

## COMMENTARY

# Conceptions of Research and Methodology Learning: A commentary on the special issue

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This special issue on conceptions of research and methodology learning consists of five interesting studies. The studies have all been conducted carefully and are reported clearly. A very remarkable fact, noticed by several authors in this special issue, is the lack of any empirical research on students' conceptions of research and their learning of scientific research skills in the research literature. The one study that has been done, which several of the authors refer to, is that of Brew (2001). This lack of existing research underlines the relevance and originality of the studies reported in this special issue.

### Different Categories of Conceptions

In the contributions to this special issue a variety of conceptions of different groups of people have been studied: social and physical science students' conceptions of research, good research, and successful researchers (Meyer, Shanahan, and Laugksch); supervisors' conceptions of research, good research, a good researcher, and a good student researcher (Kiley & Mullins); research students' views and orientations toward qualitative and quantitative methods (Murtonen); nurse and medical students' conceptions of science (Pettersson). The researchers did not ask students directly about their conceptions of "learning about research", "good teaching about research", or "good supervising".

From all studies in the special issue several conceptions emerge about research and science. The different studies, however, yield different categorical systems of conceptions. The qualitative study of Meyer et al. resulted in the identification of eight categories of description: information gathering; discovering the truth; insightful exploration and discovery; analytical and systematic inquiry;

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incompleteness; re-examining existing knowledge; problem-based activity; a set of misconceptions. Their quantitative study yielded six categories, of which five were similar to those from their qualitative study: misconceptions; re-search; an insightful process; finding the truth; problem solution. The study of Kiley and Mullins resulted in two sets of categorical systems. One consists of four main categories: technical; creative/innovative; integrating complexity; new ways of seeing. The other categorical system has seven categories: systematic inquiry; a systematic process with a purpose; hypothesis testing; critical inquiry; discovery or production of new knowledge and understanding; contribution to the development of their discipline; academic scholarship. Murtonen identified two different orientations (positive and negative) towards qualitative and quantitative methods among students, which means that her study resulted in four categories of views or orientations. Petersson found five categories of medical and nurse students' conceptions of science: creation of new knowledge; development of society; the big scientist; the big progress; process. Finally, Lehti and Lehtinen's study was not directed primarily at the identification of conceptions of research or science, but more at establishing the power of new methods of teaching and learning about research methodology. All in all, the special issue has resulted in 33 categories of conceptions of research or science.

As a reader one wonders about possible relationships between these categories. It is hard to be satisfied with the fact that these studies all result in different categorical systems of the same phenomenon. In Table 1 a tentative attempt is made to depict some possible similarities and differences between the various categories of conceptions found in the different studies. In Table 1 those categories that seem related to each other are listed in the same horizontal row. Those conceptions that show up in many of the categorical systems are depicted at the top of the table, while further down the table those conceptions described in only one study are shown.

Several of the contributions refer to the pioneering work of Brew (2001) on conceptions of research: the domino, layer, trading, and journey conceptions. Kiley and Mullins outline similarities and differences between the categories they found and those found by Brew. For example, they state that their "integrating complexity" category relates closely to Brew's "layer" conception. Thus, one conclusion is that this new field of study still suffers from some conceptual confusion, as may be typical for many new fields of study.

### **The Stability and Changeability of Conceptions of Research and Science**

An issue that recurs in several contributions is the idea that conceptions are very stable and resistant to change. Although they may change in various ways during learning, the process of conceptual change is often considered as very slow. Murtonen concludes that "views on methods were quite stable during the course, although there were some changes". Petersson's study especially deals with this issue. She concludes that "The conceptions students hold at the start of their studies

Table 1. Conceptions identified in the various studies and tentative similarities and differences and similarities among these conceptions.

Article	Meyer et al. qualitative	Meyer et al. quantitative	Kiley & Mullins 1	Kiley & Mullins 2	Murtonen	Pettersson
Conceptions of	Research	Research	Research	Research	Research methods	Science
Similarities are marked on same row	Insightful exploration and discovery	Insightful process	New ways of seeing	Discovery or production of new knowledge and understanding		Creation of new knowledge
	Analytic and systematic inquiry		Technical	Systematic inquiry		Process
				Systematic process with a purpose		
	Re-examining existing knowledge	Re-search	Integrating complexity			
	Problem-based activity	Problem solution		Critical inquiry		
				Academic scholarship		Big scientist
				Contribution to development of discipline		Development of society
	Discovering the truth	Finding the truth				
	Set of mis-conceptions	Misconceptions				
	Information gathering					
	Incompleteness					
			Creative/innovative			
				Hypothesis testing		
					Negative towards quantitative methods	
					Negative towards qualitative methods	
				Positive towards quantitative methods		
				Positive towards qualitative methods		
					Big progress	

do not change over time, but become more highly developed and elaborated". This quote, however, suggests a certain conception of "change" held by the author. In my view, becoming more highly developed and elaborated points to change too, but this is evidently another kind of change than Petersson considers "essential". Other studies have shown that students' conceptions of various phenomena do change over time (see, for example, Marton, Dall'Alba, & Beaty, 1993). Thus, there is a need to be more precise about which developments are considered essential change and which are not, and why this is so.

Petersson's study suggests an important environmental factor influencing students' development of their conceptions of science. Her medical students referred to the fact that their teachers were all involved in some kind of research and, therefore, they were "surrounded by models of their future profession". In contrast, the teachers of the nursing students were employed as full-time teachers in the school, with no research engagement. "Nurses do not become scientists, doctors do", Petersson concisely concludes.

### **Qualitative Versus Quantitative Research**

An important issue mentioned by Murtonen and Lehtinen in their introductory essay is that the academic community itself has no uniform conception of research, for example because of the general controversy between quantitative and qualitative approaches. This division into methodological camps has hampered students' attempts to construct a coherent idea of research methodology. However, Meyer et al. demonstrate that quantitative and qualitative studies are by no means opposed research methods excluding each other, but that they can supplement each other. They combine the strong elements of the two research perspectives: a qualitative study on the nature of research students' conceptions of research, followed by generating items from students' utterances to make up an inventory for a larger scale quantitative study.

### **Differences Among Various Groups**

The studies were done with different subjects: Australian and South African postgraduate students, from a wide variety of social sciences and physical sciences (Meyer et al.); supervisors of research students (Kiley and Mullins); nursing and medical students (Petersson); US and Finnish students (Murtonen). Some interesting differences show up between these groups. For example, many more Finnish students turned out to have a negative orientation towards quantitative research methods than US students. Many more Finnish students reported experiencing difficulties in learning quantitative methods. Finnish students appreciated qualitative methods much more than did US students (Murtonen). Two interesting issues in this respect are in need of further study: the similarities and differences between conceptions of research identified with graduate research

students and those identified with researchers; and the relations between supervisors' and students' conceptions of research.

### **Relations Between Conceptions of Research and Epistemological Beliefs, Conceptions of Learning, Actual Approaches to Research, and Experienced Difficulties**

The examples of students verbatim responses in the contribution of Meyer et al. show that conceptions of research are closely connected to conceptions of knowledge and learning and to epistemology: beliefs about "truth" and "knowledge" (Perry, 1970), "information" and "understanding" (Säljö, 1988), and "new ways of seeing" (Marton et al., 1993). A remarkable fact reported by Murtonen is that the Finnish cluster groups with different views on research methods differed in their experienced difficulties in quantitative methods studies, but the US cluster groups did not. Although it is likely that, for example, students' conceptions of research affect their actual approaches to research, as Meyer et al. state, the studies in this special issue do not present any direct evidence on this matter.

### **Teaching and Supervision Strategies**

Kiley and Mullins' study identified supervisors' conceptions of good supervision strategies: dialogue; peer support groups; more formal, structured programmes; modelling; "getting rid" of unsuitable students. Lehti and Lehtinen's study addresses the issue of strategies for teaching students about research methods and statistics most directly. Their point of departure was that traditional research textbooks do not provide students with an understanding of the process of scientific inquiry, with an understanding of what scientists actually do. In their study they applied the didactic approach of problem-based learning, combined with realistic computer simulations, to the teaching and learning of research methodology. Students had to construct research designs, received feedback on the quality of their designs from both the computer and the teacher, and conducted statistical analyses using real data. Their study showed that this approach was much more powerful than two other methods of teaching experimental research methodology. Moreover, the differences concentrated on higher order skills (procedural knowledge and statistical knowledge, not on factual knowledge and practical design skills) and the differences in total achievement were large. Their study points to the importance of embedding the learning of research methodology and statistics into the whole research procedure.

### **Practical Implications**

There are several practical benefits to be expected from the kind of research reported in this special issue. As noted by Murtonen and Lehtinen in the introduction to this special issue, postgraduates and beginning researchers can be helped to understand

the different ways in which research can be conceptualized. The research can contribute to a better understanding and overcome adjustment problems, increase thesis completion rates, and inform the design of research methodology courses. An unacceptable percentage of students who enrol in research degrees fail to complete them. One possible cause, indicated by Kiley and Mullins, is that students' beliefs about research deviate from their supervisors' beliefs. The practical value of Lehti and Lehtinen's study is obvious and refers to improved methods for learning research methodology and statistics, something many students all over the world find very difficult.

A practical implication not mentioned by the authors has to do with the review process conducted by scientific journals. In light of the fact that researchers and academics may have very diverse views of what constitutes "good" research, an obvious implication would be that the editors of academic journals should place more emphasis on selecting those referees whose conceptions of good research coincide with their own. Current practices are more that referees are chosen based on their knowledge of the subject of a manuscript.

### **Further Research**

The authors raise questions for further research about issues that are similar to the issues raised in the general conceptions of learning literature: about identifying students at risk, disciplinary differences, relations to approaches to doing research, and cultural specificity (Kiley and Mullins). In my view, further research in this domain should also be directed at a more direct comparison between research students' conceptions of research and those of their supervisors and the effects of the distance between these two conceptions on Ph.D. students' progress and success. Another issue for further research is the relation between conceptions of research and actual approaches to research, for both students and supervisors. Moreover, attempts should be made to integrate the various categorical systems of conceptions identified in this special issue into a more unified whole. Finally, an interesting question connecting the different types of studies in this special issue is how new approaches to teaching and learning about research methodology, like those reported by Lehti and Lehtinen, affect students' conceptions of research and science.

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