Workshop on the development of learning outcomes-oriented and modularized study programs

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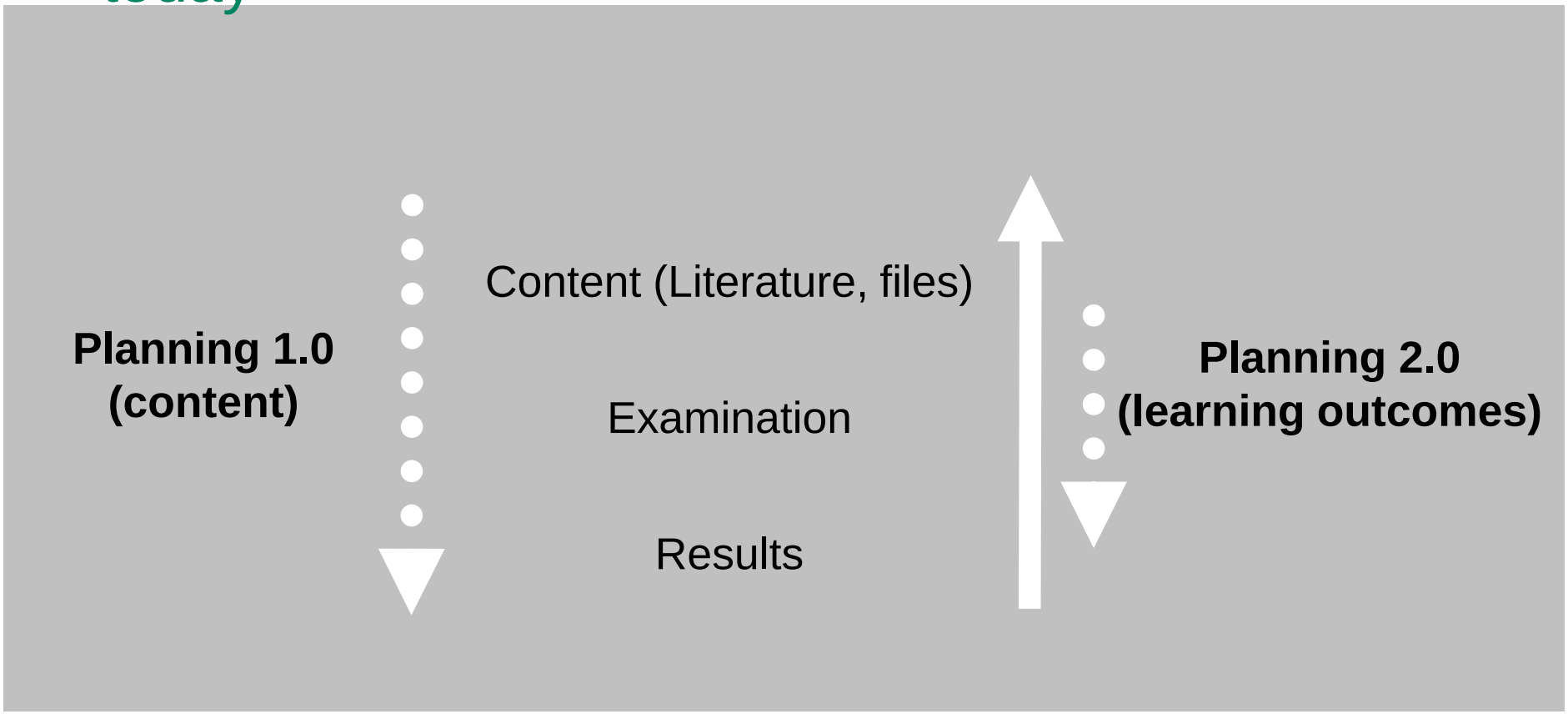
FACHHOCHSCHULE
TECHNIKUM WIEN

> So spannend kann Technik sein.

Planning of study programmes yesterday and today



Development of the study programme

(1) Professional activities

Construction

……

……

……

……

……

(2) Qualification goals

… taking into account the material, the component geometry and the safety requirements, to select suitable manufacturing processes and to plan the optimal manufacturing process sequence.

(3) Learning Outcomes/ Modularizing

… describe state changes and processes thermo-dynamically (for example, theorems of thermodynamics, caloric diagrams).

Development of the course

(1) Learning Outcomes

After completing the course, students will be able to apply the second law of thermodynamics to energy-technical systems.

(2) Test (examination)

Explain the second law of thermodynamics using the example of the diesel engine.

(3) Teaching

- To explain
- Examples
- Methods (for example, partner work)
- Learning actions (What should the students do?)
- Learning tasks

Motivation for study programmes and Modularization

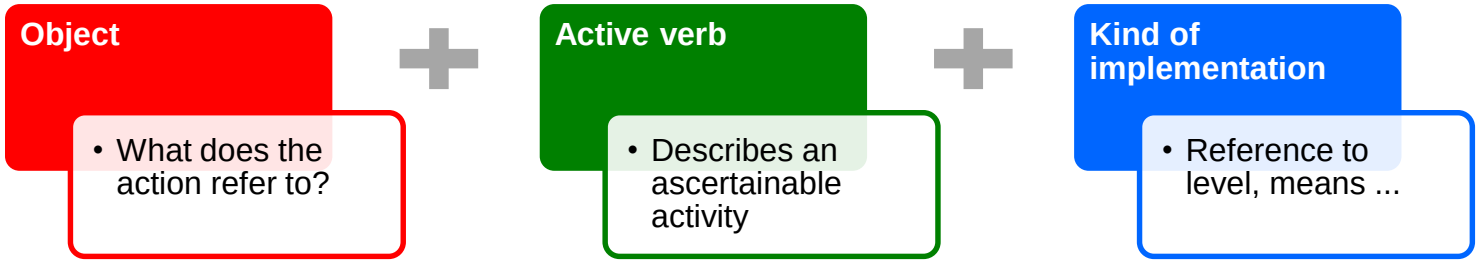
- Organization
  Vocational program and occupational field (qualification objectives and professional activities)
- Learning Outcomes
  Students: Clarity of what they can do after successfully completing a study programme
  (New) Teacher: Study programmes planning aid (= planning from the results)
  Students & Teachers: Possibility to check whether students have really achieved the set goals
- Modularization
  Competency acquisition: networking of partial competences through integrated study programmes
  Examinations: Reduction of the examination load by module examinations

Learning Outcomes – Definition

- Learning Outcomes mean:
  - Knowledge stock
  - Skills and abilities
  - Attitudes or opinions
    Students should have acquired by attending an unit or module.
- Learning Outcomes answer the question:
  - What should students be able to do at the end of an unit or to complete a degree course?

Learning Outcomes: Formulation

- Learning Outcomes … observable / ascertainable / assessable abilities
- Formula: "After successfully completing the course students are able to ...



- ... to design a guide for an interview (standardized or semi-standardized).
- ... calculate the heating demand and the heating load of a building using the software X, Y, Z.
- Recommendation: 3 - 8 learning outcomes per course or module

Learning Outcomes: typical errors

- ... students are able to understand the image of a company in SAP. (not to determine)
- The students know the basics of private law. (not to determine)
- The graduates know about mobbing and know about the possibilities of prevention. (not to determine)
- ... students are able to apply project management methods. (too general)

- ...

Exercise:
Learning Outcomes: Abstraction Level
(Question: Are the Learning Outcomes adequate?)

After successful completion of a course the partizipants are able to…

- … study and compare different types of heat dissipation in terms of their net power. (Energy Systems)
- … evaluate marketing strategies of various online business models. (BWL)
- … understand the picture of a company in SAP. (IT)
- … explain political-economic causes and effects (focus Central Europe) of the October Revolution of 1917. (History)
- … enumerate and explain the criteria to be followed in the medical treatment of patients with tuberculosis. (Medicine)
- ... formulate and solve problems related to ordinary differential equations. (Mathematics)

Solution:
Learning Outcomes: Abstraction Level
(Question: Are the Learning Outcomes adequate?)

After successful completion of a course the partizipants are able to…

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too unconcrete - How and WHAT should be evaluated?

"Understand" is not verifiable!

What are "ordinary" differential equations?
(a) "problems" is very general, and
(b) there are many different "ordinary DGs"

Learning Outcomes
Example „Presentation“

OLD:
The graduates can plan presentations effectively and professionally, design and carry out appropriate target groups.

- ✓ NEW:
  The graduates of this course are capable
- ✓ to present a given situation in a free speech (in the length of 3-5 minutes) in a structured way (if necessary with a tag); (Keyword: elevator pitch).
- ✓ to prepare simple technical issues target group-specific ("non-technicians").
- ✓ to use different variants of the entrances and exits in the presentation.
- ✓ to use both the visual and the textual code in the presentation.

Learning Outcomes
Example: "Embedded Systems"

OLD:
... has gained practical experience ...
... has knowledge of embedded software architecture ...
... the graduate has knowledge in the hardware-oriented programming of embedded systems after successfully completing this module

- ✓ NEW:
  Upon successful completion, students are able to
- ✓ To distinguish (characterize) embedded (embedded) processors and to select them for specific application classes (e.g., building automation);
- ✓ to select or plan a software architecture suitable for the application (with / without operating system);
- ✓ Designing, implementing and testing (software) applications involving peripheral devices (e.g. lighting control) for given hardware platforms.

Learning Outcomes and tasks

Learning Outcomes areas	Verbs (as result detectable)	Tasks (examples)
→ (1) Reproduce and explain → concepts, models, concepts	call, define, rewrite, explain, interpret	✓ Name and explain the second law of thermodynamics. ✓ Explain why the circuit is similar to a water cycle. ...
→ (2) Apply and implement → cases, situations, problems	calculate, solve, apply, transfer, implement	✓ In the following circuit, calculate all resistors and the partial currents. ✓ Apply the second law of thermodynamics to the diesel engine. ...
→ (3) Analyze and develop → Comparisons, analysis, evaluations, problem solutions, innovations	compare, assess, evaluate, evaluate, develop	✓ Evaluate the pros and cons of the three types of cameras available. ✓ Develop a circuit to monitor the fluid level in a vessel. ...