DG 11: Quality and relevance of mathematics education research

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Introduction

The discussions concerning the quality and relevance of mathematics education research built on the work of similar discussion groups at ICME9 and ICME10. In accordance, the questions that were chosen as focal points in the call for participation were (1) What are appropriate criteria for quality and relevance, respectively, in mathematics education research? (2) How and by whom are such criteria established? (3) Are there potential conflicts between the pursuit of quality and the pursuit of relevance in such research? (4) How can criteria be established that pay due respect to the diversity of approaches and perspectives used in mathematics education research?

The co-chairs Ole Bjorkqvist (Finland) and Frank Lester (USA) served in the preparatory stages before the congress. Professor Lester was not able to attend ICME11, and was replaced by Lyn English (Australia) as co-chair during the congress itself. The discussion group attracted approximately 20 participants to each of the sessions. Gabriela Bundia (Mexico) and Guy Brousseau (France) provided planned presentations that addressed the issues, but except for those, the discussion group functioned purely as a discussion group as intended.

The contribution of Gabriela Bundia related her experience as president of the Red de Cimates (Research Centers in Mathematics Education Network, Mexico) and as an active member in Clame (Latin-American Committee of Mathematics Education). In both cases the policies of quality and relevance in mathematics education are internal ones rather than dependent on external associations – they are products of the agreements and the consensus of researchers in the area.

Guy Brousseau provided an example of the extravagant interpretations of the work that certain scientists make in order to influence opinion and promote an agenda about the teaching of mathematics. The preferred instruments of such texts are unwarranted inferences based on the naïve empiricist epistemologies of the populations to whom the interpretations are really addressed. They reaffirm the idea that categories like “concrete”, “abstract”, “generalisation” suffice for analysing mathematical knowledge and the teaching of it. This misleads the public and blocks other research routes that are more relevant and more useful. In many cases the conclusions do not even seem contestable. Who would doubt them? What exactly is being rejected?

The quality and relevance of research in mathematics education is thus highly dependent on the way it deals with important mathematical notions, that is, notions that carry with them their own questions and new concepts that are difficult to establish. The real educational question is to know in what conditions it is appropriate to use one or another approach as part of the continuous process of deepening students’ understanding of the concepts of mathematics and of its culture.

Quality versus values and expectations

The relationship between quality and values seems to have been the subject of rather little scrutiny so far. The extent to which the scientific quality of mathematics education research reflects values held by various stakeholders was the subject of the initial stages of the discussion in the group. If one limits oneself to the group of researchers themselves, quality criteria could possibly be seen as the result of a process that negotiates values towards some kind of

consensus. Explicit criteria also make it operationally possible to "evaluate" quality. There is no underlying assumption that such criteria are independent of place and time.

Extending the circle to include researchers that represent other fields, some criteria of quality may be shared, for example, research should concern new contributions to knowledge, research reports should be logically consistent, and they should include evidence of the validity of the claims. Specific kinds of research, for example, case studies, may, however, be valued differently in different fields of research. Research in mathematics education, which employs a multiplicity of methods and accepts notions from many disciplines, may thus be an arena for partly conflicting values. This contributes to difficulties in the process of establishing general criteria for quality.

It is sometimes more appropriate to consider expectations rather than values, particularly if one wants to emphasise special properties of the new contributions to knowledge, for example, utility, from the point of view of particular stakeholders. Sometimes the expectations are expressed in terms of scientific standards; in other cases they reflect the particular life circumstances of stakeholders who have few direct connections with research. The expectations have different characteristics in relation to different fields of research, research in mathematics education being justified (at least in the eyes of some) if it deals with problems that are widely acknowledged as important and if there are indications of progress.

Relevance

The recurring question of whether relevance is a quality criterion or a property on its own did not receive a clear answer in the group. If quality is viewed very broadly, and one accepts that individuals have their own perspectives of quality, there is of course no problem in accepting relevance (to a particular group of stakeholders) as a quality criterion (as seen by that group of stakeholders). However, the more important a consensus about quality is, the more justified it is to treat relevance as a property on its own, which takes on different shapes for various groups of stakeholders. Emphasising a distinction between theoretical and practical relevance fits the latter scheme.

It was also observed that relevance is closely connected to utility, or even a condition for the utility of research in mathematics education. In that sense relevance (if viewed as a quality criterion) is one of the first priorities, in comparison with secondary properties like generality versus specificity, or complexity versus simplicity.

Certain stakeholders, like teachers and educational decision-makers in society, are implementers of the results of research in mathematics education. For research to be accessible to them it needs to be reported in accessible ways. Furthermore it needs to take into explicit account some of the deepest concerns of those stakeholders. This may affect the conceptual framework of the research and has led to paradigms in which society is present in the research process in new ways. Thus increased attention to relevance has extended the limits of what is considered as research in mathematics education. In the opinion of some, it necessitates specific care about the presence of mathematics, so that research in mathematics education is not research in something else, with mathematics just a placeholder that could equally well have been substituted by another subject.

Other quality criteria

As has been previously observed (for example, in a corresponding discussion group at ICME10), some of the traditional quality criteria, like validity and reliability, are being transformed in view of new approaches to research (as well as changing values in society). This development was present in the discussions as part of the search for criteria that pay due respect to the diversity of approaches and perspectives used in mathematics education research.

One list of four such criteria was presented by Mogens Niss (Denmark). It involved the actual or potential impact of the research, the sustainability of the solutions to problems, the

depth of the investigation or analysis, and novelty. In addition, in view of the importance of the stakeholders outside the community of researchers, emphasis was laid on the need for the research to be trustworthy in a sense formulated by Frank Lester (USA).

The distinction between different kinds of quality criteria included the observation that some criteria are not monotone functions. For example, lack of originality and excessive originality are similar in their inconvenience. Those formal criteria are just indicators of questions. Drawing conclusions from them is an affair for the scientific community itself, as pointed out by Guy Brousseau. The intrusion of external interests, as in premature diffusion or immediate utilisation, cannot avoid diverging individual pieces of research from each other and works against the construction of systematic knowledge.

Quality and relevance of the field as a whole

Supplementing the discussion about the quality and relevance of individual pieces of research, quite a bit of time was devoted to a discussion of the situation with respect to the field as a whole. Some of the remarks were basically indications of worries about the situation, but in other cases there were suggestions about how to go forward.

Some serious concerns were expressed regarding the accumulation of systematic knowledge. Too often it seems that ideas are brought up as if they were new but in fact are hard to distinguish from similar ideas with other names. In cases were references are made to previous research there is too much name dropping and term dropping to show you belong to the "in crowd" rather than evidence of thorough familiarity with the research field. Partial remedies may include support for work that synthesises the field and stricter reviewing processes of journals.

As brought forward by Lyn English, there is a need for robust opportunities to argue and question publications in the field. Does the field have a quality control that is comparable to other fields of research? In some cases the internal quality control may suffer from established procedures that need to be altered.

Throughout the sessions quality and relevance were associated with the funding of research in mathematics education. Again, the expectations of particular stakeholders play a central role. If the field of research is identified as a priority it may obtain large funding, but that funding may be locked to particular goals that are likely to differ from the long-term goals of the community of the researchers themselves. This delays the build-up of a body of systematic knowledge and influences the application of criteria for quality and relevance at least somewhat in the direction of those of the funding agencies.