ARE THE WRONG ANSWERS BAD?

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By evaluating our students' knowledge, it is too hard to ascertain whether the pupils have really understood exactly the tasks, or whether they can only give a casual though right answer. So if their answers are good we never know exactly whether their answers show a deep understanding or the answers are only occasional ones. Only mistakes, they do show a deeper level of children's thinking. Analyzing their mistakes we trying to follow their train of thought so we can understand their thinking better. It can helps us to correct their learning mistakes.

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When children are tested, we are happy if they gave the right answer. We do not like them to give the wrong answer, because as teachers, we feel that we failed them. But the question is, that are the wrong answers really bad, or, by giving the wrong answer can we get some useful indication how to improve our teaching methods? For using the wrong answers to improve our teaching works we should became a scientist a bit. So we have to develop simple theories concerning our job, as the next example shows it.
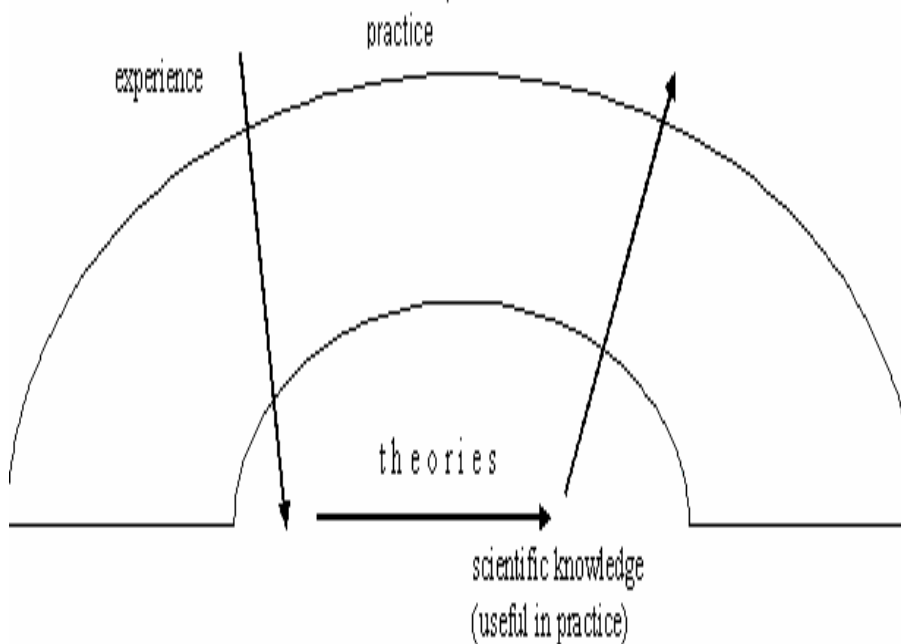
There are two different types of knowledge: one is the common, everyday knowledge, this may be called beliefs, opinions, or ordinary knowledge or information, and the second is the exact scientific knowledge what may called science. With science when we use the concrete terms we usually move to a deeper level of the different levels of understanding, or we change to a meta-level to represent a more scientific view.

Reflecting to our school practice the information collected from the level of everyday experience in a long way will sank to a deeper theoretical level. It usually moves from every day communication on to the field of research at the research institutions if does. At that research level researchers analyze this type of information. They also work out methodologies, processes, and strategies in practice and improve those further and at the end of this process they advices the teachers how to improve their methods of teaching. However, communication between the sophistically different levels of the teachers and the researchers for example, is not always easy. Therefore, the process of communication is not always efficient.

In our education system there are different tests available to measure the curriculum-related achievements of the pupils. How are these tests evaluated? By seeing if the pupils gave the right or the wrong answers than by selecting and counting the right answers, item by item. What about the wrong ones?

Sometimes pupils secretly help each other during tests, though we try to avoid this. Of course when we evaluate the tests we can't be sure that someone has cheated if the answers are correct. Usually only the same wrong answers show the forbidden cooperation between the children. Of course their answers are unacceptable in that case. But this may be the end of our reflection on wrong answers. But we ignore all other explanations, although we can get much more information and can reflect further on the wrong answers.

Why is it that the wrong answers are more important for a teacher, than the right ones? Because by analyzing the wrong answers of the pupils, the teacher him or herself can take a shortcut by deciding what practical steps to make to improve his or her teaching methods based on experience, on a practical level. What I mean is that the advice by researchers can be shortcutted, if the teacher is able to analyze the wrong answers him or herself. On the basis of those wrong answers he or she can improve his or her teaching methods. By short-cutting the route of information and communication, the time to teach better shortens.
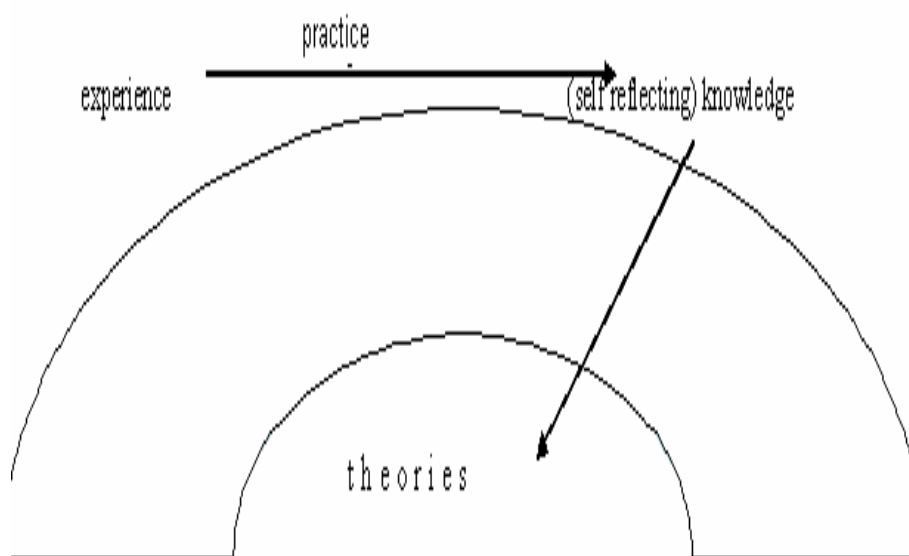
It can be scientifically analyzed by measuring the level of competency by the individual pupils. Teachers' general task is to lead children to a sure, clear knowledge, or cognitive competency. We teach a topic, practice it, and test the knowledge of the children orally or in writing. It is impossible to ascertain whether the pupils have really understood the topic, or whether they give the right answer only by chance. So we **never** know exactly whether their answers show a deep understanding or just a lucky guess. Nothing shows us on a deeper level what the children are thinking, but their mistakes. By trying to follow their chain of thought we can understand their thinking judge their knowledge better. This helps us to correct their misunderstandings and mistakes.

Let's see an example: weightlessness versus gravitation:

1. the weight is the force what acts between the body in gravitational field and the holder of the body
2. without any gravitation there are no weight
3. a body may be imponderable in gravitational field
4. the falling bodies are imponderable

This four statements had to be learned by the pupils about gravitation. On the tenth physics lesson we have measured the following distribution for 16 pupils. Each point represents an individual on the next diagram.
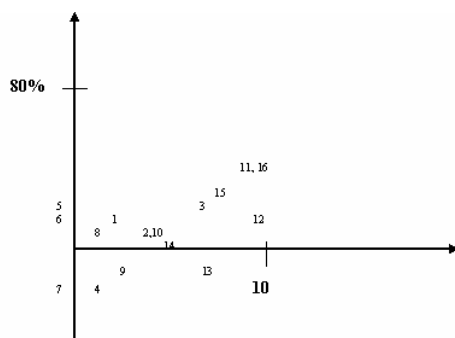
After that we have analyzed the wrong answers we can help pupils who gave the wrong answers to learn also quicker. 5 lessons later, the situation has changed, all pupils have developed further to some extent:
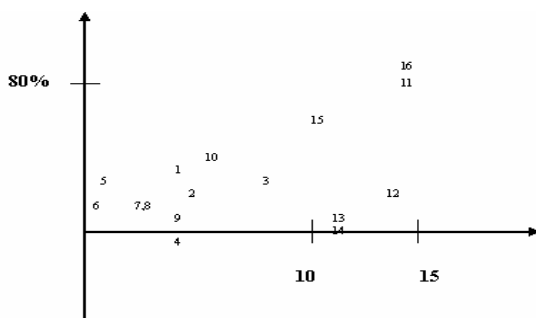
If we mark the changes in their level of knowledge, one can clearly see that those pupils who started from a lower level of knowledge develop slower, but those from a higher level learn quicker.
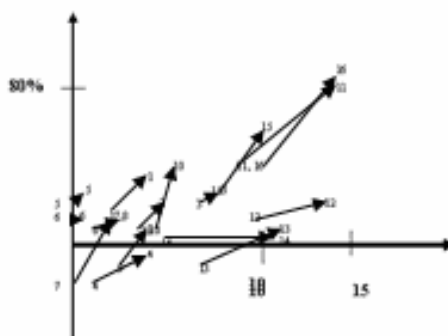

If we follow the whole process of learning, we get the next diagram.
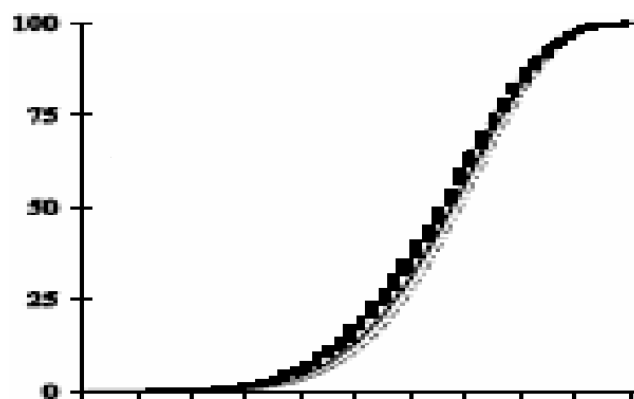
We equire our knowledge by learning for a while, but when we have already learned something we cannot improve any further, we reach the saturation level at 100%. So we have a simple learning-model which have developed during the working on our research. From the point of view of any concrete knowledge element we are either learning, or forgetting something at any time during our entire life.

Positive values on the y axes represent the level of proper knowledge. Negative values are for false knowledge or information on the next diagram.

The whole picture
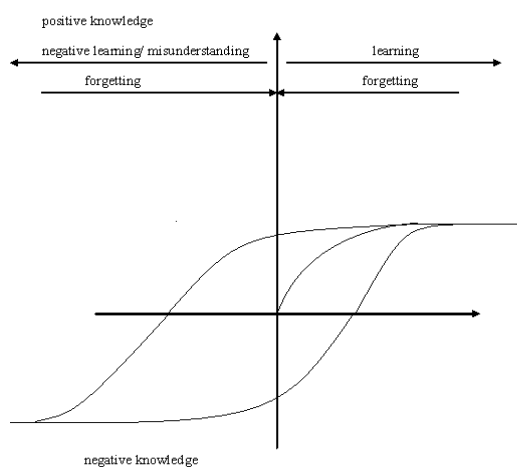
Moving away from the y axes we are learning either the right or the wrong information. Moving towards the y axes we are forgetting either the write or wrong information. Where-ever we are on the diagram if we learned the wrong information the point representing our knowledge has moved towards left. If we learned the correct information it moved to right. If one starts from the origo, from nothing his or her knowledge will continuously improve until reaches the saturation level. It is easy to get to the saturation level (or to the full knowledge) either from zero knowledge or by having some positive pre-knowledge. However, if one has the wrong information, it takes much longer to correct that and get to saturation level. The previous

figures showed the level of knowledge by the individual pupils at an early stages of learning, therefore none yet riched the saturation level.

In my presentation I tried to show you how teachers can make use of the wrong answers. It helps them to improve their teaching methods, and involves them in researching their own methods and developing their skills further without outside help instantaneously. Also I tried to show a very simple learning-model, what can be useful in school practice. I've done this work not as a research worker, but as a teacher engaged in a primary school practice. May be some of you will interested in this field, and try to continue this research.