

Bridging two worlds – cooperation between academics and teacher-researchers

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Teacher-research represents a broad and current topic not only in the field of mathematics education. The term refers to a variety of situations in which teachers are involved in research, either conducting research in which they focus on their own teaching or cooperating in a collaborative research with academics from all types of institutions and/or other teacher-researchers. In any case, teachers' participation in any research project influences all participants' approaches to both school practice and theory of mathematics education.

In the plenary lecture, examples of successful teacher-research and fruitful collaboration among teachers and academics will be presented. G. Brousseau's characterization of the difference of the teacher acting as a teacher and as a researcher will be used. Generally, teachers researching their own practice reflect and improve the practice in their natural environment. Their ambition is to comprehend the situation in which they are the main participant. Action is linked with reflection.

The aim of cooperation between academics and teacher-researchers in communities of practice is to gain knowledge related to a specific research question. Through the process of sharing information and experiences with other members of the group, members learn from each other and have an opportunity to develop personally and professionally. Examples of cooperation of academics and teacher-researchers will serve as the basis for the analysis of factors contributing to success of such research events. Our objective is to present the differences between the roles of teacher-researchers and academics and the impact of such cooperation on both teachers and academics.



Prof. RNDr. Jarmila Novotná, CSc., is the professor at the Faculty of Education of Charles University in Prague. She has HDR (habilitation à diriger des recherches) at l'Université Bordeaux 2 Segalen, France. She is chercheur titulaire at CeDS – Université Bordeaux Segalen. Her main fields of interest are didactical conditions of transformation of students' models of activities when grasping knowledge and skills, pre- and in-service training of mathematics teachers for their profession and transfer of research results into practice.

She is an active member of Czech and international research community (e. g. she was a member of the International Committee of The International Group for the Psychology of Mathematics Education (PME) and European Society for Research in Mathematics Education (ERME); she has been a member or chair of IPCs of several important international scientific events; she was the member of IPC of ICMI Study 15 – The Professional Education and Development of Teachers of Mathematics and ICMI Study 23 – Primary Mathematics Study on Whole Numbers; she was a member of ICME 10 Survey Team – The professional development of mathematics teachers; she has been a member of editorial boards of several international journals; she is the member of informal communitie Learners' Perspective Study and Lexicon). She is the member of several Councils of PhD Studies in didactics of mathematics in the Czech Republic and abroad and she is the supervisor of PhD students.

Motivation in the learning of mathematics: Mathematics education and the founding principle of history

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Mathematics is most often, according to a UK national study conducted earlier in this century, described by British teenagers as ‘irrelevant’ and ‘boring’. Even withstanding that this may have improved since 2004 (despite some evidence to the contrary) this talk will focus on exploring what the possible meanings of such statements may entail. It will also propose that, in order to construct a personal engagement and motivation for the learning of mathematics, learners need to develop skills for creating internal dialogues about mathematics. These dialogues, in order to be effective, should be rich in examples of different images and visions of mathematics as well as interpretations of what ‘doing’ mathematics may entail.



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Dr Snezana Lawrence works as a senior lecturer at Aviation Programmes, Department of Design Engineering & Mathematics, Faculty of Science and Technology at Middlesex University, London, United Kingdom.

She is interested in the creativity, identity, and engagement in the learning of mathematics, and is a mathematical historian. She is involved in the national and international initiatives to promote the use of the history of mathematics in mathematics education. Snezana is on the Council of the Institute of Mathematics and Its Applications, is an editorial board member of *Mathematics Today* (Institute of Mathematics and Its Applications) and is the Associate Editor of the *BJHM* (British Journal for the History of Mathematics), published by Taylor & Francis). She is the Education Council member of the same society.

Using a variety of methods for mathematics education research

Patrick Barmby

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In this talk, I will discuss different methods I have used in my research into mathematics education. My particular research interests have included children's understanding of mathematics and the role of visual representations, assessment in mathematics education and professional development of mathematics teachers. Reflecting these interests, I will discuss three research methods that I have found particularly useful in these areas of interest. I will try and provide a balance of both quantitative and qualitative approaches, and in fact discuss methods that are useful in both types of approaches.

Firstly, I will discuss research that I carried out in England using eye-tracking methods to examine primary children's understanding of visual representations of multiplication (Bolden, Barmby, Raine & Gardner, 2015). Although I will discuss some quantitative results resulting from the research, I will mainly focus on the use of eye-tracking as a qualitative video tool to find out how children examine mathematical representations and what we can infer about their understanding from the resulting videos.

Secondly, I will discuss research work I am currently involved in using a comparative judgement to assessing pupils' understanding in mathematics. Ian Jones and colleagues (Jones & Inglis, 2015) have shown that comparative judgement can be used to assess more 'nebulous' constructs in mathematics education research such as 'understanding'. I will discuss what comparative judgement is and how I use it to assess children's understanding, and also what qualitative results can be obtained in terms of progression in children's understanding in particular areas of mathematics education.

Finally, I will discuss the work of one of my PhD students, Brantina Chirinda (Chirinda & Barmby, 2017), and her use of Design-Based Research (DBR) methodology to develop a professional development intervention for secondary mathematics teachers in an informal settlement in Johannesburg, South Africa. I will particularly emphasize how DBR develops

practical interventions and theoretical perspectives which take into account and apply to particular contexts – in fact the recognition of context being an important part of this research.

Bolden, D., Barmby, P., Raine, S., & Gardner, M. (2015). How young children view mathematical representations: a study using eye-tracking technology. *Educational Research*, 57(1), 59-79.

Chirinda, B., & Barmby, P. (2017). The development of a professional development intervention for mathematical problem-solving pedagogy in a localized context. *Pythagoras*, 38(1), 1-11.

Jones, I., & Inglis, M. (2015). The problem of assessing problem solving: Can comparative judgement help? *Educational Studies in Mathematics*, 89(3), 337-355.



Dr Patrick Barmby is the **Head of Research** for *No More Marking* and joined the organization in July 2017.

Prior to moving to *No More Marking*, Patrick was working in South Africa as a Senior Lecturer in mathematics education at the University of the Witwatersrand, Johannesburg.

He also worked for 13 years at Durham University in the UK, and in both institutions, he worked closely with trainee teachers and also carried out research mainly in primary mathematics.

His research interests include the notion of understanding in mathematics, the use of visual representations in teaching mathematics and the use of eye tracking technology in mathematics education research. In the past, he has also published on developing attitude towards science measures and on the teaching of problem solving. Patrick also taught for two years in a rural secondary school in Kenya.