

Play as a pedagogical tool in the subject Technology and Design

**A project at the University College
Stord/Haugesund.**

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Abstrakt

Technology and Design (TD) is becoming a new subject in the Norwegian school. Teacher students can qualify for teaching this subject at Stord University College.

How can play be used as a pedagogical tool for teacher students in TD?

Playing with materials is a source of knowledge in TD. We used wasted equipment such as coffee machines, vacuum cleaners and radios, and the task we gave to the students was to find parts they could use in new technical constructions. Many interesting components were found, and the students' fantasy was stimulated. They could play with different components, thoughts and possibilities of new constructions.

As result, the student made written/pictured documents of their play with materials and the researchers sum up the total results, concluding that this playful method gave many creative solutions.

Consequences: Construction play is an important activity, not only for children, but also for teacher training in TD.

Background

The interest for technology and science related subjects are decreasing in Norway. It is believed that among others the dry and theoretical approaches to the items are keeping students away. As an attempt to compensate the trend, Technology and Design is becoming a new subject in the Norwegian school. Stord University College has at their side started a course in TD in order to educate teachers with competence to teach TD in the school. We want the students to be able to use play as an entrance to the subject, and hope this will take away some barriers in the children's and the students' minds. This is done by making toys like water jet rockets, small cars with electrical engine, sailing boats, small dams and hydro electrical power plants. We are continuous looking for new play inspired working methods. The projects we want to present in this paper was created a year ago, and tried out for the first time in the beginning of December. At that time they had already had a course in electronics, and some students took advantage of that.

Research problems

1. How to make a description and interpretation of construction play in Technology and Design at Stord University College?
2. Theory development for TD in relation to new empirical research
3. What TD Production by adult students gives them best background for teaching in primary and secondary school.

Methods

Naturalistic observation in own TD classes over one year, and shorter actions in classes in the secondary school. Logs around, and photos of TD production.

Interview with students

Student reports of TD productions

Students try out in school and make reports.

The idea behind the project

- Our assumption is that students use the same teaching method when they get out in school as they have experienced as students

- Often students are given a problem, an idea, something they want to create. We develop the form and function, look for the parts and tools and start to make the thing. In this project, however, we would like to change the order in this standard work method. By start with some random parts, the fantasy and creativity can get some impulses. The parts they have in front of them can give associations to mechanisms they else would not have offered a thought. The good idea can be developed out from a small part or a complete mechanism like for example an electric engine with tooth wheals, a fan, or a pump. When they have decided what to do, the students may need other parts and have to look among the waste to find the rest. It is just like some music composers who tune the strings on the guitar in a new way, and suddenly they get new sounds which may give a start point for their music.
- This working method spread activity over many subjects. To be a good teacher, it is important to have many ideas when you are planning and running the lections. Some ideas you make up all by your self, but usually it is variations of what you have seen and done earlier. When the Design and Technology group are spread out on several different activities, the students also get advantages of seeing what the others are doing.
- Get cheap parts. How to get all the parts you need is usually a tough economical question. When you explore wasted equipment you can find expensive parts for free. I remember as a child how I always was prevented in my projects by leak of parts or tools. If children experience this way to find useful parts, they may do this by them selves at home, and continue their constructional play there. It is important that children knows the difference between wasted and stored equipment though.
- Challenge their knowledge. It is a question if this activity is reserved teachers with big technical knowledge. What is a ball bearing? What does a transformer do? Is this an engine which can be used with DC power? The students will learn a lot by looking into technical equipment if they have someone to ask.

How we practically carried out the project

- Take the wasted parts from the recycling bin
- Spread it out on the tables
- Let the students choose objects. Two and two students worked together
- Tear the objects into parts using screwdrivers, saw, and hammer, player and other tools. They had to be careful so they didn't harm parts they could use. As a teacher I got a whole lot of questions like "what is this little thing". I was from time to other surprised of the leak of knowledge the students showed. I think this part gave face to many partly known substantives.
- Choose the useful parts and start to plan what to make. This is the construction play part in the project. They have a number of parts and try to find ways to use them. As mentioned they had been through a course in electronics, and some students found a small microphone, a small speaker, a good audio transistor, a number of resistors and managed to build a small amplifier of the parts. One student found parts he could combine with an engine to a small belt wagon. He found them in a wasted computer scanner. When he started to build the toy, he also needed other parts, and found switches and some light diodes to make front and rear light.
- Teacher must help some of the students to get ideas, and to make them realistic. The student with the belt wagon didn't need help at any time through the project. Other students really have problems to get started, and the teacher has to inspire them.

Results of the project

- New technological objects. The best parts to play with, was mechanical parts and switches combined with motors and different kind of lights. It was useful to make something to transferee motion from one place to another. Don't make the projects to big! Some pupils will be exited just by making the light turn on and off. Then they should be helped the next step. Where do you want the light to shine? A light house, a traffic light...
- New understanding of mechanical skills. We wanted to create something with a function, not only represent something visually. This made them step into the subject with the attitude, "we have to figure this out".
- New attitude to broken equipment. Students came with broken equipment afterwards and complained that they didn't have opportunity to store them, but they thought we could use this wit the next group of students, because they guessed that there were some useful parts in there.
- They really enjoyed the time, and it was an enthusiastic atmosphere in the classroom.

Problems during the project

- It takes a lot of time to prepare for the project. You have to collect useful waste from recycling stations several times to get enough for a whole class.
- It is difficult to be allowed to take away any object from the recycling station. You have to get permission to remove the waste, and I used a lot of time to find the right person to give me this permission. When I was there at the other hand, nobody asked me a question when I picked my peaces, so I didn't get use of my reference.
- Some equipment is really hard to open and demount without killing useful parts. Sometimes you need specialized tools to open products, and there is no easy cure for this.
- Electronic parts are difficult to use and both the student and the teacher need a lot of specialized knowledge.
- The activity challenges the teacher's knowledge about how many things work. This project put us on a hard task.
- Some students don't know too much about how anything is build up, and you have to teach them one by one how simple mechanics work. But, if you do it well, the students will get opened their eyes one glance at the time.

The way further

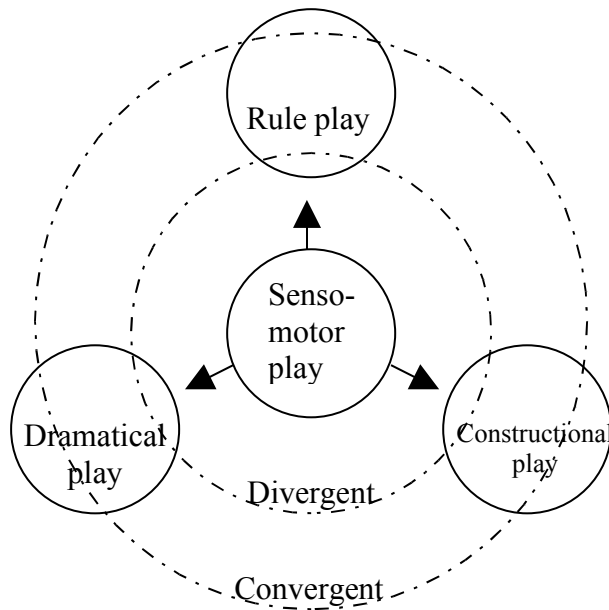
- Try to do this method with pupils in primary school
- Try it once again with students, with more focus on how to play with the parts they find, and to look for the good ideas.
- Find better ways to document the project and the outcome.

Theory production

In Piaget's play theory, the child is often manipulating concrete materials.

According to L. Vygotskij the experience is the fundament for the imagination.

The relation between the usual categories of play has Trageton (1997) described in the following model.



In my study we put focus on the constructional play.

The development starts with sensomotor play with materials, and continues through divergent constructional play about 4 years and to convergent symbol play at about 6-7 years. This is about children, but the same structure is suitable for grown ups. The sensomotor experience with tools and materials, and knowledge about principles in basic construction is basis for the constructional play. Our project starts with a kind of senso motor play when they open the materials and find out what there are inside. It continues with divergent construction play with the parts, and ends up with convergent construction play when they decide what to make and complete the object.

One of my observations is that the students who come from farms are much more used to tools and have much more practical knowledge than other students. They tell me that they have used their hands a lot, and to grow up at the farmland gives opportunities for activities the boy or girl from town don't have.

When I was a boy in the 80's, it was common for boys to build a cabin in the trees. According to researchers with the center for child research in Trondheim, this activity seems to have decreased, and the children loose valuable experience. We want to find out if playful working methods may inspire the children to bring the TD activities with them home.

What we make with the children has influence on how they respond on the project. We want to find object to make which will be a motivation factor for learning and to keep the steady progress on the work. The more time the pupils spend with this, the better foundation they get for further knowledge.