

Innovating Roles in Mathematics and Research

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Abstract

A methodological insider approach enabled to view teacher education from the students' perspectives, by focusing how discursive power-relations affected what becoming mathematics teachers brought forward as concerning during education. I took a socio-political theoretical perspective and understood discourse, power and positioning as dynamically interrelated concepts, which allowed the analysis to foreground several aspects simultaneously and to illustrate elusive phenomena as they occurred and disappeared. The results show that the mathematics education and mathematics discourses are open and multifaceted and reveal empowered positionings, whereas the language/culture and institutional discourses both are narrower and more constraining.

Keywords: *Role of Mathematics education, positioning, power, socio-political research in Mathematics.*

Introduction

Education is sometimes perceived as a sector which is resistant to change, while at the same time it faces a crisis of productivity and efficiency. Innovation could help improve the quality of education, as well as provide more “bang for the buck” in times of budget pressures and rising demand. In this paper, considers what is meant by innovation in the context of the education sector, and how best it can be measured. Education is more innovative in some ways than other sectors and that there has been innovation across all countries, particularly in teaching methods. It considers what skills are needed to encourage innovation more widely in the economy and whether schools and universities are helping students develop those skills. Finally, it looks at national and international strategies covering innovation in education and beyond. The

core of education, that is mathematics and mathematics education, may therefore be obscured by discourses of “truths”. The study shows a need for further research on how to strengthen students possibilities to influence their education, and to ask questions like why education is organized this way, and who benefits from that.

Innovation in education: why and what

This defines innovation as “the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations” Innovation in education is a highly contentious issue. Education is sometimes perceived as one of the most conservative social systems and public policy fields. But talking to teachers gives one the opposite idea – that there are too many changes imposed on them without much consultation or the necessary preconditions for successfully implementing change. In some countries, innovative change has been implemented without the care and diligence needed or the appropriate prior testing, experimentation and evaluation. This controversy should not deter us from looking to the facts. And the facts clearly demonstrate that education systems are running up against very serious problems which, if left untouched, could result in serious risks not only for education itself but also for future economic growth, social progress and well-being. Since the mid-20th century, education systems have expanded enormously and human populations have never been more highly educated than today. The problem education is facing is mainly one of productivity and efficiency. Here, efficiency means the balance between resources invested and the outcomes in terms of students’ performance and equity. The problem of productivity and efficiency in education is even more striking when education is compared with other public policy sectors, which have realised enormous productivity gains in past decades. In sectors such as health, technology has been a major driver of increased productivity and efficiency with much improved outcomes even if the cost has also gone up. Many observers wonder why enormous advances in technology has not yet led to similar improvements in education. Governments have invested a lot in bringing technology, mainly information and communications technology (ICT), to schools.

Aim of the study

The overall aim of this study is to explore and understand what characterizes becoming mathematics teachers' concerns regarding mathematics and mathematics education. This understanding can give insights in possibilities and constraints that are discursively produced in educational contexts. Understanding concerns here means, trying to understand what lies behind the students' worries, what they care about, fears they have, what touches them and matters in contexts related to the educational program. The aim of understanding involves interpretations of what is said and done, that is, what is expressed, how it is expressed, and why; through talk and actions in social settings. Mathematics teacher education is not seen as a single trajectory through which all students end up as fully skilled teachers, having the same experiences, competences and goals. Rather, it has been important for me to assume that each student experience his/her education individually, and to talk about their education from their perspective. Thus, all their stories became important for understanding student teachers' concerns, and from a rich ethnographic data construct I strived for creating an account of thick descriptions. I have chosen larger pieces of transcripts when presenting the results and I have also chosen to use transcripts and field notes in other parts in the paper. Through the whole study it was important to keep the positive spirit of searching for opportunities. I believe that every student has the power to challenge and to overcome difficulties. I also believe that power expressed by them who are involved is necessary to take into account and to learn from. Therefore, from the basis of what the students chose to talk about and how they chose to act in different contexts, I aim at foregrounding possibilities for development and opportunities to learn even though difficulties and challenges sometimes will be used as stepping-stones to articulate this.

Effective skills strategies:Innovation rests on people with the knowledge and skills to generate new ideas and technologies, bring them to the market, and implement them in the workplace, and who are able to adapt to structural changes across society. But two out of three workers do not have the skills to succeed in a technology-rich environment. A broad and inclusive education and skills strategy is therefore essential.

Participation in the digital economy:Digital technologies offer a large potential for innovation, growth and greater well-being. However, policy action is needed to preserve the open Internet, address privacy and security concerns, and ensure access and competition. Digitally enabled

innovation requires investment in new infrastructure such as broadband, but also in ensuring there will be enough spectrum and Internet addresses for the future.

New demands of work and workplaces: 21st century workplaces demand in-depth knowledge of subject matters required for specialized work such as engineering, medicine, plumbing, teaching, etc. Curricula that prepare people for the 21st century workplace need to ensure high mastery of subject matters that are foundations for diverse specializations. However, technical specialization is necessary but not sufficient for success at work and in the 21st century workplaces. Specialists also need soft skills, or 21st century skills like creativity, communication, collaboration, critical thinking, problem solving, ethics, positive attitudes, technology savvy, etc., to round up their technical knowledge into effective competences. Thanks to technological advancements, teachers and learners can more easily create and share their own content. Technology is also easing direct learner access to knowledge and information. and teachers as providers of knowledge and information. Teachers are progressively recognized as learners, and learners as teachers, both engaged in collaborative teaching and learning.

The Notions and Roles of Theory in Mathematics Education Research

Notions and concepts of theory play key roles in mathematics education research, as they do in any scholarly or scientific discipline. On closer inspection, the notion, concept, and nature of what is termed “theory” in such research are very varied indeed, as are the roles, uses and implications of theories employed in mathematics education research.

Before I brought in any theoretical concepts I framed the scope of the study as focusing the students’ concerns. That is: how they expressed their worries, what they found important for themselves and others as well as challenging and demanding; and what they talked about as their strengths and benefits. The departure point of this study hence developed from a wish to understand what becoming mathematics teachers chose to talk about with regard to their education, how they chose to express themselves and why they chose to articulate themselves the way they did. Through the whole study one goal was to curiously listen to the stories I was told and to give the stories enough space when writing up the results, since the students judged them as important to tell.

Approaching a theoretical perspective

Despite the challenging task to find theoretical tools and concepts this process helped me to understand which possibilities and constraints different theoretical frameworks could offer. In addition it helped me to refine research questions and concepts; in order to make clear wherein the field of mathematics education research this study could be framed.

Research focus on and within mathematics teacher education research

Researchers take on different theoretical and methodological approaches in studies on and within mathematics teacher education to facilitate our understanding of possibilities and constraints for becoming mathematics teachers. The overview focuses on research questions and methodologies for conducting research on and within mathematics teacher education. From the overview they point at differences between countries regarding group sizes and diversity in socio-economic conditions within which student teachers become prepared for their future profession. This implies that becoming mathematics teachers all over the world are offered essentially different resources as teacher-learners. Another troublesome issue in teacher education internationally is the diversity in the students' mathematical history. In many countries, student teachers are expected to teach mathematics they have not learnt, or have weak knowledge. The efforts of comparing mathematics teacher education on the basis of worldwide research can be discussed as social, cultural and political factors that constitutes the education may differ significantly even in comparison between neighbouring countries. However, there are also similarities in culture and educational systems, and mathematics is taught and learnt all over the world, so there might be examples from which we can learn in order to develop our national programmes. I observed that, methodologically, the field is dominated by studies conducted in English speaking countries. They also showed that mathematics teacher education research often build on small-scale studies presented from a teacher educator's perspective, whose informants are his/her own students reporting from short term development activities. However, they argue that these approaches are not contradictory, since qualities are to be found in both small-, and large-scale studies.

Conclusion

In conclusion, in repositioning guidance and counseling and curriculum innovation in higher education, professional counselors should ensure that students in Higher education have the sense of industry, competence, planning, entrepreneurship education, innovative skills and an enabling environment which will make them have the right type of education which encompasses everything that will make them independent and even employ others and not always rely on the government white collar jobs. This indicates that education should be repositioned to be more of practical than theory in both informal and non formal education and so, in order to provide. The researcher opines that the teaching and learning process (methodology of teaching and learning), the content of what is to be taught and the overall educational delivery system should be improved in order to produce adequate and effective 21st century workforce geared towards national development.

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