine tuning to be more sensitive to discipline differences.

Keynote Speaker
Prof. Ivar Bråten (Department of Education, University of Oslo, Norway)

Ivar Bråten is a professor of educational psychology in the Department of Education at the University of Oslo, Norway, where he is the head of the research group on Text Comprehension - Development, Instruction, and Multiple Texts (TextDIM). He is currently directing the project *Understanding and Promoting Upper-Secondary School Students' Critical Reading and Learning in the 21st Century Information Age*, funded by the Norwegian Research Council, addressing how critical source evaluation skills develop among students and the importance of such skills to learning processes and learning outcomes. His publication list totals more than 300 titles, including nine authored or edited books and approximately 125 international peer-reviewed articles and book chapters, co-authored with 50 different scholars from 8 different countries. He currently serves on the editorial review boards of *Contemporary Educational Psychology*, *Learning and Individual Differences*, *Learning and Instruction*, *and Metacognition and Learning*, *and is a co-editor of the recent Handbook of Epistemic Cognition* (Routledge, 2016).

Epistemic Cognition Concerning Sources of Knowledge: Antecedents, Consequences, and Educational Implications

Ivar Bråten
University of Oslo, Norway

Thinking about sources of knowledge has been considered a central dimension of personal epistemology for decades. Arguably, this dimension is more important than ever due to the abundance of easily accessible information on almost every issue that characterizes the 21st century. In this talk, I will discuss epistemic cognition concerning sources of knowledge in the context of textual discourse, defining this aspect of epistemic cognition as attending to, representing, evaluating, and using available or accessible information about the sources of knowledge claims presented in written documents. I will discuss how thinking about sources of knowledge varies with individual and contextual factors, as well as how critical evaluation of sources may impact people's understanding of complex, controversial issues discussed across multiple documents. Finally, I will discuss educational implications and argue that designing, implementing, and evaluating interventions to promote adaptive epistemic cognition concerning sources of knowledge is an important research agenda within personal epistemology.

Keynote Speaker

Prof. Barbara K. Hofer (Department of Psychology, Middlebury College, USA)

Barbara K. Hofer is a Professor of Psychology at Middlebury College, and is an educational, developmental, and cultural psychologist. She received her Ph.D. from the University of Michigan from the Combined Program in Education and Psychology, with a certificate in Culture and Cognition; an Ed.M. in Human Development from the Harvard Graduate School of Education; and a B.A. in American Studies from the University of South Florida. Her research interests focus on learning and psychosocial development, particularly in adolescence and the college years. Current work includes: 1) the development of personal epistemology (beliefs about knowledge and knowing), and how this interacts with learning strategies, motivation, cognition, and academic performance (research funded by the National Science Foundation); and 2) the development of self-regulation and autonomy during the college years. and how this is related to frequent contact with parents through emerging technology. She has also worked on cross-national studies of achievement, and research on the interrelationship of mind and culture, and spent two sabbaticals as a faculty fellow at Doshisha University in Kyoto, Japan, and the most recent one as a visiting faculty fellow at the Danish Institute for Study Abroad in Copenhagen. Her research is done in collaboration with undergraduates, who have also been involved in presenting results at conferences and co-authoring papers. She is a Fellow of the American Psychological Association and on the editorial board of *Educational Psychologist*, *Learning and Instruction*, and the Journal of *Metacognition and Learning*. She is the editor, with Paul Pintrich, of Personal Epistemology: The Psychology of Beliefs about Knowledge and Knowing, and the author, with Abigail Sullivan Moore, of the iConnected Parent: Staying Close to Your Kids in College (and Beyond) While Letting Them Grow Up.

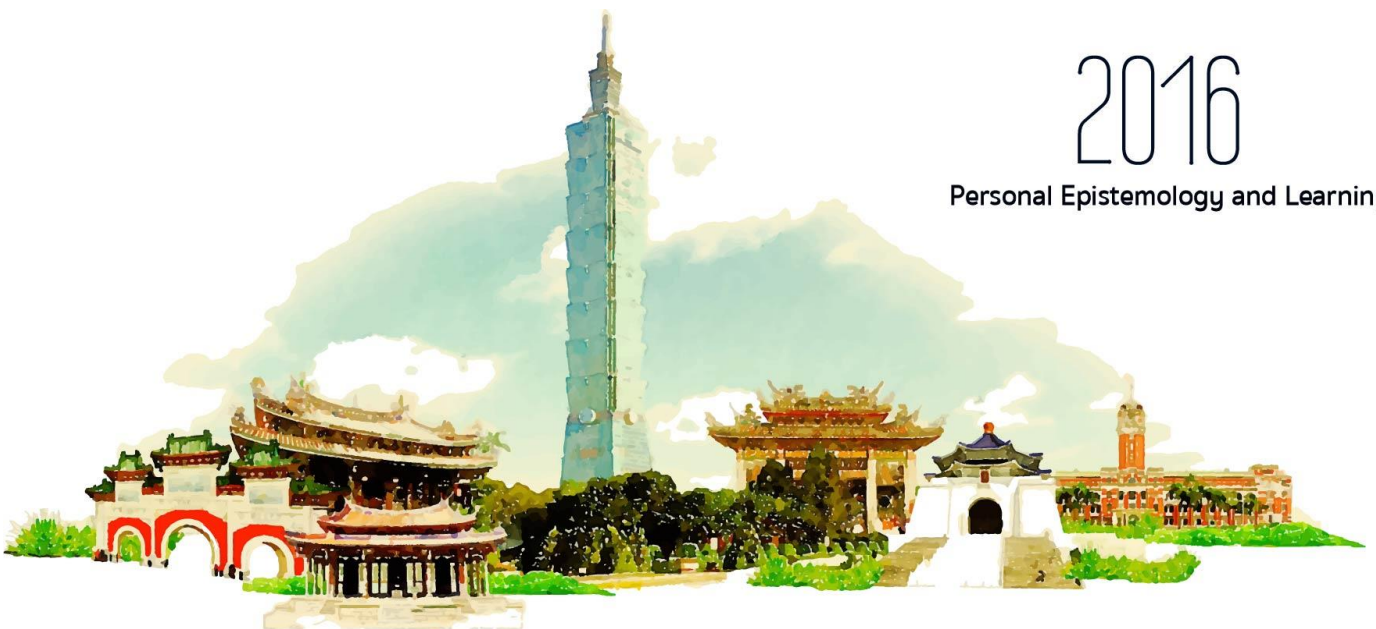
Epistemic Cognition: What Is It, Why Does It Matter, and How Do We Make It Relevant?

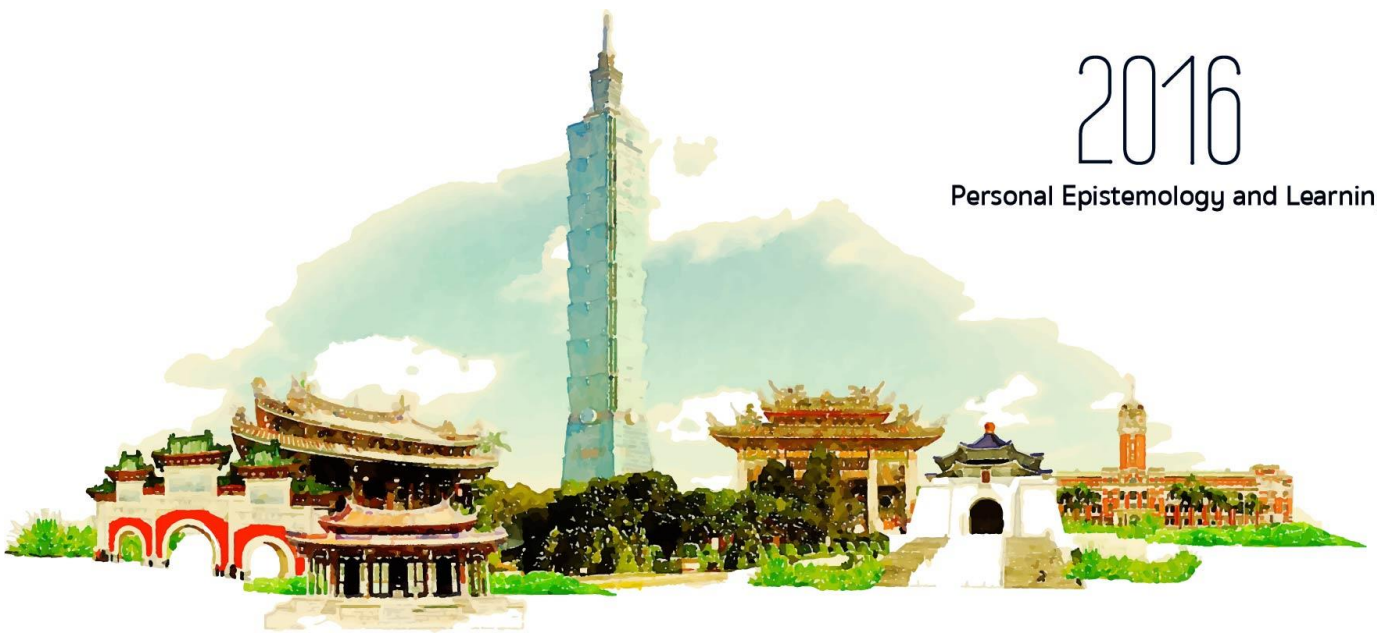
Barbara K. Hofer
Middlebury College, USA

What individuals believe about knowledge and knowing and how they think and reason about what they know are all part of the psychological construct of personal epistemology or what is now also being called epistemic cognition. These cognitive processes have a deeply influential role in learning, as well as in everyday encounters with new information, and are critical to an educated citizenry with the competence to assess the abundant information available on complex topics, especially in our digital world. Recent examples of public confusion about such topics as climate change, vaccinations, and evolution suggest the problems posed when individuals have difficulty weighing competing claims – with implications for individual well-being, communities, educational systems, and the planet. The need for clear thinking becomes ever more evident, and those who study epistemic cognition have a critical role to play in asserting the value of the construct and its place in education. In this talk I will give an overview of the construct, talk about why it matters, and discuss how researchers can better address issues of translating academic work for a broader audience, public dissemination, and application. I will focus on the role of epistemic cognition in the public understanding of science as an example. Those of us engaged in epistemic cognition research can help make it clear to others that epistemic cognition is not only an academic concern but also involves the development and application of a critically useful set of skills that can be applied, and which continue to develop, throughout life.

Paper presentation

Day 1
Session A1 / 11:35-12:25
IB-201




2016
Personal Epistemology and Learning

University students' conceptions of learning and knowledge - How are they related to mental models of learning?

Elina E. Ketonen*, Niclas Sandström, & Kirsti Lonka
University of Helsinki, Finland
*elina.e.ketonen@helsinki.fi

We investigated how our epistemological scales, combining ideas of learning and knowledge (i.e., collaborative knowledge building, reflective learning, valuing metacognition, certain knowledge, practical value; Lonka et al., 2008) were related to mental models of learning (i.e., intake of knowledge, construction of knowledge, use of knowledge) presented by Vermunt (1998). The participants (N=1515) were Finnish university students from five different domains. Four epistemological profiles were identified using latent profile analysis: 1) collaborative, fact-oriented, and practical (68%), 2) collaborative, reflective and practical (22%), 3) fact-oriented and individualistic (7%), and 4) solitary, reflective and theoretical students (3%). All mental models of learning varied according to the epistemic profiles: those students who belonged in groups that valued reflection, also scored high in construction of knowledge, whereas intake of knowledge was more typical in fact-oriented groups. Students with a theoretical profile did not value use of knowledge. Finally, epistemological profiles differed also in terms of age and domain: believing absolute knowledge was most typical among the youngest students and among science and engineering majors.

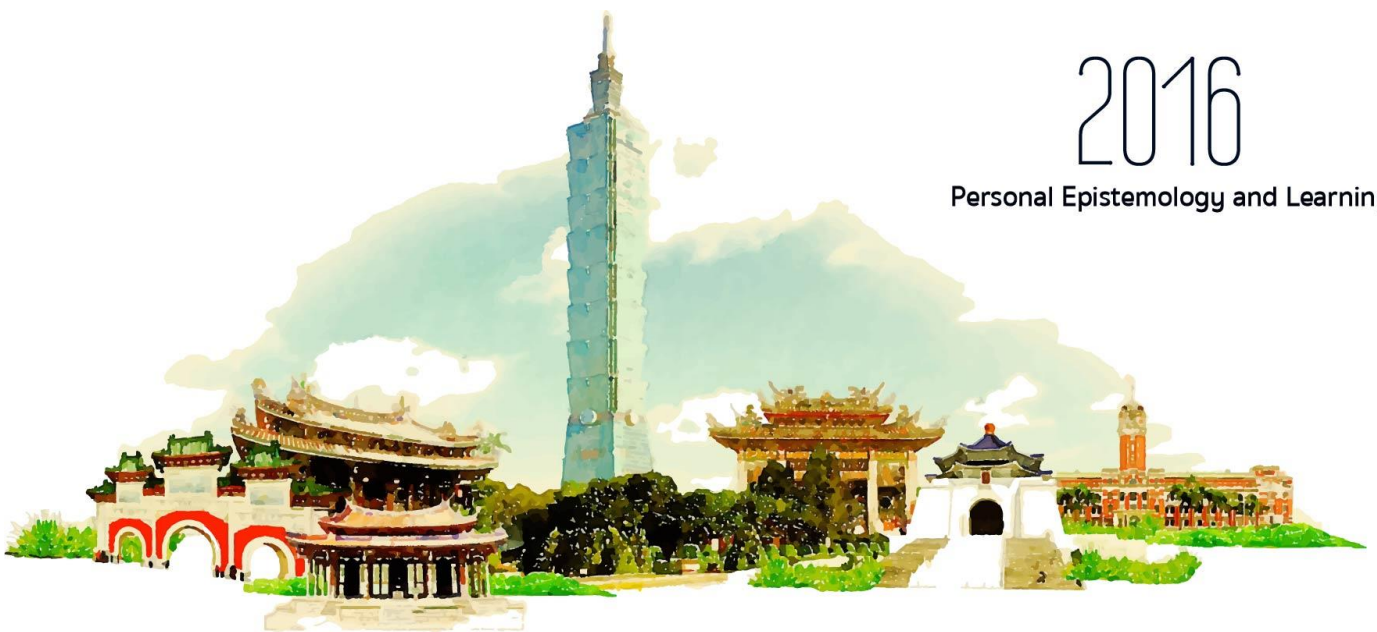
Two Scientists' Epistemological Beliefs about Mathematics and Physics

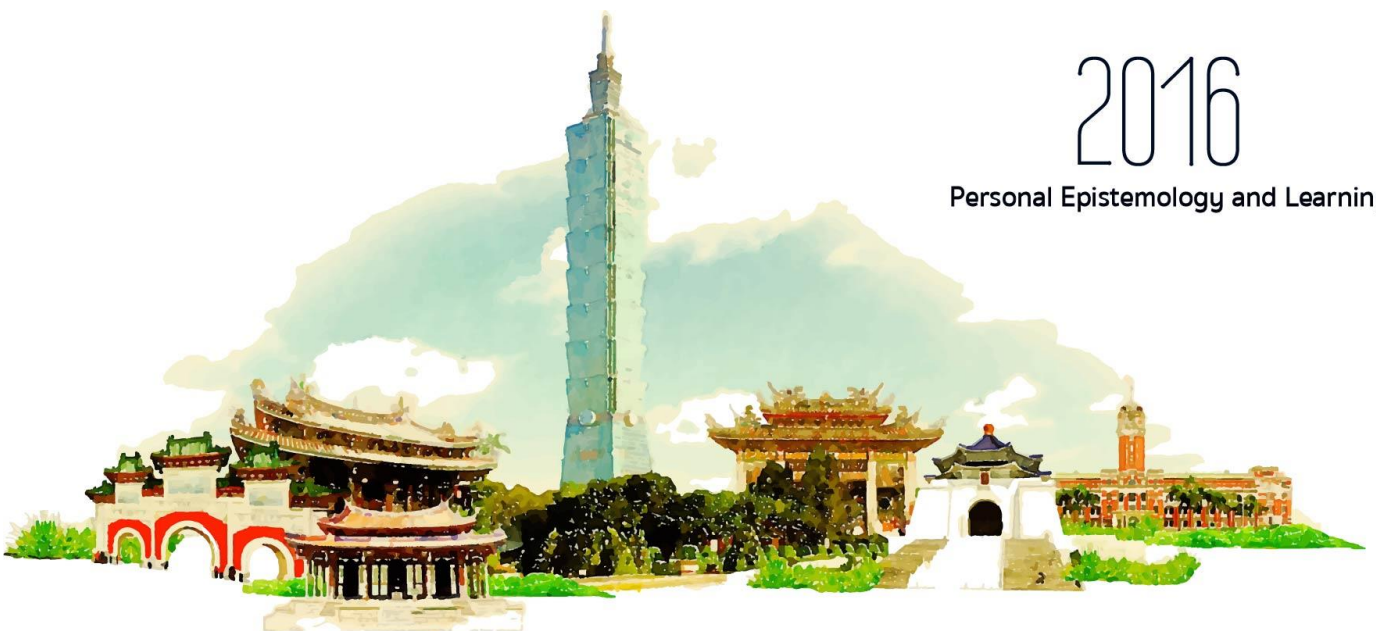
Po-Hung Liu [*], Shiang-Yao Liu
National Chin-Yi University of Technology, Taiwan
National Taiwan Normal University, Taiwan
[*]liuph@ncut.edu.tw

The objectives of this paper are to discuss the epistemological and dialectical interrelationship between mathematics and physics, and investigate two university faculties' epistemological beliefs about the two disciplines. We conducted two case studies to gain further insight into the following issues: (*a*) How does a mathematician, who had been deeply involved in the research of mathematical physics, interpret the epistemological nature of mathematics and its relationship with physics? (*b*) How does a theoretical physicist, who had received formal training in mathematics, interpret the epistemological nature of physics and its relationship with mathematics? (*c*) What can we imply from the two experts' epistemological beliefs? The result indicated that, though their interpretations of the nature of mathematics/physics may be varied, both of them agreed that mathematics is a science about studying the structure of knowledge and having a succinct but promising structure is crucial for the beauty in mathematics and physics. We advocate that the *structuralist* view may serve as an appropriate epistemology for teaching, learning, and interpreting the interrelationship between mathematics and physics.

Paper presentation

Day 1
Session A2 / 14:40- 15:30
IB-201





2016

Personal Epistemology and Learning

Exploring high school students' scientific epistemic beliefs towards learning science in Belgium.

Hannelore Montrieux[1*], Tammy Schellens[2], & Chin-Chung Tsai[3]
[1] *Department of Educational Studies, Ghent University, Belgium*
[2] *Department of Educational Studies, Ghent University, Belgium*
[3] *Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taiwan*
[*]Hannelore.Montrieux@UGent.be

During the last decades, educational research is focusing on the factors that can influence students and their learning experiences. Based on this finding, in this study, we focus on the high school students' scientific epistemic beliefs. 318 high school students of 20 secondary schools in Flanders, in Belgium participated in this research. By using the Scientific Epistemic Belief (SEB) questionnaire, developed by Tsai et al. (2011), students' beliefs about the nature of knowledge and the process of knowing have been measured. Results show that students' epistemic beliefs are in general sophisticated. However, students' characteristics such as gender and academic track play a significant role. Furthermore, students' self-efficacy seems to be an important predictor towards students' epistemic beliefs. These results inform teacher practices and these preliminary results and implications for teacher practice should be extended and discussed at the conference.

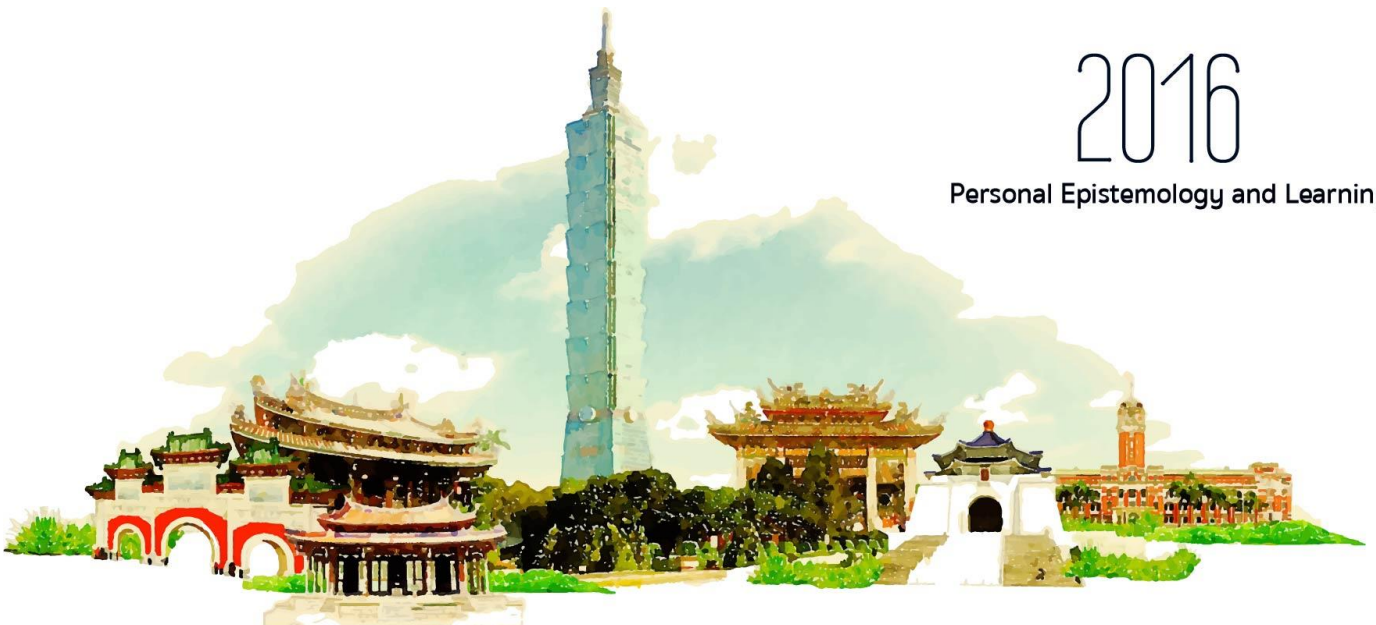
Experts' epistemic understanding of metavisualization while visualizing the concept of carbon cycling

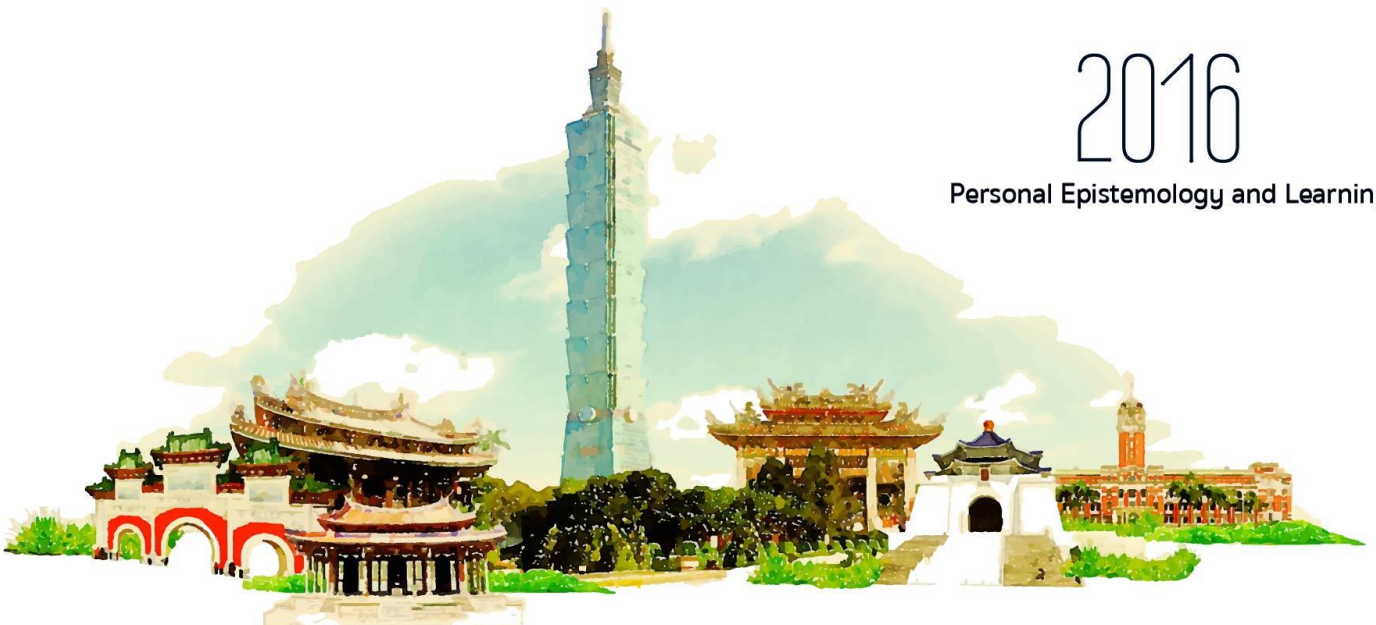
Jung-Yi Hung[1*], Hsin-Yi Chang[2], & Jeng-Fung Hung[1]
[1]*Graduate Institute of Science Education and Environmental Education, National Kaohsiung Normal University, Taiwan*
[2]*Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taiwan*
[*]mermaid236@gmail.com

Proficient in visualization like an expert involves metacognition and is important for complex tasks such as modeling and inquiry in science education. In order to understand the experts' metavisualization which is "metacognition in respect of visualization" (Gilbert, 2005), this study interviewed eight experts and explored their epistemic understanding of metavisualization, including the reflection of resources while conducting visualization tasks, the understanding of the purposes and limitations of visualization, and the reflection of the visualization criteria. Furthermore, this study integrated experts' strategies of epistemic understanding of metavisualization and finally framed them, which referred to the Information-Processing Model of cognitive psychology, to propose a simple framework consisted of three stages to describe experts' cognitive processes of visualization. This research provides not only directions to facilitate teachers' professional development in visualization and metavisualization but insights into how to design concrete scaffolding for visualization and metavisualization in science class

Paper presentation

Day 1
Session A3 / 15:45- 17:00
IB-201




2016
Personal Epistemology and Learning

Epistemic Cognition and Topic Interest as Predictors of Science Knowledge

Christian Brandmo[1*], Ivar Bråten[2], & Helge I. Strømsø[2]
[1]*Department of Teacher Education and School Research, University of Oslo, Norway*
[2]*Department of Education, University of Oslo, Norway*
[*]christian.brandmo@ils.uio.no

We examined justifications for knowing in science and interest in controversial science topics as predictors of domain- and topic-specific science knowledge in a sample of 281 Norwegian upper secondary school students. Results indicated that students' justifications for knowing predicted their science knowledge, with justification by multiple sources being a positive and justification by personal opinion being a negative predictor. Moreover, it was found that topic interest played a greater role for female than for male students. Finally, results indicated a positive relationship between justification by multiple sources and topic interest.

Students' epistemic beliefs concerning Internet environments in the online argumentation activities: Conception differences

Pei-Shan Tsai[1*], & Chin-Chung Tsai[2]
[1]*National Taipei University of Technology, Taiwan*
[2]*National Taiwan University of Science and Technology, Taiwan*
[*]sandra.pstsai@gmail.com

The purpose of this study is to explore the students' conceptions different in epistemic beliefs concerning Internet environments. 45 college students in Taiwan have the experience for the online argumentation activities with two weeks. They were asked to fill in survey and conducted the interviews after the online argumentation activities for exploring their epistemic beliefs concerning Internet environments and conceptions in the online argumentation activities. The main finding derived from this study reveals that students with cohesive conceptions have more advanced epistemic beliefs concerning Internet environment which consistent with the constructivist view, including preferences for Internet-based learning environments providing more opportunities to communicates, more opportunities to evaluate information, and more opportunities to explore the nature of knowledge. It implies that the students with cohesive conceptions tended to prefer more constructivist learning environment, and then they can use different approaches to enjoy the online activities.

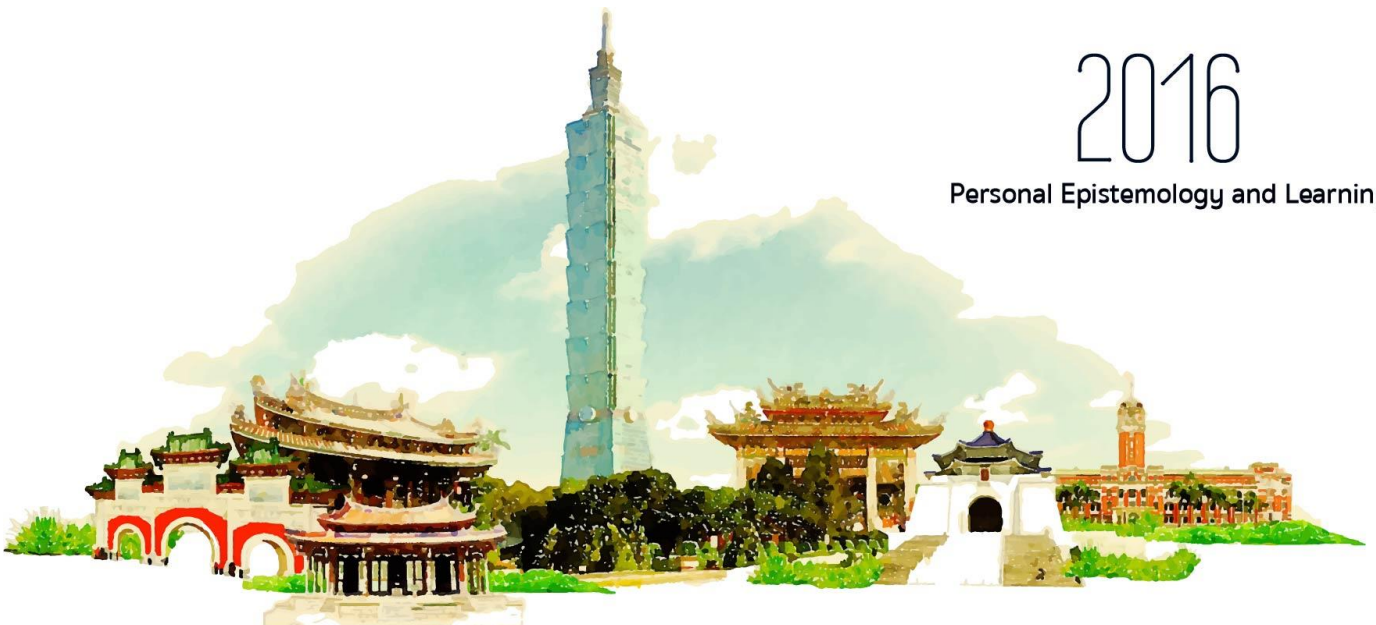
The Determinants of Taiwanese Students' Intrinsic Motivation in Science Learning Based on the Self-Determined Theory

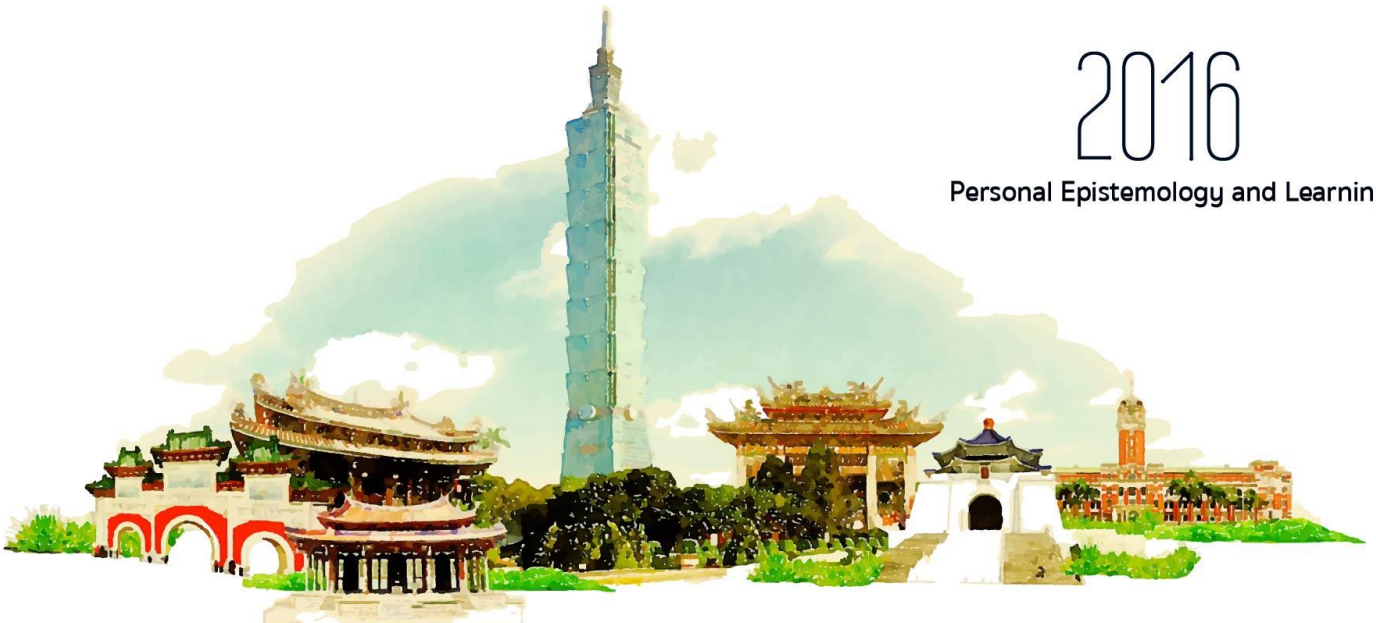
Cheng-Lung Wang*, & Pey-Yan Liou
Graduate Institute of Learning and Instruction, National Central University, Taiwan
**stevensam80@gmail.com*

Individual epistemological beliefs are linked to individual motivational learning process. Although the relationship between students' epistemological beliefs and motivation remains uncertain, several studies found that students with more intrinsically-oriented learning tended to have more sophisticated epistemological beliefs. Many positive learning outcomes (e.g., persistence, effort, and deep-learning strategies) were also associated with intrinsic motivation and sophisticated epistemological beliefs. This study aims to examine the hypothesized determinants of intrinsic motivation, namely competence, relatedness, and autonomy, based on the Self-Determined Theory. Data from the Trends in International Mathematics and Science Study 2011 Taiwanese eighth-grade science dataset were used. Results of this study revealed that students' perception of their competence and relatedness were positively associated with intrinsic motivation with 64% total variance explained. It suggested that the teacher-students relationship plays an important role in developing or maintaining individual's intrinsic motivation in students' science learning. Previous studies also proved that students' epistemological beliefs would be shaped by their previous learning context that was provided by their teacher. Therefore, future studies could uncover the underlying relationship or function between intrinsic motivation and epistemological beliefs as means of providing empirical-based research regarding the role of teachers.

Paper presentation

Day 2
Session A4 / 10:25- 12:05
IB-201




2016
Personal Epistemology and Learning

Epistemic Beliefs and the Theory-Practice Gap in Teacher Education: A Preregistered Study

Samuel Merk[1*], Tom Rosman[2], Julia Ruess[3], Marcus Syring[4], & Jürgen Schneider[1]
[1]*University of Tübingen, Germany*
[2] *Leibniz Institute for Psychology Information (ZPID), Germany*
[3]*Humboldt University, Gemany*
[4]*Ludwigs-Maximilians-University, Germany*
[*]samuel.merk@uni-tuebingen.de

Pre-Service teachers often devaluate general pedagogical knowledge taught in teacher education programs and prefer more experiential sources to derive effective teaching practice. In the current study, epistemic beliefs and source beliefs were investigated as predictors for the perceived value of general pedagogical knowledge for practice. Three preregistered hypotheses about these predictions were investigated. Pre-service teachers were presented four texts about educational research results. These texts were invariant in content but varied in a way that the results were allegedly generated by a practitioner, an expert or by means of a scientific study. Overall, we conclude that not the source of knowledge undermines the perceived value of general pedagogical knowledge. In fact, results allegedly generated by means of a scientific study were associated with a higher perceived value for practice. Epistemic beliefs, in contrast, predicted the perceived value of general pedagogical knowledge as expected.

Teachers' personal epistemologies and practices: promoting moral learning for active citizenship in elementary education

Joanne Lunn Brownlee[1], Laura Scholes[1], Sue Walker[1*], & Eva Johansson[2]
[1]*Queensland University of Technology, Australia*
[2]*University of Stavanger, Norway*
[*]sue.walker@qut.edu.au

Little is understood about the role of teaching in elementary classroom contexts to support values education for active citizenship. The research reported in this presentation sheds new light on teaching for active citizenship by investigating the relationship between teachers' personal epistemologies and teaching practices for promoting moral learning in the early years of school. Specifically, the research investigated a) the nature of teachers' personal epistemologies and practices for values education and b) the alignment between such personal epistemologies and practices in early years classrooms. The research draws on teachers' stimulated recall interviews and observational data gathered over the first 2 years of a 3-year longitudinal study. Participants were 29 early years elementary school teachers. Findings revealed four patterns of relationships between personal epistemologies and teaching practices for moral reasoning: *evaluativist*, *towards evaluativism*, *practical reflection* and *practical implementation*. All teachers reported a range of teaching strategies but they differed in the extent to which teachers supported children to value different opinions and helped children to justify these opinions. The findings support the existence of a complex relationship between beliefs and practices which suggests that it may be important to pay attention to both beliefs and practices during professional development experiences for values education.

How ready are teachers for change in Finnish Schools – Their epistemological beliefs, work engagement, burnout and perceptions of physical school environment

Lammassaari, H.[1*], Sandström, N.[1], Järvinen, J., & Lonka, K.[1,2]
[1]*University of Helsinki, Finland*
[2]*Optentia Research Focus Area, North West University, South Africa*
[*]heidi.lammassaari@helsinki.fi

Abstract

We aimed to find out, whether teachers' epistemological theories play a role in their work engagement and perceptions of their physical working environment. It was hypothesized that those teachers who would see learning as a collaborative and reflective act, would be more likely to report engagement in a rapidly changing school environment. There seems to be a potential friction between current knowledge practices and the new, more collaborative and reflective demands of the new Finnish curricula. Also the physical environment of schools needs to be changed to meet the demands. Such major changes may have consequences for work engagement/burnout. The participants were Finnish subject-matter teachers (n=132). *Mind the Gap* teacher questionnaire was administered in 2016. Exploratory factor analyses were carried out to form epistemic factors. The correlations among the epistemic factors and teachers' work engagement, symptoms of burnout and perceptions of their physical environment were calculated. Two factors were: 1) metacognitive-collaborative epistemology and 2) valuing superficial certain knowledge. Factor 1) correlated positively with work engagement and perceiving the environment important, and negatively with burnout. It was concluded that teachers who entertained sophisticated epistemologies were more likely to be engaged in their work in the middle of a change process.

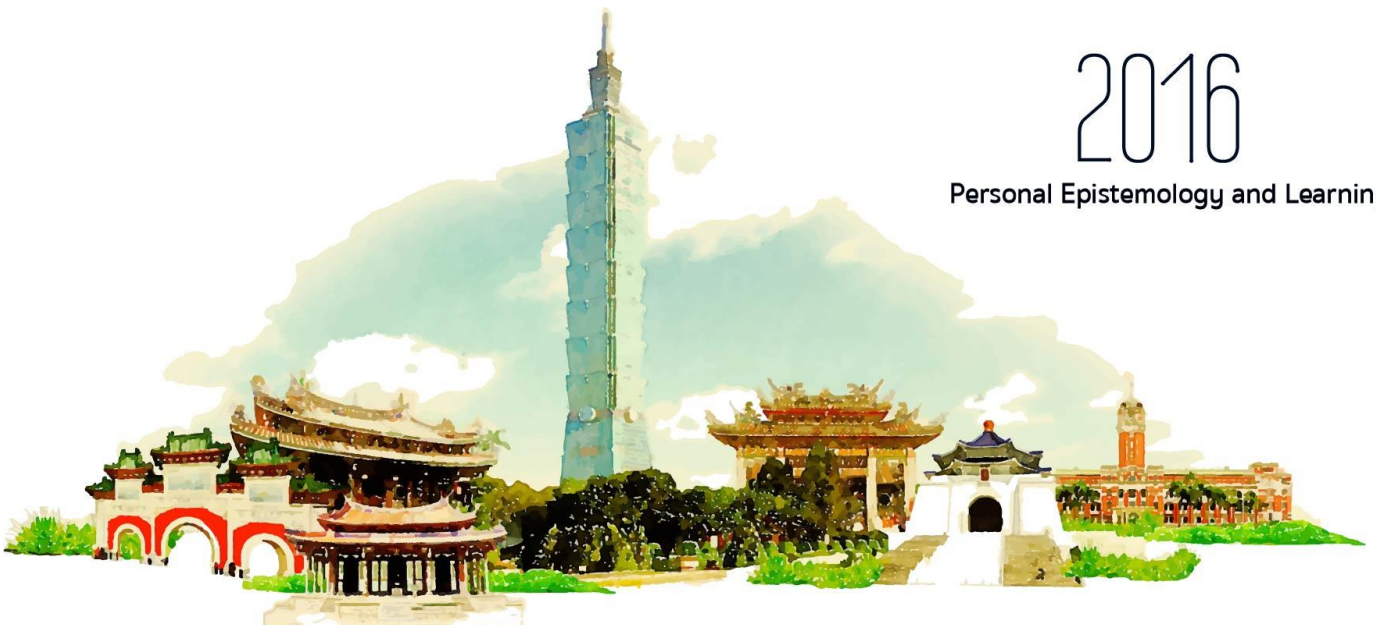
Exploring the relationship between preservice chemistry teachers' scientific epistemological beliefs (SEB) and their technological pedagogical content knowledge (TPACK)

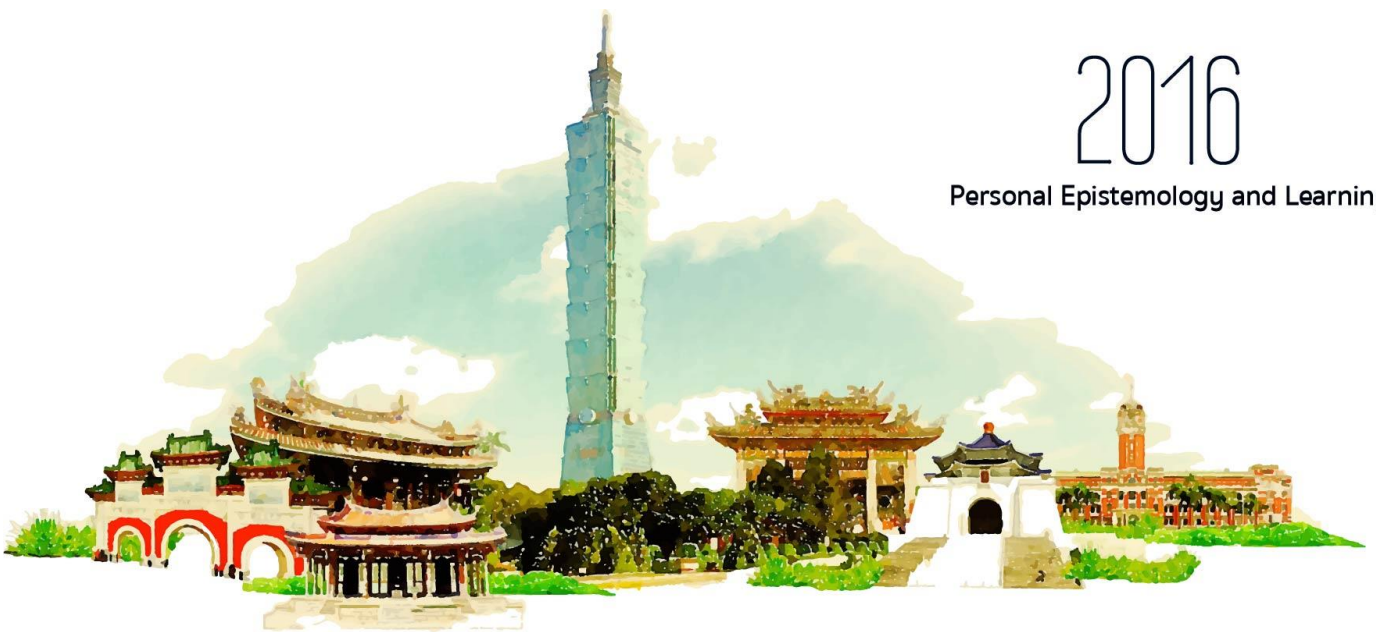
Feng Deng[1], Ching Sing Chai[2*], & Hyojeong So[3]
[1]*South China Normal University, China*
[2]*Nanyang Technological University, Singapore*
Ewha Womans University
[*]chingsing.chai@nie.edu.sg

This paper aimed to examine the profiles of Chinese preservice chemistry teachers' scientific epistemological beliefs (SEB) and their technological pedagogical content knowledge (TPACK), as well as the relationships between SEV and TPACK. Participants who were 350 volunteer preservice chemistry teachers (aged from 20-21 years old; 75% females) from Guangzhou, China. Results showed that the preservice chemistry teachers generally showed fairly sophisticated SEB, while their TPACK seems to be inadequate. Results of both stepwise regression analyses and the structural equation modeling indicated that participants' TPACK were significantly predicted by their beliefs about the empirical, tentative, inventive, subjective, and socially-culturally embedded nature of scientific knowledge. They uniquely explained about 2.1%, 3.2%, 1%, 8.2%, and 55.7% of the variance of TPACK, respectively. Findings were discussed and future directions were suggested.

Paper presentation

Day 2
Session A5 / 14:30- 15:45
IB-201




2016
Personal Epistemology and Learning

Exploring Relationships between Students' Computer-Supported Collaborative Knowledge Building Activity and Their View of the Nature of Science (NOS) as well as Their Scientific Inquiry Processes

Li Pei-Jung*, Hong Huang-Yao
National Chengchi University, Taiwan
*97102006@nccu.edu.tw

The aim of this study was to explore whether computer-supported collaborative knowledge building activity is related to the development of students' view of the nature of science and their scientific quality. Participants were 52 teacher-education students. Data included (1) an adapted, open-ended survey regarding the nature of science survey; (2) students' online inquiry and discussion and (3) their online interaction records. Results indicated that (1) students' view of the nature of science was significantly changed after 18 weeks' online knowledge building activities; (2) students' scientific inquiry quality was also significantly enhanced from phase 1(week1~week9) to phase 2(week10~week18); (3) there was a positive correlation between students' scientific inquiry quality and the quantity of their online knowledge building activity; and (4) a regressional analysis also showed that idea improvement activity served as a key factor that enhanced students' inquiry quality. Some qualitative accounts were also provided in the paper to help explain how students conducted their online scientific inquiry.

Explore Epistemological Foundation of Think- pair-share with iPad Math Application

Mahbubul Hasan*, & Denise L. Winsor
Educational Psychology and Research, University of Memphis, Memphis, TN, USA
*mhasan1@memphis.edu

It is not surprising that technology is being used on a regular basis and with much ease by very young children. Kindergarten teachers utilize iPads in reading centers as a way to improve early literacy skills; and as instructional tools to teach numeracy skills. We see teachers applying historically successful teaching practices (e.g., think, pair, share) to how they utilize technology in the classroom. This qualitative study investigates 15 kindergarten children using iPad math applications and a think, pair, share teaching strategy. Knowing more about children's epistemological foundation, experiences and preferences using think, pair, share instructional strategies can inform our classroom instructional strategies and effectiveness around the use of technology and inform us about effective developmentally appropriate practices as the use of technology continues to acculturate our classroom practices for teaching and learning.

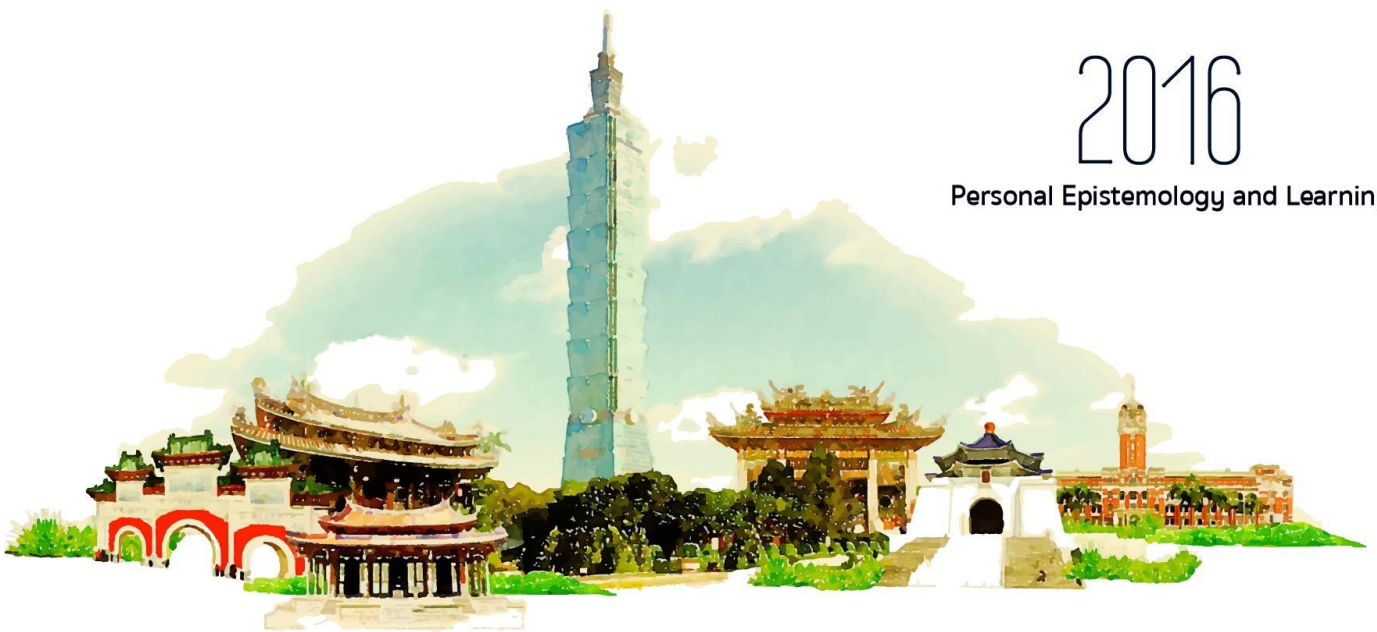
Characterizing and Fostering Epistemic Cognition through Computer-Supported Knowledge Building

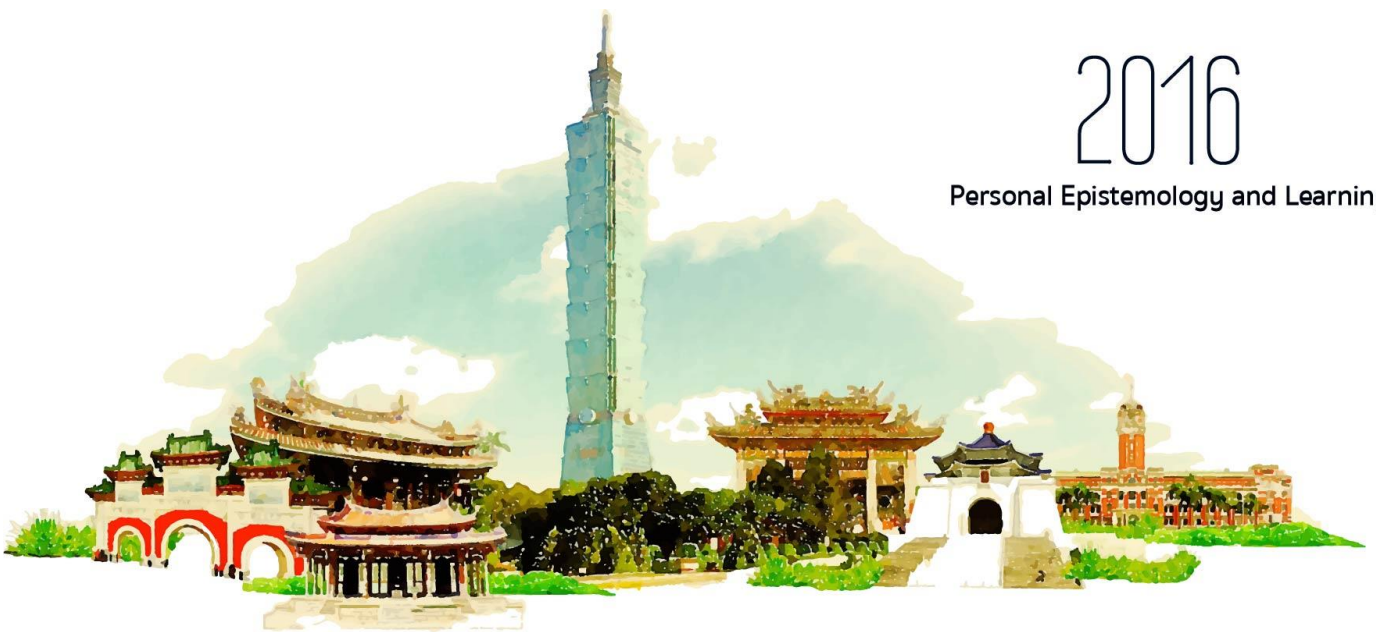
Carol K. K. Chan*, & Ivan C. K. Lam
University of Hong Kong, Hong Kong SAR, China
Open University of Hong Kong, Hong Kong SAR, China
*ckkchan@hku.hk

This study investigated the role of knowledge building and Knowledge Forum®, a computer-supported collaborative learning environment in fostering epistemic and conceptual change. Participants were eighty 10th grade students studying electro-chemistry in two Hong Kong classrooms. Supported by Knowledge Forum, students engaged in knowledge-building inquiry posting questions, co-constructing explanations and they wrote reflective knowledge-building portfolios tracing their own trajectory of conceptual change and collective growth. Two conditions were included, knowledge building (KB) and knowledge building with epistemic scaffolds (KBS). Data included epistemic-belief questionnaires; conceptual-change tests and knowledge-forum portfolio. Quantitative analysis indicate both knowledge-building classes improved on post-test conceptual and epistemic-belief measures with stronger effects in KBS class. Qualitative analysis of knowledge-building portfolios identified six epistemic cognition processes grouped as (a) epistemic aims and goals; (b) evaluation of knowledge claims; and (c) creation and development of ideas. Analysis of portfolios showed increases of epistemic cognition indicating growth over time. Hierarchical regression analyses show that epistemic cognition scores predict post-test conceptual scores over and above pre-conceptual scores; similarly, epistemic cognition scores predict post-test epistemic-belief scores over and above pre-test epistemic-belief scores. Implications of examining epistemic cognition in situated context and role of knowledge-building environment in epistemic and conceptual change are discussed.

Paper presentation

Day 2
Session A6 / 16:00- 16:50
IB-201




2016
Personal Epistemology and Learning

An initial investigation of Taiwanese high school students' scientific epistemic beliefs and goal orientations

Tzung-Jin Lin*, & Chin-Chung Tsai
Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taiwan
*tzungjin@gmail.com

The main purpose of this study was to initially investigate the relationships between Taiwanese high school students' epistemic beliefs and goal orientations in the domain of science. To achieve this aim, two instruments including the Scientific Epistemic Beliefs Instrument (SEBI) and the Goal Orientations in Learning Science Instrument (GOLSI) were developed. In particular, the SEBI was mainly based on the framework of Conley et al. (2004) and two additional dimensions, including "*Purpose of Knowledge*" and "*Purpose of Knowing*" which conform to the notion suggested by Chinn et al. (2011). A total of 300 Taiwanese senior high school students were invited to fill out the two abovementioned instruments. The main results indicate that, first, the factors of the SEBI and GOLSI were all grouped as hypothesized with satisfactory validity and reliability. Second, the correlation results show that the students with more sophisticated beliefs about the development and justification of scientific knowledge as well as the purpose of knowledge and knowing were more oriented to adopt two mastery goal orientations (i.e., mastery-approach goal and mastery-avoidance goal). Yet, only those who think science knowledge could be acquired from multiple sources tended to have a mastery-approach goal orientation in learning science.

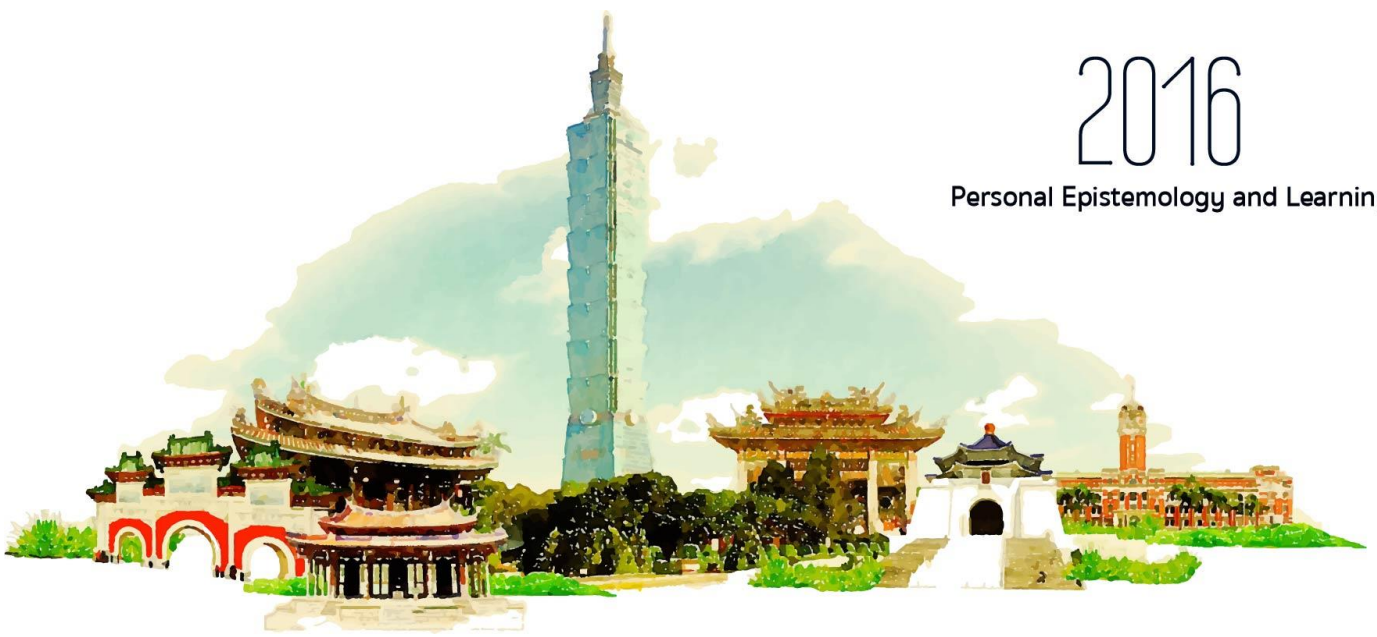
Examining the situated epistemic cognition of secondary mathematics teachers in a technology-driven teaching methods professional development session

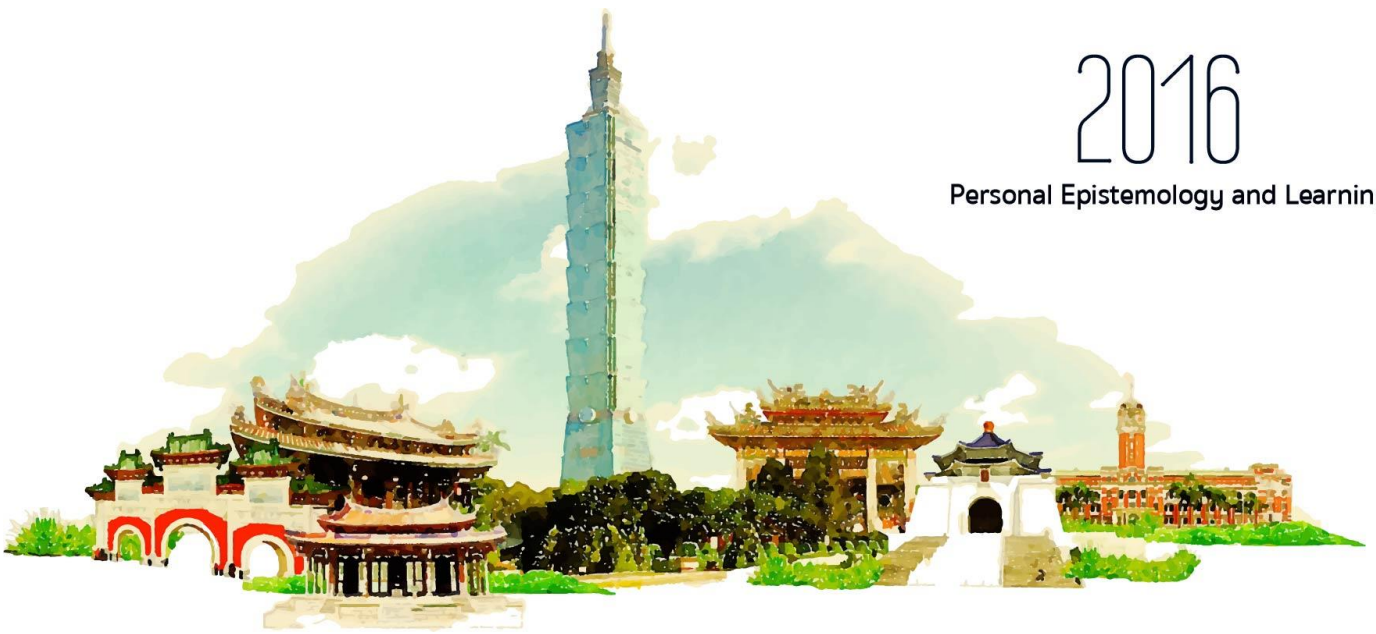
Eric Hosman*
The University of Memphis, The United States of America
*ehosman@memphis.edu

Many researchers have called for examining the situated, or contextualized, nature of epistemic cognition, including both social and emotional contexts. Yet, there are few studies where researchers examine the situated epistemic cognition of teachers. The purpose of this paper is to examine the social interactions and emotional exchanges and behaviors involving individual teachers' epistemic cognition over the course of a multi-day, technology-based training session. In this qualitative study, the researcher participated in a week-long professional development training session in which in-service secondary mathematics teachers learned to incorporate iPads into their instruction. Data was collected through participant observation, interviews with 10 in-service teachers and the course instructors, and in-class assignments. The epistemic claims, stances, aims, values, virtues, and vices of students and the course instructor were tracked, as well as their social interactions and emotions, using audio recordings and fieldnotes. Themes include both instructor and in-service teacher usage of appeals to authority to justify knowledge claims, closed-mindedness, and acknowledgement of diversity in thinking without implying only one pathway to knowledge is correct. This research has implications for in-service teacher professional development, including how teachers' epistemic cognition is informed by the instructional climate, familiarity with technology, and willingness to work with others.

Paper presentation

Day 3
Session A7 / 10:25-11:15
IB-201




2016
Personal Epistemology and Learning

Epistemic cognition developed in an elementary classroom culture

Li-Ching You*
National University of Tainan, Taiwan
*lichingyou@gmail.com

Epistemic cognition is evolved through context of life experience. I therefore took a phenomenological approach in exploring students' experience of solving word problems and explanation of his or her solution in classroom and group discussion settings to provide references for argumentative practice in mathematics education. One 1st graders' mathematics discussions in whole class and within group were observed, audio- and videotaped, continuously to their 2nd grade. In addition, group discussions after classes were captured. Taking argumentative events, in which class members pursuing the rationale of resolution records, the focus of my analysis placed on what students' perception of mathematic knowledge and knowing of addition and subtraction and how their epistemic cognition developed. In the description of how the classroom epistemic culture was gradually evolved from some students' persistent argumentation about the rationale of solution records, five of the students' epistemic cognition and their developmental processes were described and the mechanism for changes was explained. Implication to methodology used to explore epistemic cognition and its development and suggestions for mathematics teaching and further research is addressed in the end of the article.

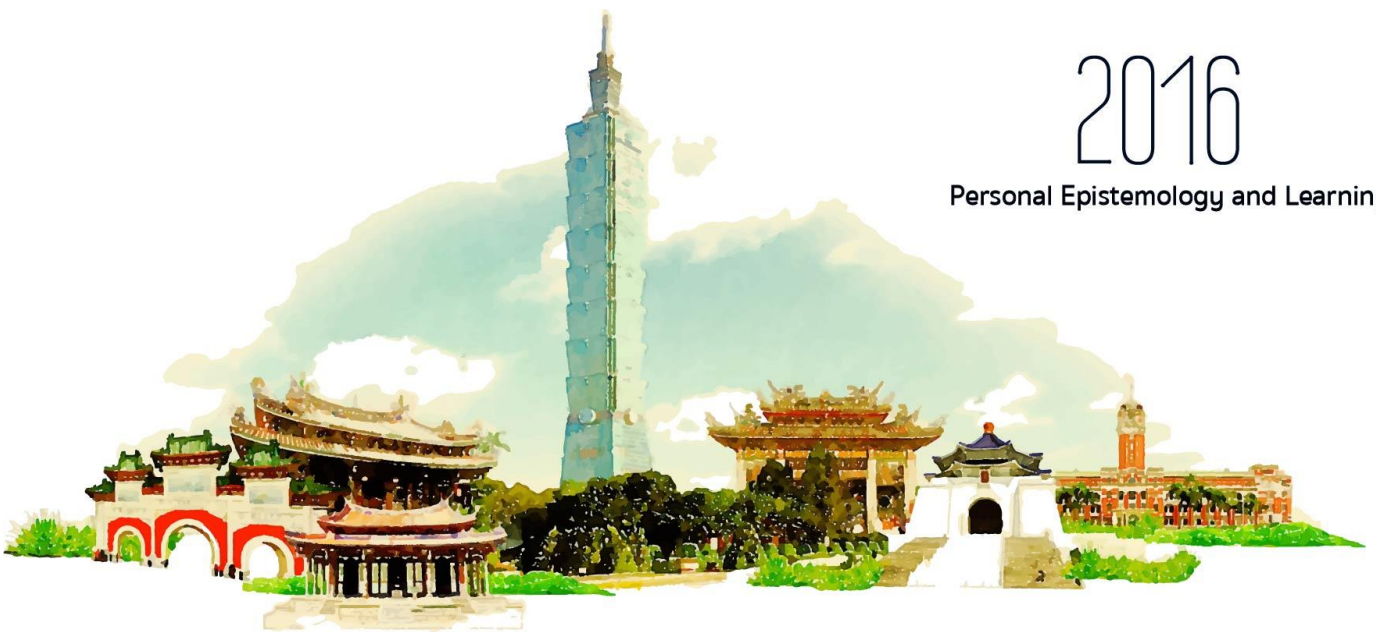
Relational analysis of primary school students' epistemic beliefs, thinking process and outcomes in knowledge building

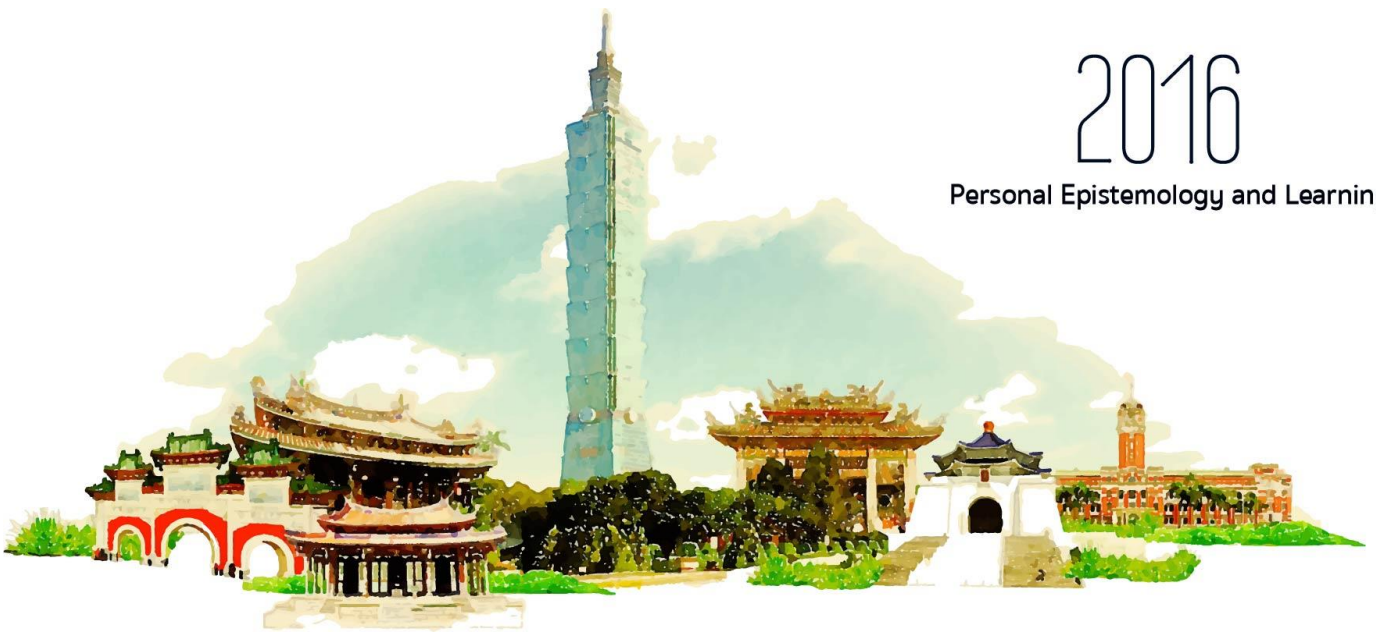
Pei-Shan Tsai[1*], & Ching Sing Chai[2]
[1] *National Taipei University of Technology, Taiwan*
[2] *Nanyang Technological University, Singapore*
[*]sandra.pstsai@gmail.com

This study explored the relationships among students' epistemic beliefs, thinking processes and outcomes in the knowledge building activities. The participants of this study include 240 primary three and primary four students from a school in Singapore. The participants had experienced using the Idea Garden for collaborative knowledge building for at least one year in their social studies classes. After one year of knowledge building activities, all of them responded to a survey for investigating their perceptions of collaborative knowledge building. The survey included seven factors: "knowing source (KS)," "knowledge development (KD)," "certainty of knowledge (CK)," "peer working with idea (PI)," "problem solving (PS)," "critical thinking (CRIT)" and "knowledge creation efficacy (KCE)." The scales of KS, KD and CK are related to students' epistemic beliefs. The scales of PI, PS, CRIT are associated with students' thinking processes, while the KCE scale is related to students' outcomes. Stepwise regression analyses showed that students' epistemic beliefs, both "KS" and "KD," were significantly positive predictor for their thinking processes (i.e. PI, PS, CRIT) and outcomes (i.e. KCE).

Paper presentation

Day 3
Session A8/ 13:20-14:35
IB-201





2016

Personal Epistemology and Learning

The differential development of epistemic beliefs in psychology versus computer science students: A four-wave longitudinal study

Tom Rosman[1*], Anne-Kathrin Mayer[2], Martin Kerwer[3], & Günter Krampen[4]
[1] *Leibniz Institute for Psychology Information (ZPID), Germany*
[2] *Leibniz Institute for Psychology Information (ZPID), Germany*
[3] *Leibniz Institute for Psychology Information (ZPID), Germany*
[4] *University of Trier & Leibniz Institute for Psychology Information (ZPID), Germany*
[*]rosman@zpid.de

We analyze the differential development of discipline-specific epistemic beliefs in computer science and psychology. Since knowledge in computer science is axiomatically founded and derived from formal reasoning, we expected computer science students' absolute beliefs increase during the first few semesters of their undergraduate curriculum (Expectation 1). In contrast, in the "softer" discipline of psychology, freshmen are likely to become more multiplistic after study entrance. Since, while they advance through their curriculum, psychology students acquire knowledge on research methods allowing them to evaluate and weigh knowledge claims, we nevertheless expected this trend towards multiplism to invert sometime later. We therefore suggest multiplistic beliefs to follow an inversely U-shaped curve over psychology students' first few semesters (Expectation 2). Hypotheses were tested in a three-semester long four-wave study with 226 undergraduates. Data were analysed by multi-group growth modelling for parallel processes. In computer science, absolute beliefs indeed increased over the study period. In psychology, an initial increase in multiplism was followed by a steep decrease. We therefore suggest that at least in higher education, epistemic "sophistication" should be conceived of as a flexible adaptation of epistemological judgments to the characteristics of specific contexts, and not as a generalized developmental sequence.

Teachers' epistemological theories: are they related to their ideas of assessment?

Lonka, K.[1,2*], Järvinen, J.[1], Makkonen, J.[1], & Hietajärvi, L.[1]
[1]*University of Helsinki, Finland*
[2]*Optentia Research Focus Area, North West University, South Africa*
kirsti.lonka@helsinki.fi

We explored the epistemologies that Finnish teachers expressed, and how these were related to their ideas of assessment, creativity and critical thinking. The participants were Finnish subject-matter teachers (n=132). *Mind the Gap* teacher questionnaire was administered in 2016. Exploratory factor analyses were carried out to form epistemic factors. The correlations between them and teachers' ideas of assessment, creativity and critical thinking were calculated. Also, a person-centered profile analysis was done. Two factors were: 1) metacognitive-collaborative epistemology and 2) valuing superficial certain knowledge. Factor 1) correlated positively with such ideas of assessment that emphasized setting goals together, assessing understanding, and motivating students to learn. Factor 2) only correlated with statements stating assessment should compare pupils with each other and to see, how well they met the teachers' criteria. Factor 1) also correlated with the ideas that it is important to develop creativity and critical thinking, whereas Factor 2) correlated negatively with such ideas. Only 36 teachers would have Factor 1) type profile and 90 teachers expressed Factor 2) type profile. A relativist, collaborative epistemology correlated with seeing assessment as promoting deep understanding. The simplistic epistemological theory correlated with more objectivist ideas. We looked at holistic epistemological theories rather than simple beliefs.

Nested ecology: Examining high school students' belief systems regarding epistemic beliefs of science, learning science, and science assessment

Min-Hsien Lee[1*], & Chin-Chung Tsai[2]
[1]*Center for Teacher Education and Institute of Education, National Sun Yat-sen University, Taiwan.*
[2] *Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taiwan.*
[*]leemh@mail.nsysu.edu.tw

What students think scientific knowledge is and how they think they know and learn science have become critical components of students' learning science. This study aims to investigate students' belief systems regarding learning science from the nested ecology perspective (i.e., the interrelations among beliefs about scientific knowledge, beliefs about the knowing of science, conceptions of learning science, and conceptions of science assessment). A total of 60 Taiwanese high school students' epistemic beliefs of science (i.e., beliefs about the nature of scientific knowledge and knowing science), and conceptions of learning science and science assessment were obtained by in-depth interviews and the phenomenographic method. The results indicated that, on the one hand, the students' beliefs about the nature of knowing science seemed to have greater power to explain their conceptions of learning science than their beliefs about the nature of scientific knowledge. On the other hand, their beliefs about the nature of scientific knowledge seemed to relate more closely to their conceptions of science assessment. This study further identified four models of students' nested ecology regarding learning science: the complete, connected, partial, and divergent nested ecologies. In particular, this study also revealed the development trend of nested ecologies regarding learning science.

中文論文發表(一)

Day 1
14:40-15:30
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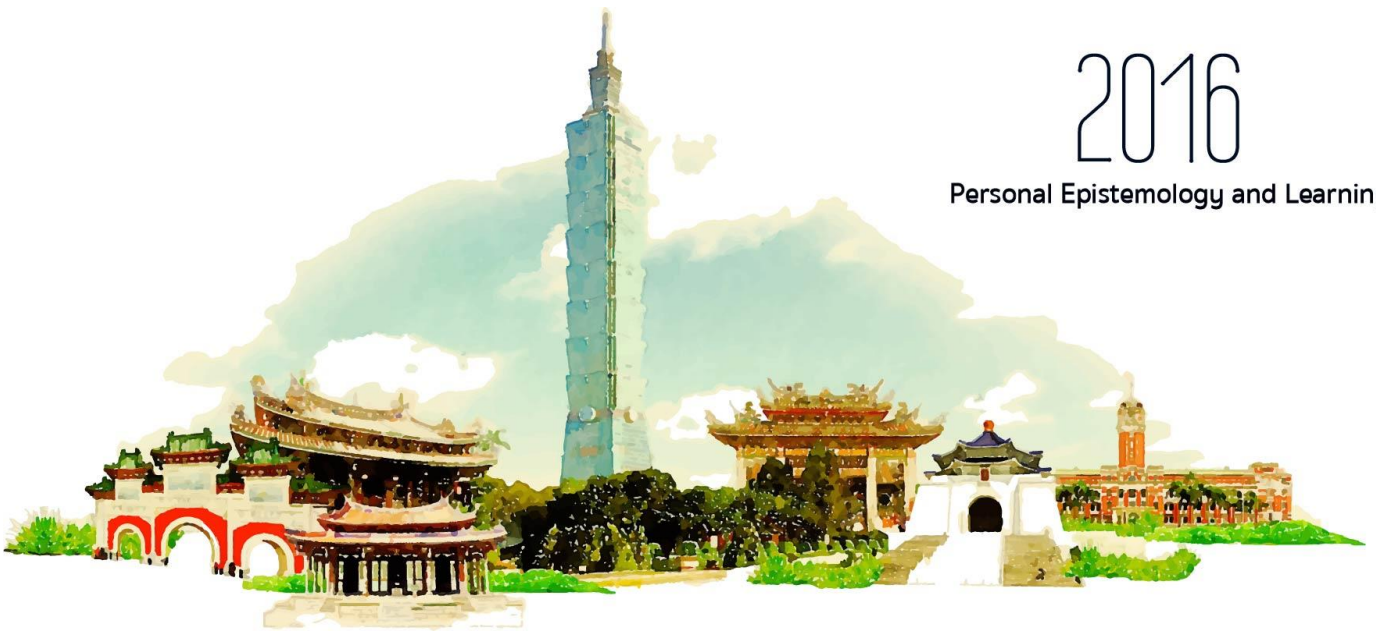
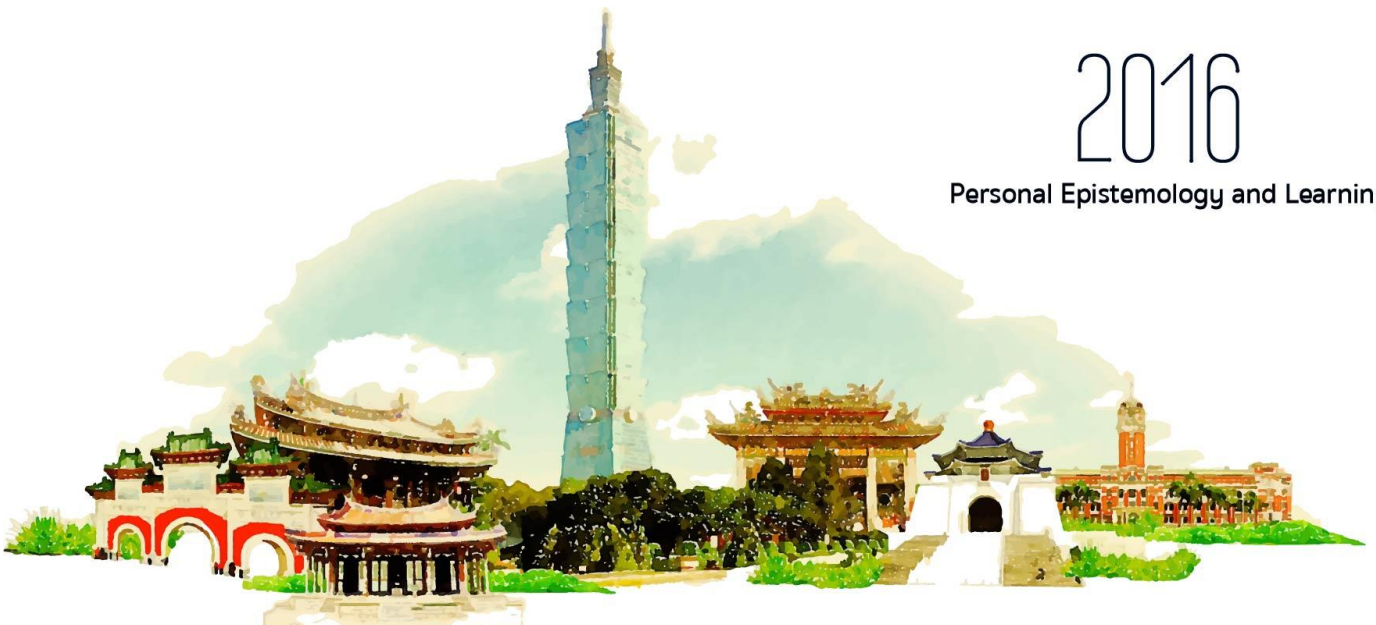



2016
Personal Epistemology and Learning

探究知識翻新活動對大學生科學家意象之影響

楊家睿*
國立政治大學教育學系
*104152004@nccu.eud.tw

本研究旨在探討基於知識翻新（knowledge building）的自主學習對大學生科學家意象(image of scientists)之影響。研究對象為34位修習「自然科學概論」課程的大學生。資料來源包含：（1）科學家意象之前後測開放式問題；（2）學生每週於平台撰寫之科學家故事；（3）科學家意象之前後測量化問卷。質性分析結果指出，經由知識翻新教學，學生於學期後對科學家意象產生轉變。學生之科學家意象在期初較強調科學家具備天生特質(如聰明為必要條件)轉變為強調後天特質（如努力的重要）；工作方式由個人取向轉變為團隊合作；科學家的科學探究則從重視基礎知識轉變為也同時強調產生想法的重要。量化問卷分析則顯示學生對科學家意象之前後測達顯著差異（t=-13.579, p<.05）。整體研究結果指出，知識翻新學習可以幫助學生建立更建構取向之科學家意象，使學生從不同面向認識科學家及科學工作。

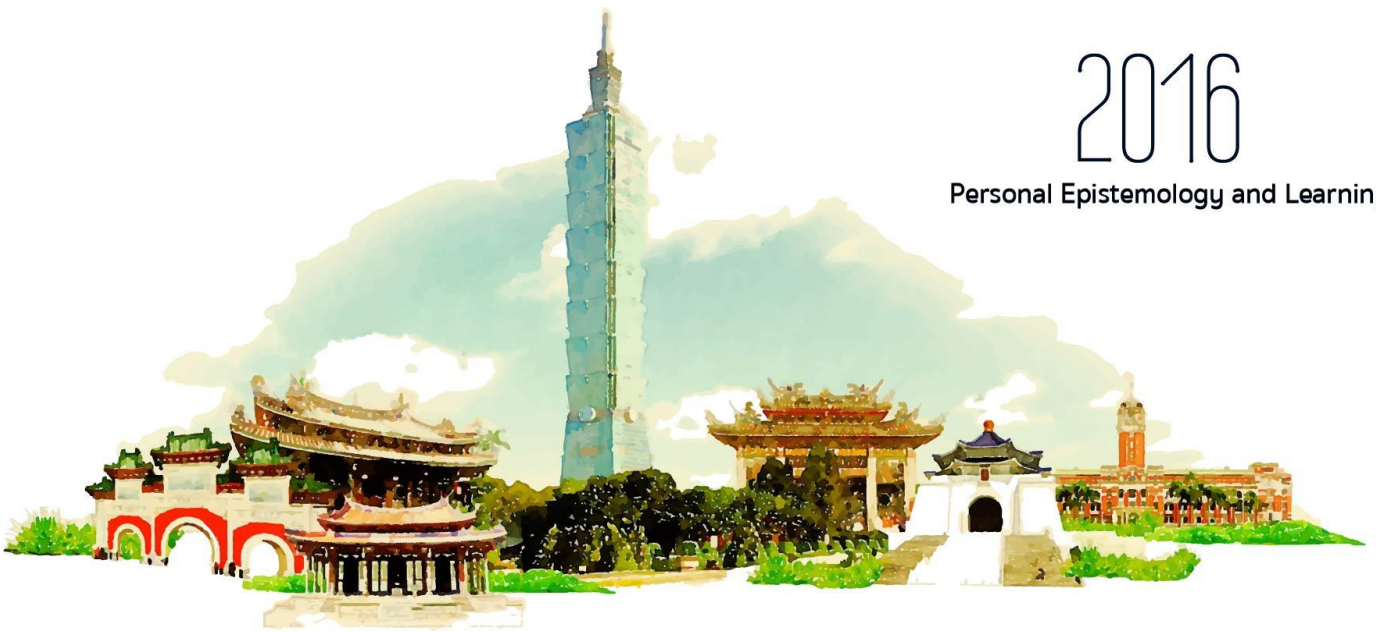
初探個人科學認識信念與科學學科表現及知識結構的關係—以天文主題為例

陳怡君[1]、楊芳瑩[2*]
[1]國立台灣師範大學科學教育中心
[2]國立台灣師範大學科學教育所
[*] fangyang@ntnu.edu.tw

本研究旨在天文的背景脈絡下，探討個人科學認識信念、科學學科表現及儲存在長期知識結構中，陳述性知識與程序性知識間的關係。基於研究目的，選取修習過「太陽視軌跡」簡介課程者，即大一及大二學生共35人參與研究。分析的結果顯示，學生的科學學科表現；包含標準化測驗及天文繪圖測驗的成績僅與科學認識信念中屬於科學知識本質的信念，即：確定性及發展兩個向度較為有關。而程序性知識的提取數量則與科學認識信念中的四個向度：來源、確定性、發展、辯證皆達（近似）顯著相關。綜合上述，由於程序性知識是經由概念理解後，確實知道如何做（解題）的動態知識，因此，對科學知識形成過程的觀點，很可能進一步影響動態知識的豐富程度。

中文論文發表(二)

Day 1
15:45-17:00
IB-202



2016

Personal Epistemology and Learning

探究科學認識信念與生物學文本閱讀歷程之關係

鄭嘉惠[*1]、楊芳瑩[*2]

國立台灣師範大學科學教育研究所

[*1]80545002s@ntnu.edu.tw [*2]fangyang@ntnu.edu.tw

多數的科學教育研究結果支持科學認識信念影響科學學習的行為。本研究利用眼球追蹤法，分析科學閱讀歷程與個人科學認識信念的關係，藉以從「歷程」的角度了解認識信念在科學閱讀與學習上扮演的角色。研究欲探討科學信念是否會影響文章閱讀的歷程，受試者為28位生物背景的大學生，進行生物文本的閱讀，並使用問卷檢測受試者的科學認識信念，然後將受測者科學信念各個向度的平均分數與閱讀文章的眼動指標作相關分析。研究結果發現，眼動指標和不同的概念閱讀之間主要與知識「來源」、「發展性」、「確定性」有關。

臺灣研究生之特定領域知識信念：以生物與物理學科為例

蔡祐翔[1]、葉恒儀[2]、張欣怡[1*]、林宗進[1]
[1]國立臺灣科技大學數位學習與教育研究所
[2]國立臺灣科技大學應用科技研究所
[*] hychang@mail.ntust.edu.tw

本研究目的在於透過讓34位臺灣研究生以繪圖的方式，了解他們的物理及生物學科的知識信念結構。受試者皆為科學教育領域的背景，或是曾修習過科學教育相關課程之研究生。在經過反覆之歸納與分類後，主要研究結果發現，近七成的受試者在物理和生物的知識信念結構，均連結至相關的學科內容。而在比較其物理與生物知識信念結構後發現，其物理知識信念結構中，「部分類別」、「內容網絡」和「生活連結」的比例多於其生物知識信念結構；反之，其物理知識信念反映在「內容類別」、「學習」和「探究」的比例則少於其生物知識信念結構。此外，「知識的本質」面向較易隨科目不同而有所改變，但「求知的本質」面向較不易隨著科目的不同而有所改變。

台灣與香港高中學生在網路課業知識觀點與網路課業搜尋行為之差異研究

呂珮甄[1]、莊紹勇[2]、梁至中[3*]
[1]國立臺灣科技大學應用科技研究所
[2]香港中文大學課程與教學系
[3]國立臺灣科技大學應用科技研究所
[*]aljc@mail.ntust.edu.tw

本研究旨在探究網路知識觀與網路課業搜尋行為之關係，並檢視台灣與香港高中學生兩族群間之異同。本研究調查對象為台灣高中學生共470人；香港高中學生共521人。研究工具為「網路知識觀量表」以及「網路課業搜尋行為量表」。研究結果發現，兩個區域的學生在其網路課業知識觀點與網路課業搜尋行為均具有顯著差異性。台灣與香港高中學生如果不相信網路上課業資訊確定性，就傾向使用吻合的課業搜尋行為；如果具有評估的網路課業知識觀點，則傾向使用多項來源以及重視內容的網路課業搜尋評判標準。但是台灣高中學生如果不相信網路課業資訊的結構，則不傾向整合網路上的課業資訊，而香港高中學生則是不傾向使用官方網站以及重視內容的網路課業評判標準。

The Second Personal Epistemology and Learning (PEL) Conference

第二屆個人知識/認識觀與學習國際研討會

【會議日期】2016年12月13日、12月14日、12月15日
【會議地點】國立臺灣科技大學國際大樓
【主辦單位】國立臺灣科技大學數位學習與教育研究所
國立臺灣科技大學網路學習研究中心
【贊助單位】科技部
教育部
國立臺灣科技大學

『蔡今中教授國家講座系列活動』

感謝朱振南大師惠賜墨寶
Appreciate for Master Chen-Nan Chu's valuable calligraphy.