Mathematics in agriculture and vocational education for agricultures

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This paper presents some of the results from a research study about mathematics in agriculture and agricultural education. The purpose of the study is to investigate the role of mathematics as a professional knowledge, and how to organize vocational secondary school education so that students receive the math knowledge and skills they need for their future profession. The study is done from a curricula theoretical perspective with concepts from Bernstein (2000). The results indicate that mathematical skills are essential for a professional farmer, but according to those interviewed, many agricultural students have deficient mathematical skills for their future profession after their education.

Keywords: Mathematics, workplace, agriculture, vocational education, Bernstein.

INTRODUCTION

In Sweden it has in recent years been pointed out from various professions that vocational students do not have the desired or adequate mathematical skills for the professional life after their education. Based on that I found it interesting to study the reasons for vocational students to learn math, which math skills the professionals deem most important, how this is reflected in the school's math education and also how the students' mathematical knowledge affects their future career possibilities within their profession.

THEORETICAL FRAMEWORK

The study is done from a curricula theoretical perspective with concepts from Bernstein (2000). Bernstein's pedagogical codes, classification and framing and his theory of discourses is used to analyse how the curriculum is realized in mathematics education and how this may affect students' professional career.

METHOD

To answer the questions, I have in the winter of 2012 and the spring of 2013, done interviews with 15 professional farmers, 13 vocational teachers in agriculture, 11 mathematical teachers who teach agriculture students and 40 secondary vocational agriculture students. The students are interviewed in focus groups. The teachers and students come from eight different schools with vocational education in Sweden.

RESULTS

The results indicate that mathematics is an essential professional skill for farmers because they use mathematics all the time. Farming profession is today very advanced and as a farmer you do not only have use of practical skills. The farmers that I interviewed gave examples of 54 different job tasks that require skills of mathematics. Many of the farmers also said they do not want to hire someone who doesn´t have sufficient skills of mathematics since miscalculations can mean costly mistakes. The farmers claimed that they did not need any advanced skills but that they must have very good basic mathematical knowledge, since there is often advanced applications of the mathematics (cf. Fooreman & Steen, 1995). It is mainly the areas of percent, geometry and statistics that farmers need to have knowledge about. Farmers must also be very good at mental calculation, rough calculation and plausibility assessments.

The interviews revealed that many students did not really seem to understand the importance of learning mathematics and they claimed it to be boring. Students' lack of motivation to learn mathematics results in deficient mathematical skills to handle the calculations appearing in the profession. Lack of mathematical skills also results in that many students do not pass the professional certificates available in

agriculture. To learn the required mathematics of the farming profession, many of those that were interviewed advocated that mathematics- and vocational classes should be largely integrated, and that even the professional farmers should be responsible for teaching mathematics. Students working with an integrated mathematics education say that it gives them more motivation, they learn better, and understand and remember more, when it's related to their reality. Using concepts from Bernstein, an integrated code was requested with a more a context-bound and horizontally organized mathematics teaching. But most of the schools in the study has what Bernstein calls a strong classification, where the school mathematics is clearly separated from other subjects and from work outside of school. At these schools the teachers have no or little cooperation with each other. Hierarchies and power relations described by Bernstein between different categories of teachers, were found to be prevalent. In order to enable an integrated code both the teachers and the school management must agree. An easy way to create a collaboration between vocational- and mathematics teachers, and thereby increase an integrated mathematics education, seemed to be to let these categories of teachers have a shared office space.

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