

Chapter 9: Different Approaches to Teach CS/IT

In CS/IT the gap between the theoretical foundations and the practical applications of a topic is often big.

The approach to teach a topic from theory to applications is often neither motivating nor obvious for the students.

Therefore, several approaches should be considered to teach a topic depending on teaching goals. This can be illustrated on the example of databases.

First, from the point of view of a database user, the focus is set on working with the data in existing databases. After the students have experienced such a working database more theoretical concepts can be introduced.

Second, from the point of view of a database administrator, the focus is set on running existing database systems. In this case, it is again advisable to start from an example database and show how to perform administrative tasks.

Third, from the point of view of a database designer, the focus is set on the data model and the design of the schema. Theoretical concepts could be introduced first, but also a top-down analysis of existing database schemata is a viable approach.

In summary, it is not required to always follow the same approach for teaching a topic.

Different approaches should be considered to increase the variety of the teaching. It is, however, important that a chosen approach is clearly structured.

Chapter 10: Learning Targets in Teaching CS/IT

Teaching in CS/IT covers knowledge about concept and products but also skills. To avoid the danger that students get lost in non-relevant details it is important to have clear learning targets. Clear learning targets are a feature of good teaching, not only in CS/IT. Learning targets have positive effects for the student and the teacher as empirical evidence has shown.

Learning targets are particularly important in CS/IT because of complex field ranging from concept to product knowledge. They help to students to keep focused on the important aspects.

There are three types of learning targets: 1) affective learning targets are related to the development or the change of interests, behavior, values as well as social skills. (2) Psychomotor learning targets are related to the adoption and application of motor skills. (3) Cognitive learning targets are related to thinking, knowledge, problem solving and the development of intellectual skills. The focus here is on the cognitive learning targets, considering some aspects of the affective learning targets.

An applied guide to formulating learning targets is the target-layer-model. It distinguishes three layers of learning targets: vision, disposition targets and operational learning targets. This model is extended by a fourth layer the fundamental ideas. The vision is related to why something should be learned, why is it relevant and how it fits into a bigger context. Each topic has some fundamental ideas, the vision or other factors (time, target audience) determine which of the fundamental ideas are selected for teaching. The disposition targets answer the questions on what are the students capable of after the lecture and how will this be reflected in their behavior. Operational learning targets consist of specific abilities the students have after the lecture and how these abilities can be tested.

Phrasing learning targets according to these four layers helps to distinguish between long-living and short-living content. Only the operational learning targets should (but do not need to) depend on specific products.

Chapter 11: Teaching CS/IT Courses Requires Careful Planning

Compared to teaching CS/IT in a school environment, teach CS/IT courses for continued education to adults need different planning. The most important differences are:

- target audience: Students are often not interested in one particular school topic, they attend because it is part of the curriculum. Attendees of a course, however, specifically choose a course and have to pay for it. That means they want to get some value for their money.
- content: In a school, the contents of a lecture is given by the syllabus and are more of a conceptual, long-living nature. Attendees of a course expect directly applicable contents. It is therefore challenging for the teaching to find a good mix between these two extremes.
- learning targets: Learning targets for a school lecture are designed for a longer period of time and are not available for each lesson. Learning targets for courses need to be more detailed.
- time management: Teaching courses requires an increased time management because of the smaller amount of time that is available. Missing content may also result in unsatisfied attendees because they paid for that content too.
- previous knowledge: The previous knowledge of students is expected to be homogenous. The previous knowledge of course attendees is usually quite heterogenous. This must be taken into consideration and may even be tested with voluntary self tests.
- social environment: In a school setting, the teacher and the students usually know each other. There is some familiarity and (implicit) social rules. In the course situation this is not the case. The teacher does not know the attendees and they at most some of the others. This requires a careful design of social interactions in the course to enable an open environment where the attendees have no fear to ask questions.

In summary, teachers must consider the special properties of CS/IT courses compared to teaching at a school. The learning targets and the schedule must be planned carefully.