Technology Education in Primary Education in the Netherlands: How Do We Realise This?

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Everyone in every place has to deal with technology. Technology is part of daily life. If education tries to teach pupils and students how to live in a modern society, then it has to teach pupils and students to deal with technology. So it has to be a part of compulsory education, also of primary education. In my presentation at the PATT- 7 conference in Breukelen, last year april, I presented the results of a short questionary I had asked teachers in primary schools. The general conclusion was that all the teachers liked to give technology education a greater place in their lessons, but they didn't know how to do it.

I. Publication of an Action Plan

In 1993 the Netherlands government published an action plan to give technology a place in Dutch primary schools. The actions should result in implementation of technology education in primary schools.

In the Netherlands the primary school curriculum is overloaded. Therefore the choice has been made to integrate technology in existing subjects, especially in the subjects science (in Dutch: 'natuur' = in German 'Natur' like in 'Naturwissenschaften', in Dutch 'natuurwetenschappen') and in craft. (The outcomes of the questionary pointed in the same direction. Dutch teachers made a choice for implementation in craft and nature education.) The plan also gives a description of the possibilities of technology activities out of school, in clubs, museums and so called 'discovery places'.

II. Three lines to get more technology in and around primary education

In order to try to get more attention towards technology in primary education, three main lines have been described along which the stimulation of technology education must take place. These lines are:

a. to develop methods and material,
b. to react on action that takes place around the primary schools,
c. to teach the new teachers.

Let us have a closer look at these lines:

II a. To Develop Methods and Materials

The National Institute for Curriculum Development (the SLO) was asked to develop a curriculum, in which technology was incorporated in the present school curriculum. It must be incorporated in existing subjects, because the school program is overloaded. If technology gets a real chance, then it must not be a new part of the school curriculum.

Other support institutes were asked to develop lessons as part of this integrated curriculum, so it could be easy for the Netherlands teachers to implement technology education in their own program.

II b. To React on Action That Takes Place Around the Primary Schools

Outside the school there are a lot of possibilities to practice technology. You can think about training centers in firms, technology clubs and museums. There are more possibilities that schools can use. That is why this kind of projects is supported financially, so schools can participate in networks, which give technology a greater chance in schools.

II c. To Teach the New Teachers

If technology is a part of the training of new teachers, then the new teachers should come into the schools with knowledge about technology and technology education.

That makes an acceptance of technology education in schools more easier. At this moment 8 schools for teacher training have already plans for developing new lessons and materials which can be used in teacher education, but also in primary schools. The government also gives the teacher training colleges a substantial amount of money to equip a technology classroom, where future teachers and primary school classes can visit and play with technology.

III. Philosophy of the Steering Group

The action plan on technology had a great response in the Netherlands. Both schools and teacher education institutes made clear that they would support this plan. To realise and to coordinate this plan a committee was formed under the name Steering group for technology in primary education. This committee that will exist for 5 years, described what they will use as the working definition of technology education[1].

III a. Working Definition of Technology

Technology is a field of human activities, based on collections; knowledge and skills, by wich humans provide themselves with the means to adapt the environment to their needs, both in their own interest and in the interest of the group.

In technology and in primary technology education there are 5 aspects, which are very important:

1. The process of technology is central. It must be clear that technology is developing, making and using of materials. It is not about the products but about the process of developing these products.
2. The knowledge of technical principals. We must teach the pupils about the technical principles like movement, information etc.
3. Technology has a historical component. Technology is a part of human activities with a history and a future.
4. Technology and society. Technology has changed the lifes of the pupils and pupils must get a positive attitude towards technology. Technology has an impact on how society is organized. It infuences profoundly the life of pupils. They must learn to be aware of this influence and develop a critical attitude towards benefits and risks of technology.
5. Materials, energy and information. Recently the accent in technology was

shifted from material technology towards energy-technology and information-technology.

IV. Projects of the Steering Group

The main activity was to start a project that would give a lot of schools (1500 from the 8000 schools for primary education) course material and equipment. There were 15 projects chosen to be presented to the schools. The schools could make their choice and in January 1996 they received the material and the lessons.

Before I come to a description of a project, lets have a look at **the aim of the project**:

Teachers and pupils get acquainted with technology and have experiments in all the age groups. The experience they have, must give a positive impression to the teachers and their pupils, so they will look to other possibilities of technology education.

The project consists of four stages:

Stage 1: Between January and September 1995.
The Steering group selected the projects to be presented to the schools. Publicity was made and the support services for school were asked if they would help the evaluation.

Stage 2: Between September and December 1995.
The projects are presented to the schools in a small booklet and schools make their choices. When all the choices are made, the Steering group divides the projects among the schools and let the schools know what project they can expect. The school-support services receive all the material, so they can make preparations for the advice and the evaluation.

Stage 3: Between January and May 1996.
This is the most important stage. In this stage all the selected schools get their projects and now it is time to get experienced in technology education. The teachers and the pupils deal with the project in the school, make experiments and learn to know about technology education in the classroom.

Stage 4: Between May and September 1996.
In this stage the evaluation will take place. At the moment of writing of this paper, the Steering Group just presented their first proposal of the evaluation. It was their

idea to hold interviews with all the schools that worked with the projects.

The school-support services disagreed with this way of evaluation. Although they agree with the Steering Group that this is the best way of evaluation, this was not the way they would do it. It costs a lot of time for the services as well as to the schools and yet it is not clear what will happen with the outcome of the interviews. So they told the Steering Group that an evaluation on paper is the one they would prefer. At this moment (March 1996) it is not clear in what way the evaluation will take place.

V. What Makes a Technology Project a School Technology Project?

You can take a technology project at will, but then you are not sure the project will fit in the classroom and teacher and pupils enjoy experimenting with it, although the project in itself is a good project. So the Steering group made up their minds and wrote down 7 points of selection, before a project was to presented to schools. Here are the points:

1. It has to be usable in normal classes, without any changes, extra material etc.
2. The project must be developed for a special age group.
3. It must be have been used in classes before.
4. It must not be necessary to get extra provisions in schools, before working with the project.
5. It is not necessary for the teacher to get some extra education, before working with the project.
6. It must have a relation with the curriculum the National Institute for Curriculum Development has developed, as I
7. mentioned earlier.
8. The project asks about 10 to15 hours of education.

As you see, the Steering group tries to find projects, that are very easy to work with in schools. The philosophy behind all this is, when you give teachers and pupils some projects that are easy to deal with, they might get some enthusiasm about technology education and try to find more projects for their schools, and that was the main part of the aim of the project as I described earlier.

VI. Projects for Schools

Now I will describe three projects, presented to schools and chosen by schools:

VI a. A Small Course of Electronics

This project consists of a box in which all the elements are brought together. You find in the box: batteries, lamps, wires, diodes, LED's, resistances, potential meters, transistors, a hammer, a screw driver and a cutter. Beside this "electronic material" you find in the box two workbooks for the children, some books for their teachers, so they know what to do and what they will need. When the children are working with the books they will learn about:

how to make an electronic circuit with a lamp;
the effect of a resistance on the lamplight;
the effect of a potential meter on the lamplight;
making a light dimmer;
the effect of a diode on an electronic circuit;
the effect of an transistor on an electronic circuit;
building an electronic hygrometer;

The project was tested on age groups 10–12 year old girls. Working with this project gives a great pleasure, to the pupils and to the teacher. You can start immediately with the lessons and most of the experiments worked very well. The workbooks were very clear so the children could work in small groups, having fun and learning technology. I think this is a good project to get experienced in technology lessons.

VI b. Time for Technology

This project, a TECHNON publication, consists of a series of 10 technology lessons for young children, student texts, a teachers guide and a box with materials.

For many of the lessons only simple materials have to be present:
paper, glue, straws, wooden sticks.
Some titles of lessons are:

how to make a gift box,
how to make a paper monster,

a tower, made of straws,
a chair,
how to design and build a house,
how to design and make a traffic light.

The lessons have been tried out with 7–10 year old pupils. The gift box, the monster, the tower work well. The construction lessons sometimes fail because of little experience of the teachers themselves.

VI c. Steam and Steam Machines

This project consists of a series of six lessons which teach children about steam and the use of steam power in machines and technology. All the lessons follow the same schema. First is a short introduction and then the children have to do some experiments. You do the lessons in little groups or as an individual. Within the project the school gets a steam machine, a book for the teacher and a book for the pupils. With the steam machine the school gets two on steam working models of a grindstone and a circular saw.

I also tried this project out in my classroom. My experience was that the experiments were too difficult for the children, not because of what they had to do, but because of the danger. Children must use fire to make steam and to make the machine work and to get the boot moving on to the water. There was a great disappointment about the working models. When the first group and their teacher had made the steam machine working and the saw moving on, we tried to saw a Lucifer. It did not work. Even a piece of paper couldn't be sliced. Because the project about electronics was a great success, we were disappointed.

VI d. Other Projects

In this way I could describe all the 16 projects of the Steering group. You must see the projects and have a critical look at them. So I am very glad that you can see a few projects at this conference, because the publishers of the projects send them with me to show them to you. Some publishers sent me the complete project, others only send me the books for children and their teacher, but that gives you an idea as well. So you can have a look to the following projects:

1. A course of electronics
2. Batteries and lamps
3. Experiments for age groups 6 to 9
4. Time for technology
5. Lego doctor for age group 5 to 7 year
6. Steam and steam power
7. Technology with Capsela
8. Play with electricity
9. Robotica

Notes

1. We refer to the publications of Raat and de Vries *'What is technology?'* with the 5 characteristics of technology, in the Reports of PATT-1 conference 'What do girls and boys think of technology?' (Eindhoven, 1986) and of later PATT-conferences.