LOW ACHIEVEMENT AS A PROBLÉMATIQUE IN MATHEMATICS EDUCATION

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Low achievement in mathematics is a major challenge to mathematics education in the European Union. Although it is a complex phenomenon, it is often reduced to deficiency models of students’ competencies. With a notion taken from French research low achievement in mathematics is perceived as a social problem field, une problématique sociale, in this theoretical paper. A stance will be taken in dynamic systems theory. Consequences both for research and developmental work will be discussed.

INTRODUCTION

Low achievement in mathematics is a major challenge to mathematics education in Europe (Eurydice 2011). The issue is not only a question of efficient education, but concerns the need to create an equitable education system. In 2010 the European council adopted the policy Europe 2020: Strategy for smart and sustainable growth. One of the five main strategic areas is to reduce the number of students leaving school prematurely in the EU by 2020. Prematurely, in this context, means not completing upper secondary education. In Sweden the proportion of students not completing their education in three years is around 30% (Skolverket 2011-12-20). Students from low social-economic and students with immigrant backgrounds are strongly overrepresented in this group.

Mathematics functions as a critical filter for students. Success in mathematics is often a key to success in the whole education. Failing it therefore often has greater and more far-reaching consequences than failing in another subject. In this respect mathematics education is a system indicator. Problems or deficiencies in the education system often emerge as difficulties or problems in the mathematics classroom.

In this theoretical paper low achievement in mathematics education will be perceived as a social problem field. Taking its stance from dynamic systems theory consequences both for theory and education practice will be discussed on different levels of system. Deficiency models of low achievement will be challenged.

With the aim, not only within the European Union, but also in many other countries, to raise the educational level of citizens accentuate the problems related to this social problem field. Previously, school and education was associated with childhood and adolescence. Now lifelong learning is an approach that forms the basis of the educational system in most countries. More and more young people shall go longer
in school, working adults should undergo periodic retraining and updating and unemployed will sometimes supplement previous training.

Results from international surveys and research support the fact that low achievement is a complex phenomenon. In the traditional educational discourse, it is common to reduce the problem of low achievement in mathematics to a question regarding the student’s ability to learn a given mathematical content, i.e. a relationship between the student and mathematics. Many educational approaches are based on deficiency models of students’ competencies. The focus is either on the student’s lack of cognitive, psychological, or social conditions for learning mathematics or mathematics as a particularly demanding subject with its alleged hierarchical structure. Evaluations of the National Agency (Skolverket, 2009) indicate that students’ achievements also are greatly influenced by structural factors.

Low achievement is mainly due to social and economic disadvantages, but findings also shows that many students make a satisfactory start in primary school and fall behind later (Cassen & Kingdon, 2007) stress the importance to improve mathematics education in secondary schools.

Not all students from low socio-economic background fail in school. We also know that schools do make a difference to outcomes. But there could be a considerable variation among schools. Some schools with high proportions of disadvantaged students do much better than others, as stressed by Cassen & Kingdon, 2007). Low achievement will not disappear, but it the proportion of the lowest achieving students can be reduced.

**Lower end of a continuum**

Low achievement in mathematics may well be described and perceived as the lower end of a continuum (normal variation), as well as deviation from the normal. This division has its counterpart in the terms Learning Difficulties (LD) and Mathematics Learning Disabilities (MLD) proposed by amongst others Berch and Mazzocco (2007). This is also in accordance with Eurydice (2011). There is a strong empirical support (see eg. Dowker, 1995) that for the vast majority of the students with low achievement falls within a normal variation. A small percentage of students can be said to have specific difficulties, in the sense that their low achievement has a biological basis. In U.S. the diagnostic manual DSM-IV estimated prevalence of approximately 1 %. Magne Gothenburg Studies (Magne, 1958) in the 1950’s estimated no more than 3 per thousand. In the Middletown Studies (Engström & Magne, 2003, 2006, 2008) which involved around 6,000 students in the comprehensive Swedish school the prevalence were estimated of no more than a half percent.

As proposed in Berch and Mazzocco (2009) MLD can be seen as a biological based, behavioural defined condition for which currently no consensus definition exists. There are no tests that can objectively determine such a deviation. As a consequence
there is lack of consensus on the existence of possible subgroups, prevention and intervention efforts. Low achievement will here mainly be discussed in the latter sense as LD.

A problématique sociale

In this paper a deficiency model of low achievement is challenged. Instead low achievement will be regarded as a problématique, a notion taken from French research in mathematics education (Balacheff, 1990). A problématique is set of research questions related to a theoretical framework. As will be shown this problématique can be seen as social in its nature, therefore I will use define it as une problématique sociale.

In the Middletown Studies (Engström & Magne, 2003, 2006, 2008) a systemic theory approach to low achievement in mathematics was proposed, where symptoms in different parts of the system are the result of an interplay between three factors: mathematics, the student and the environment. It implies that in special needs education one should try to avoid any reductionism and instead pay attention to the intricate interaction between these parts.

Concepts and notions from complexity sciences will be used to understand mathematics education as a learning system. Schools and education are mainly social systems sharing the properties of self-organizing systems. We will challenge linear and casual relationships on teaching and learning mathematics where no are.

To address low achievement

In order to reduce the proportion of low achievers in mathematics a combined approach that simultaneously target a range of both in and out of school factors (Eurydice, 2011) are needed. Curriculum content and organisation, classroom practices, teacher education, as well as environmental factors such as students’ socio-economic background, the educational level of the parents, the language spoken at home must be taken into consideration. Different measures for a comprehensive approach are according to Eurydice needed as:

- Responding to the diverse needs of learners.
- Emphasising the relevance of mathematics.
- Early interventions at primary level.
- Focusing on individual weaknesses.
- Motivational factors.
- Increasing parental involvement.
- Links to literacy problems (Eurydice 2011).
Conclusions

Consequences both for research and educational practice will be drawn from on a theoretical framework based on systems theory in education.

References


