

University of Jyväskylä
Department of teacher education

Jorma Ojala
Reconstruction model instruction

This study project is based on the educational reconstruction model and has the goal of concretizing the general and abstract theories which are associated with knowledge and learning and which come up in the education. The study project is realised in small groups (of 3-4 people) where every group chooses a theme that they can teach during second teacher training period (OH2) in their own practice class. The study project is comparable to the educational reconstruction model developed by the IPN- institute in Kiel. According to the model each theme is studied carefully and rearranged to be optimal for meaningful learning. In other words it is a process to acquire pedagogical content that is connected with a certain limited theme. The goal is to adopt a certain strategic plan that can be applied to working with different contents again and again.

The study project involves the following stages:

1. Being conscious of one's own thinking
2. Comparing the views of group members
3. Learning to know the theme and creating a deepened conceptual chart
4. Schoolbook analysis
5. Familiarizing with didactic research
6. Studying pupils' thinking
7. Planning the realisation of the theme
8. Seminar

I will closer describe the different stages with reasoning in the following.

1. The purpose of mapping one's own views is to make the thinking of the student visible and document it before the working so that it can be examined later. This way the students can evaluate their knowledge and see the alter and development of their thinking.
2. The members of the group can compare different views with each other and especially look at the different reasoning behind the different views. Knowledge doesn't just come out of nowhere. The reasoning of knowledge is more important than the knowledge itself. Students can also compare their views of themes with the way these are presented in the school books and see the similarities.

3. The purpose of the familiarization in the theme is to find out all the essential elements in learning the theme in question. At this stage students utilize more thorough source material than normal school books.

4. Even after this it is possible to do a critical school book analysis. The student can notice elements missing from the school book that are essential for learning. The text in the study book cannot be perfect, so a teacher must always evaluate what kind of extra information the pupils will need beside the text in order to make the theme understandable in a sensible way. The teacher must therefore know the subject well.

5. Didactic literature can function as a stepping stone to help the student to advance quickly with the help of previous research. Especially preparing an enquiry is a challenging task.

6. The aim in studying pupils' thinking is to find out the preconceptions of each pupil concerning the subject in question. There is a limited amount of preconceptions. The goal is to map the different rationalization models. It would be especially important to find out how the pupils reason their own views. It is important because the different explanations are internally reasonable even though they differ from scientific knowledge.

7. The education is finally planned based on all the abovementioned deep knowledge on the subject and the knowledge about the pupils' thinking. At least two terms have been used of this knowledge: "The educational reconstruction model of knowledge" or "pedagogical content knowledge".

8. The seminar examines the study project and its results and critically evaluates how well the theme has been taught. At the same time the alter of the own thinking concerning knowledge and learning is estimated.

It is desirable that the work started at this course will continue further, at first concerning proseminar work and later on the pro gradu thesis. There is much to be researched in the didactic of science.

The aim of the course is to guide and support the students grow to become researching, functioning and critical citizens. A good teacher is interested in nature and exploring it as well as in environmentalism and the development of the community. This is not possible without fundamental knowledge in science. During the course students will get to know the basic scientific theories and their development. The course also examines the problematic of the development and learning of scientific information. The students exercise efficient learning strategies and different ways of acquiring information, such as using different instruments of observation, research and measurement. Alongside with scientific theories the course studies and evaluates the alter and development of the students own thinking in relation to both science and learning.

The course is also meant to realise its own ideology - an ideology that is common to students and teachers. Participants are therefore assumed to be spontaneous, active and taking responsibility for their own learning and development. The teachers on the course are interested in their field and research actively the learning of scientific

information. This means that the teachers are happy to help and answer questions whenever there are problems or uncertainties. The course is critical and the previous views of the students learnt in school are questioned. The students are expected to be open and ready to evaluate and even change their previous views if needed. The goal is that teachers graduated from the department of teacher education in the university of Jyväskylä can skilfully inspire their pupils to study, to take an interest in and to respect nature and science.

The aim is to make the students learn to understand phenomena more profoundly than before. To achieve this, on one hand the student's empirical world is taken advantage of even more efficiently in the studies. On the other hand examining the same phenomena from many different angles at the same time contributes to understanding them more deeply. The aim still remains that the students learn to give more grounds to their thoughts even more diverse. Nevertheless, integration is not an end in itself so that there are themes that are not artificially integrated but instead examined according to the traditions of biology, geography, physics or chemistry.

The student's knowledge of the immediate surroundings that is based on his/her own empirical world is a fine springboard for theorizing things and also understanding distant phenomena. In elementary school the goal is to study and contemplate natural phenomena of everyday life and applications of science that are related to it. Students still have common views of many phenomena which do not agree with the current scientific views. There are two consequences of the situation that are applied on the course.

First of all, the different views of learners help people learn to think. The course tries to bring out all the different views of the students. Even though the foreknowledge of the students doesn't agree with the current scientific knowledge, their views are still consistent and believable to themselves since they are a part of their world view. The course aims at making the students question common views that have become obviousness and learn reasoned scientific information. Superficial learning of facts is not a sufficient basis for teaching others.

The goal is that students gradually acquire the scientific culture and learn the scientific way to talk and act. An aim is to give students new material for thinking and to get them to dedicate themselves to scientific language, thinking and acting. There is much "quiet information" in science, which one can only learn by exploring, doing and acting oneself. Similarly, the view on the nature of information becomes clear if one personally makes information.

According to some studies many teachers in fact teach many scientific phenomena against the current scientific view. There are also some themes presented incorrectly in modern school books. A current study has shown that the pupils' capability to adopt things is considerably better than people have assumed before. A strong knowledge of subject is an essential requirement so that the teacher can come up with challenging questions and exercises for the class.

The aim of this course is to change the attitudes students have to knowledge and knowing: to give them facilities to apply problem centred and research based learning strategies in different contexts. The development of a student is not all about learning

certain information but they should at the same time learn many other skills and qualities that have to do with practising science. Learning natural sciences requires the ability to concentrate, exactness, carefulness, preciseness, perseverance and persistence of the student. These characteristics do not work against creativity but instead are important elements of it. All learning is tied to values and it is clear that a teacher must with his/her example show the students that these are important and valued things. This is difficult if the teacher doesn't see the importance of the studied themes. Such elements should also be involved in the students' work that help develop and strengthen their own will and ability to work to attain distant goals.

The course tries to amend the participants' views on the teaching methods of environmental and natural science so that these views would better agree with the results that have been attained through research on learning and didactic. It is desirable that the participants are open to new thoughts presented on the course and courageous enough to critically contemplate their view on teaching natural sciences that is based on their own experiences. There is a danger that participants might get stuck with their old attitudes and nullify the ideas teachers present because of their defences. That would be most sad. A course in environmental and natural science can be mentally trying since the superficiality of a student's own scientific knowledge is probably revealed, as rich as it may appear to be. One should however accept the fact. No one can know everything. A teacher can best help the pupils with knowledge and not with ignorance. Wisdom is being able to question one's knowledge and work.

Teaching natural sciences should be developed so that the tradition of "ready-made" information would be given up. Good teaching can not be solely based on remembering "ready-made" information read from school books or given by the teacher. This course learns to practise ways that teachers can use to study their pupils' thinking and acknowledge his/her own thinking. The course also practises how to analyse the conceptual structure of the texts in school books. The teacher will get a deeper view of natural science as a discipline and he/she will get acquainted with scientific working methods. The course also wishes to benefit a researching student. The research methods are practical and therefore useful also in the everyday work of a teacher. This way as a constant researcher of their own work teachers can develop their own expertise.