

Can skills acquired by learning mathematics be used in learning other topics?

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Introduction

An important item in education in past years has been the transfer of skills. Experiences and research showed (Kessels, 1996) that it is very difficult to organize the transfer of skills acquired in a course, to every-day practice (social activities, school and work).

In recent discussions on this subject in the Netherlands a distinction between more general skills and more specific skills has been made. We wonder how teachers and developers think about the relation between these two kinds of skills.

General key-skills and mathematical skills

As mentioned above, there is a distinction between general skills and specific, subject-tied skills. General skills (also mentioned as key-skills) are supposed to be of a higher order than the specific skills. Key-skills are the general skills used in organizing work or learning-activities. In society these skills are identified as the skills which everyone should have mastered in education and/or vocational training.

Remarks like: "The children don't learn reading and writing anymore" are based on the misconception that the ability to do activities, enable the performer to use this skill in the right place and the right time. As we all know, this is often not the case.

Using a skill in a proper way, in the right way and on the right time is a lot more difficult than just doing the skill.

The skills that are used to make other skills happen, are these hard to manage key-skills. Many key-skills are used in organizing learning: orientation, planning, reflection, reviewing and so on are categorized as key-skills. A problem with these skills is that they are often bound to the content of the task. The nature of the used activities invite and sometimes urge the worker to use a set of key-skills to perform the skills necessary for the job on hand. For example: in the case of the redressing of a wall with wallpaper, one must be able to compare, measure and fit. The problem invites you to do so as well. This example is classic in the way one learns other, more general skills by doing a limited task. Other key-skills are less bound to tasks. They are used during work and study: use of information-sources, interpretation of the information, the ability of working together, and so on.

Until now, there is no particular set of key-skills described. In the discussions on this subject it is very hard to make a distinction between acquired skills on a practical level and the skills on higher levels, e.g. the meta-cognitive skills. The skills on the higher

levels seem always in-separately attached to activities. There may be need of a different language to describe these skills and the relations to one other and to the practice.

In Realistic Mathematics Education a lot of the so called key-skills are practiced. We like to mention those skills mathematical skills, in the sense that learning to reflect on your solution and your practice, to interact on used ways to reach a solution (and so on), are viewed as essential to the mathematical practice and attitude. During mathematical practice it seems that key-skills are practiced and in that way, learned. But is this learning deliberate and conscious? Or is there no need for planned learning of these skills, because by doing mathematics you learn these skills?

At this point the transfer of skills from one field of activities to another is of importance. In this case: the transfer of key-skills to mathematics and vice versa. What do we have to do as a teacher or developer of math education, to ensure – if possible and/or desirable – the transfer happens?

It is clear that there is an overlap in key-skills and mathematical skills. In education there is an important distinction in the use the higher-level-skills: in mathematics you learn these to do mathematics, and in other education you do activities to learn the key-skills.

An illustration

An illustration of this difference is a short course for illiterate immigrant women in designing clothes. The course has three general principles:

- respect for the own body: the women's own bodies are used as the basis for designing;
- emancipation: the women are supposed to become less dependent;
- learning Dutch as a second language: talking about the clothes makes learning happen.

In designing the patterns a lot of geometry is used:

- symmetry;
- spatial orientation;
- direction;
- and talking in terms of geometry.

The general approach in designing is: use a large paper to make a paper pattern for the garment, draw the pattern on the textile, and make the garment.

Each task is made of successive actions: folding paper, measuring of the body, fitting etc.

In this course key-skills are learned by doing and talking.

Everybody will agree that it is a basic knowledge to know right and left, a basic skill to be able to draw a line on a paper, to be able to use measurement tools, directing etc.

Many key-skills in this course are also identifiable as mathematical skills, although to an non-mathematical outsider the course may seem to have nothing to do with mathematics.

The question raised, was: is this course an example of educating transfer of key-skills? We could not give a conclusive answer to this question.

The main reason for this was the difficulty of a follow-up of the course: what activities can we do so that the key-skills learned in this course are repeated and made more explicit in other activities?

The ALM-workshop

The goal of this workshop was to start a discussion on the relation between general key-skills and mathematical skills: how does the ability in using one influence the use of the other? And: how can we as teachers and designers use this mutual influence in teaching mathematics? Or is mathematics just using common sense?

After a paper skirt was made, the participants were asked to use a scheme to describe their actions and the skills needed: in which action do you use a general skill, and in which action do you use a mathematical skill?

The groups discussed a short time. After that, each group reported.

First was mentioned, that it is very difficult to make a distinction between the general skills and the mathematical skills, used in this task. Some groups had difficulties to describe the skills used. The discussion led to other topics than planned: what is the nature of a general key-skill, what is a mathematical skill?

Due to the limited time, this discussion was not concluded.

Reflection on the workshop

Although the goals of the workshop were not reached, the workshop as a whole was satisfactory. During the activities the participants discussed about what they were doing, what mathematics was involved, etc. In the discussion afterwards, some refreshing and surprising points of view were presented.

More questions on the relation between general key-skills and mathematical skills were raised than answered.

Literature:

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