

PROBLEMS ENVIRONMENTAL EDUCATION CONNECTED WITH TECHNIC AND TECHNOLOGY

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Abstract

By planning and selecting the contents of subject technology we must take into account also the contents from environmental education. Combining the different contents are compose from the process of planning, analyzing and/or evaluating achieved result. In the frame of the selected educational strategy (for example Project task) the students must acquire and strengthen the theoretical and practical knowledge, develop skills and working habits. Only if we take into account this, they will be able to transfer this theoretical and practical technological knowledge to solve the ecological problems. This is the teaching and learning in the narrow sense, which we can classified as acquiring new, knowledge, tasks and skills necessary/for solving the problems.

Learning in the wide sense means preserving knowledge and recalling it back, the knowledge that is connected with technical, technological, organizational and ecological problems.

Key words: *technology, ecological problems, environmental education, learning strategies.*

Introduction

“Ecology (gr.) is science researching beings and their relations to environment (e. g. relation to climate, soil, water, and other live beings). The branch which deals with the relation between man and environment with preventing the consequences caused by humans intervention into nature has been recently more and more thorough and spread”. We can absolutely agree with the following idea: “Slovenia should as a young country put forward first of all its relation to environment because the healthy environment is a base for business connections with the world and condition for the developing ecological strategy, which Slovenia follows,” (Smaka - Kincl, 1991).

We do not realize the main meaning of protection of nature and human dwelling and working environment. People with waste (things with returning and non-returning waste packing) pollute environment, water sources and cause illness and they also deform the appearance of nice environment. Most of the waste paper packing, which is returning is thrown away as waste and it is not need for the recycle. For 1 ton of cellulose as raw material which is useful for making paper we need “2 tons of wood, 260000 liters of water and 1000 kWh electric energy” (Pfitzenmair, Schmelzer, 1991, p. 8). This information clearly shows that “planning and protecting human’s environment includes and demands rational and effective economy with natural potentials, mineral raw materials, lands, water, forests etc.” (Kobal, 1988, p. 9). With waste paper recycle and cardboard recycle we solve problems connected with “gaining raw materials, burdening environment with waste and energetic aspects.” (Nentwing 1995, p. 357).

For rational and human use of wood we need beside protection and keeping correct and human relation to earth, air and water also correct relation to returning and non-returning waste packing's. Waste packing's are made of different materials and can be by chemical (recycle) and mechanical (transform) processes changed into materials which are used for new products nice to men and environment. For paper waste packing's and for waste paper it is true that "ground and refined old paper is very important supplement by making cardboards and paper which is used for newspaper." (Papoptnik, 1994, p.29).

Carrying out the contents of technology, lessons of technology and technical days is connected with the following global aims of subject technology:

1. By working the students develop skills for economic utilization of time and energy.
2. They develop positive relation to technology and work, responsibility, exactitude, order and ability for co-operation by solving the tasks.
3. They develop critical and active relation to human's intervention into nature. (Papotnik, 1997, p.67)

It should be emphasized that above-mentioned aims demand in the frame of strategies the field of environmental education, methods and processes which are characteristic for technology education. In the course of instruction it should be followed also the level of the cross curricular connections and ecological engineering. For ecological engineering is characteristic definition which affirms that this is science trying to solve contradictions in the environment and to protect limited raw materials and energetic sources by scientific methods and technological processes. It demands understanding of the basic mechanism in the environment (scientific, technological, social-political and economical). The area of ecological engineering dealing with the prevention of pollution of the environment is eco-technology. Solving this problem must be integrated and long-run.

I this paper I will try to point out, that ecology and ecological science is close connected with nowadays modern technology. The technology today not only pollute environment, but it is probably only one that can also preserve it from this (their) pollution,

Methodology and Strategy of Research

Research of the problems from the field of environmental education is possible also by the methods of the empiric learning in connection with technology. "Empiric learning is not only limited on receiving other experience and knowledge, but its starting-point, is activity, experience and acting of the participants in a concrete situation." (Marentič, 1987, p. 88). The source of experience can be simulated reality:

- simulation,
- role-play,
- planned plays,
- interaction plays,
- pro et contra debate,
- brainstorming, etc.

In the frame of efforts to connect the pedagogic and scientific activity and co-operation of students, dealing with the problems of the environmental education could be a challenge. This activity is present by seminars from pedagogic-psychological objects, technical-theoretical objects of didactics. Acquisition of information and results for the seminar task or seminar report by technology didactics, which is presented in the seminar by the students it is possible by the method of triangulation presented in figure 1. The triangulation is a combined method, mostly

combines information of observing and interview. (Kemmis, 1991, p.60). This method enables the information from the same situation are exposed from three perspectives: *the perspective of the teacher, the students and the observer (researcher)*.

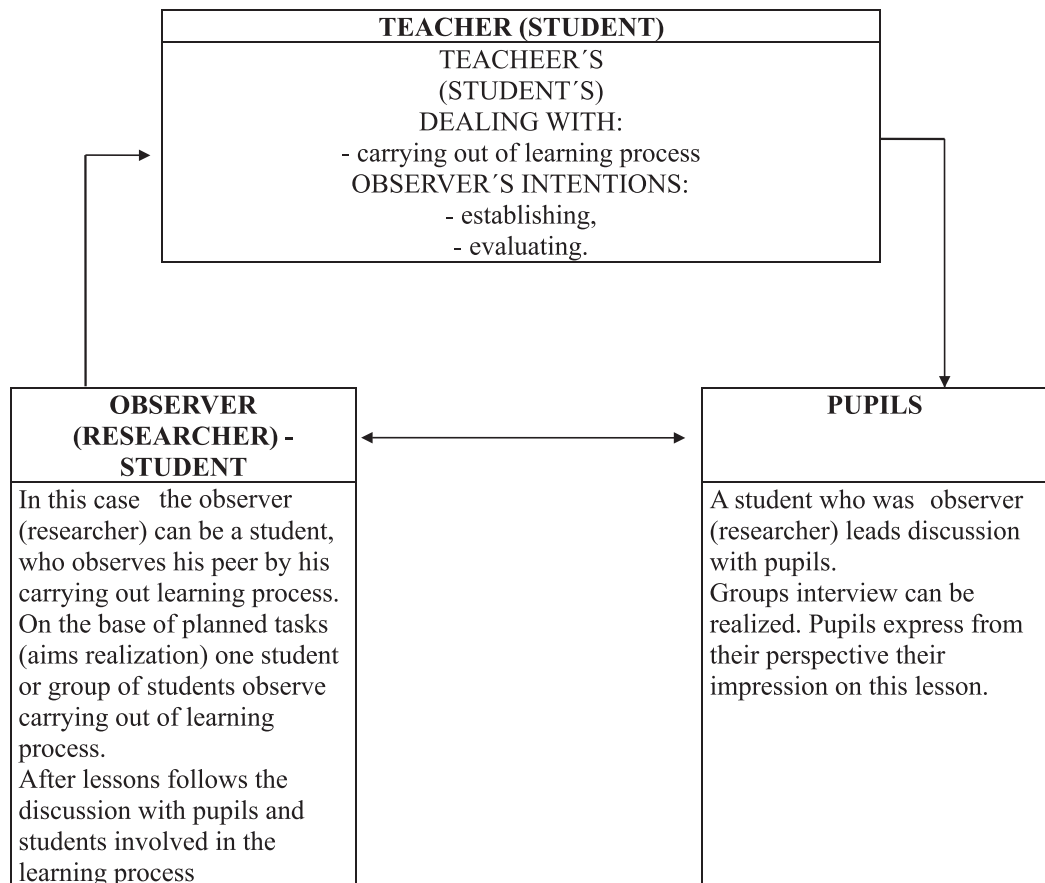


Figure 1. Method of triangulation

At the next pages I will give some clear example.

Case Study - Lecture: Dealing With Collected Waste

Our research we will execute in the 3th class with 9. Year old students. We will observe and evaluate carrying out of the lesson unit: *Planning and making useful product (from waste)*. The aims for this lesson are formed on the basis of understanding the meaning of including the aims referring connections of technology with environmental education and on the basis of the aims which are in Catalogue of knowledge for technology - (Catalogue, 1995, p. 20–21). By observing and evaluating we must pay attention to realization of the aims presented in the table 1.

Table 1. Tasks for observation

| SEQUENCE No. | PLANNED AIMS |
|--------------|---|
| 1. | Can describe the purpose of waste packing for the further recycle into new products? |
| 2. | Can develop correct relation to non - returning and returning waste packing? |
| 3. | Can prove the purpose of collecting waste paper and value this possibility from the view of preserving wood? |
| 4. | Can enumerate the most common kinds of paper materials, understand their features and prove the use from the view of nature - protection demands? |
| 5. | Can realize the difference between ecological and ordinary paper materials and gain the knowledge on the meaning of ecological irreproachable production? |
| 6. | Can understand the efforts based on prevention the consequences caused by human's intervention into nature? |
| 7. | Can explain the purpose of returning waste packing and other materials (paper, cardboards) for making new product? |
| 8. | Can define measures for the size of the product (e.g. packing's cover) and take care of rational use of materials? |
| 9. | Can draw technical drawing for product (e.g. drawing of the packing's cover)? |
| 10. | Can understand the meaning of safe - work, tools and machines and take care of correct and safe carryng out of working operations? |
| 11. | Can developing co-ordinated movement of arms, fingers and eyes by carrying out of working operations with manual tools? |
| 12. | Is according to the drawing be able to make the product (safely, correct and economically) (e.g. packing's cover)? |

The aims which I've formed them according to Bloom's taxonomy for educational (cognitive), conative and psycho-motoric area, we define the modalities into five degree scale and in she process of action research we evaluate them.

By the method of triangulation is possible to register aims' achieving by individual students. This is done by the observers who observer and follows the carrying out of lesson unit.

Table 2. Marking and evaluating of achieved aims by five degree scale.

| Seq. of number | f | f % | Answer | Aim |
|----------------|---|-----|------------------|--|
| 1. | | | Excellent | <ul style="list-style-type: none"> • can describe the purpose of waste packing for the further recycle into new products, • etc. |
| 2. | | | Quite good | <ul style="list-style-type: none"> • etc., |
| 3. | | | Very good | |
| 4. | | | Satisfying | |
| 5. | | | Non - satisfying | |

Planning and Carrying Out the Optimal Lesson

By planning and selecting the contents of technology we must take into account also the contents from environmental education. Selecting the different contents are composed from the “process of planning, analyzing and evaluating achieved result” (Knight, 1997, p. 13) shown in the area of achieving emotional, cognitive and active aims. By this we must consider three components:

1. **MEDIUM** (integrity of methods, means and experience about the value of correct and human relation to water, air, earth, environment, materials, energy, products, waste, returning and non-returning waste packings ect.).
2. **LEARNING PATTERNS** (correct choice of frontal, group and individual learning pattern in the frame of the individual learning process).
3. **KNOWLEDGE** (value of recognizing, reproduction, operation and creativeness).

This category deals with “complex cognitive strategies, structures and control” (Marentič - Požarnik, 1995, p.9). In the frame of the selected educational strategy (e.g. Project task) the students must acquire and strengthen the theoretical and practical knowledge, develop skills and working habits. They will be able to transfer this theoretical and practical technological knowledge to solve the ecological problems.

Contents of the lesson; Planning and making useful product

Aim: Carrying out educational process to acquire knowledge and skills connected with correct relation ecological problems.

1. PLANNING AND DEVELOPING THE IDEA:

- a) definition of the problem,
- b) acquisition of knowledge and kinds of packing's and the meaning of collecting waste returning and non - returning packing for recycle and preserving clean nature.

PACKING:

- a) reforming of the existing paper packing used for recycles (e.g. class degree, technical activities for class degree, technical days for class degree,
- b) forming the packing product from paper material in the primary school (e. g. in 5. class),
- c) acquisition of knowledge about the meaning of the economic time utilization, materials and energy exploitation as the elements of natural connection of technical, organizational and ecological problems.

2. CREATIVE WORKING PROCESS:

- a) making the product or project,
- b) acquisition of new knowledge and skills in mutual connection in environment - protection problems,
- c) by creative work and solving the task they develop critical and active relation to human s intervention into nature and demolition of nature balances.

3. EVALUATING EFFECTS AND RESULTS:

- a) forming the criteria for evaluating of products,
- b) role - play with the purpose of connection technology education with Slovenian language and environmental, cognitive and active aims are stressed.

Conclusion

I would like to show with this contribution how planning and performing the contents of environmental education in connection with technology education.

I am sure that the protection of environment will be in 21. Century as important as was the idea of democracy in the 19. Century or the tendency to economic growth in 20. Century. In the sphere of understanding the correlation and the transfer of environmental education with technology the special attention must be given to this problem in permanent trade education for the teachers. This will be possible to realize with the seminar for permanent education or with the student researches camps. For example at the Faculty of Education was carried out the student's researches camp; *Energy, energetic crisis, environment and school* in the frame of movement "Science to young people". The participants of this camp were the students, the teachers and professors of geography department, biology, chemistry and technical departments.

At the end I would like to point out experiences from this camp. It is very important to connect the pedagogic work with modern methods that introduce the students with researches; that contributes to growth and development of young researches, (Papotnik, 1988, p.10). In this paper I try to point out, that ecology and ecological science must be connected with nowadays modern technology. The technology today not only pollute environment, but it is probably only one that can also preserve it from this (their) pollution,



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