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Portfolio:

Didactics in international intensive teaching courses using the example of the Summer School “Soil & Water”

Content

General remarks about didactics

Effective learning during lectures is limited to approximately 20 minutes (Lloyd, 1968), afterwards the attention of the students decreases. Therefore one should insert a rest or a change in activity after 20 minutes, so that the attention rises again.

According to Atkinson & Shiffrin (1968), the memory processing needs several steps: Input is detected and enters the sensory short term memory (McLeod, 2007). If this input receives attention, it is transferred to the short term and working memory. From there, the input only enters the long time memory, if it is rehearsed. Otherwise the input is lost from the short term and working memory and is hence forgotten.

The rhythm of learning is an alteration of receiving and processing information. In order to foster the reception of information and therefore the memory processing, one should:

- make learning goals explicit
- show the structure of the content
- repeat crucial aspects
- link to learner's prior knowledge
- link to learner's interests

In order to improve the reception of information it is important to provide (and show) the structure, e.g. by showing an overview at the beginning, by using labels or color codes to show the structure on each slide, or by using structuring word ("an example of ...", "leads to ...", "is a prerequisite of ..."). Further didactical tools are intermediate summaries / conclusions, a summarizer and a synthesizer (how to connect to other concepts).

An important issue is to deal with cognitive (over)load. According to the Cognitive Load Theory by Chandler & Sweller (1991), there are three types of cognitive load:

1. Intrinsic cognitive load – a result of the complexity of the learning content
   → low load: Imagine yesterday was Tuesday. Which day will be in three days?
   → high load: Imagine 5 days after yesterday would be Friday. Which day will be tomorrow?
2. Extraneous cognitive load – influenced by the design of the learning material
   → low load: ☐
   → high load: Think of an object that consist of a line, 10 centimeters long, which is vertical. Think of another line at 90 degrees to the first line where the ends of the two lines meet and assume that the second line is also 10 centimeters long...
   → low load: lecture in native language
   → high load: lecture in foreign language
3. Germane cognitive load – the effort for the learner to understand the teaching material
   → low load: 90 minutes lecture without questions or tasks
   → high load 90 minutes lecture with discussions, brainteasers, ...

All three types of cognitive load demand the working memory capacity, which is limited (Sweller, 2005). With a simple task all three types of cognitive loads together use the capacity in an optimal way. With a complex task, the intrinsic and extraneous load are demanding more capacity, so there's not enough working memory capacity for the germane load. As a consequence for teaching one should reduce extraneous cognitive load and foster germane load.

Possibilities to reduce extraneous load are the use of pictures / diagrams on the slides instead of text, or the use of 2 channels (talk about the pictures). If text is used, only use bullet points and do not say the same text as is written on the slides. All in all, the lecture should be reduced to the crucial points (no decorative elements) – less is more!

One possibility to foster germane load are to deepen the processing of single tasks, e.g. through chat groups, voting, a summary of answers or the creation of examples. Another possibility is to gain an overview, e.g. through one-minute papers, to-go messages, test examinations or guided lectures ("Try to note all you hear about...", "Especially focus on all pictures").

Sources:

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Problems in international intensive teaching courses

International intensive teaching courses in general and our Summer Schools “Soil & Water” in particular are a special setting for learning and teaching. One reason is that the background of the students varies a lot. In the case of the Summer School “Soil & Water” the students stem from 4 different universities where they study different study programmes like “Biology”, “Forestry”, “Civil Engineering”; “Production and Marketing of Agricultural Products”, “Applied Biology of Aquatic and Terrestrial Ecosystems”, “Soil Biology”, “Biological Chemistry”, “Biology of Nature Conservation” and “Environmental Care”. Further, the students’ study progress is very heterogeneous. Most of our participating students were Bachelor students, but also Master and even PhD students attended the Summer School. This heterogeneous background knowledge makes it hard not to demand too much of some students and on the other hand not to demand too little of others.

The mixture of different nationalities requires the usage of a common language, which is usually English. In our Summer School, none of the participants, neither the teachers nor the students, is native speaker of the English language. This makes it even more demanding for the students to follow the lectures and explanations during the excursions and the practical work.

A main problem of an intensive teaching course is that there is a lot of input in a short time. Our Summer School lasts two weeks and the program is rather challenging. In the mornings, there are lectures and in the afternoons, there are excursions, practical work or self-study phases. Hence, there is only little free time for the participants.

An international intensive course like our Summer School is also a special situation for the teachers. In our case, not only the learners stem from different universities, but also the teachers. This makes the reconcilement of the teaching contents hard for the lecturers. Further, the teachers only give one or two lectures and they have to perform well in this very short time to get the students interested in their respective topic. This puts a lot of pressure on the teachers.

Suggestions for a successful presentation

Presentation media

The visual support through presentation media increase the quality and impact of the presentation. The visualization gives the teacher the opportunity to get and retain attention, to give an orientation and to simplify complicated contents. However, the used media should be as concise as possible.

All teachers from the Summer School "Soil & Water" use PowerPoint slides to support their presentations. For the slides, there are several general rules that should be considered:

- Keep the background simple → the background might distract the reader from the content
- Use a clear, consistent structure → makes it easier for the students to follow the content
- Use a consistent font and font size → different fonts appear confusing; the letters should be big enough so that even the students in the back can read everything
- Highlight important aspects: colored / bold
- Use pictures to clarify the theoretical backgrounds and facts. They should be big enough, demonstrative, elucidative and supportive.
- On slides with pictures or diagrams there should be no explanatory text (if necessary a handout with the additional information can be distributed)
- Use examples as often as possible to explain e.g. correlations, methods, concepts, etc.
- Use notes (bullet points) instead of full sentences (exception: definitions → read out or give enough time to read
- Do not overload the slides → use max. 8 bullet points per slide
- Enumerations should contain at least 2 bullet points
- Important aspects should be successively structured → If applicable, use step-by-step explanations

Of course, it is very supportive and useful to use additional tools to explain the contents e.g. drawings on blackboard / flipchart / whiteboard, videos. During one of our Summer Schools one of the teachers illustrated the proportion of soil that is suitable for agricultural production to the whole earth by slicing off pieces from an apple.

Since the Summer School contains numerous intense presentations in a short time, it would be a great support for the students (with differing preknowledge) to get an alignment of the presentation in the overall concept of the Summer School and a detailed outline about the contents of the presentation. The outline should contain the individual outline sections (the titles of the slides) and it could also contain the aims and / or the learning objectives of the presentation.

The outline and the alignment of the presentation in the overall concept of the Summer School can either be represented on a slide or even on a flipchart / whiteboard / blackboard, so it is always present for the students (if you do the outline on a flipchart / whiteboard / blackboard, prepare it before the presentation starts). This outline can also be used as a structuring element that can be referred to repeatedly during the lecture.

Appearance of the teacher

The appearance of the teacher is an important means that influences the motivation, the interest and the understanding of the students. The body language and the way of speaking reveal if you are motivated and interested in the topic and if you are sure about your topic. A positive attitude and a confident appearance are essential prerequisites for the reliability as teacher. Be aware of the signals that you are sending with the way of speaking and the body language. Use them deliberately to generate attention and to encourage the willingness to learn of the students:

- There should always be a welcome at the beginning of a presentation. If the teacher appears for the first time, he/she should introduce him-/herself.
- Foster the interaction with the students (for examples, see below).
- Keep eye contact with the students. This demonstrates self-assurance and gains the attention of the students.
- An important factor for the comprehension of the taught material is a loud and comprehensible articulation, an appropriate rate of speaking and short pauses in speech to give the students the opportunity to reflect what they just heard.
- Apply the modulation of the voice deliberately e.g. to emphasize important terms.
- Avoid filler words.
- Do not interrupt students if they ask or answer a question.
- Show enthusiasm for the subject and try to convey this enthusiasm in the presentation.
- Answer all upcoming questions in an appreciative way.

Comprehension / Transfer

A very important requirement for a successful presentation is that the students comprehend the information that is given by the lecturers. Therefore it is necessary to transfer the knowledge in a comprehensive and appealing way. Several suggestions for this transfer are given here:

- Ask an entry question or formulate learning objectives ("At the end of this lecture you know ... / are able to answer the following question...") → take it up again in between and / or at the end
- Integrate cross references for the alignment of the topic and / or for clarification (e.g. „in some lectures yesterday / this morning…", give an outlook on the remaining / next day). There could also be a short query of the preknowledge from the preceding lectures (e.g. with a quiz: „Do you remember from yesterday…?") at the beginning of a lecture.
- Elaborate on pictures and diagrams when you show them.
- Give enough time when asking comprehension questions, so the heard can be digested.
- End with a deliberate conclusion: e.g. the main points of the lecture, take up a question from the beginning of the lecture (e.g. "When we look back on the initial situation from the beginning, …", "Referring to the overview from the beginning, the main points are…") → the conclusion of a presentation lingers in the memory.

Interaction / Motivation

It is very important to motivate the students, especially when there is so much content in such a short time like during our Summer School “Soil & Water”. The interaction with the students is a simple means to receive their attention and to increase their motivation. Since the attention of the students decreases rapidly after a certain time, there should be a change every 20 - 30 minutes. Small alternations, e.g. interposed questions or interposed tasks (see below) are already sufficient to increase the students’ attention again.

There are numerous possibilities for the interaction with and the motivation of the students to increase their attention. Here are some examples:

- Ask and answer interposed questions → also ask for questions (encourage the students to ask). Those questions could be comprehension questions, ballots, process questions, estimate questions, etc. Examples for questions are: “You see this picture here, how would you interpret the situation?“, “If you compare method A with method B, which advantages / disadvantages are there?“, “How would you interpret these data?“, “What do you think happens, when …“, „What do you think could be the consequence?“, etc.
- Annotate students’ contributions appreciatively so they are motivated to participate (e.g. „Good question“). This creates a pleasant atmosphere (students should dare to ask questions without hesitation) that in turn leads to high attention of the students (no unrest or disturbance by the students) and high cooperation
- Give interposed tasks:
    - Let the students summarize the already heard content (e.g. in a MindMap)
    - Let students explain / interpret pictures, diagrams, tables or similar initially, then add the missing information
    - Let the students create examples
    - Let the students discuss different perspectives, the advantages and disadvantages of methods or concepts, let them do comparisons (e.g. with other concepts or methods) → if applicable also in team work with the seatmate
    - Let the students do the alignment into the overall context during or at the end of the presentation
    - Show film clips with an “observation mission”.
- If something is repeated from another presentation: request the “preknowledge” of the students e.g. with a quiz
- Provide reading material during the break