



D2.2 EXAMPLES AND REFLECTIONS AROUND NORWEGIAN LEARNING OUTCOMES DESCRIPTIONS IN HIGHER EDUCATION

SUMMARY

According to the OsloMET description (Norway), as an example, a learning outcome is the knowledge, skills and ability to leverage those, as a result of a learning process. Expected learning outcomes must be described on two levels:

- Overall – for the entire education program
- Course level – for each part of the education that results in credits gained

Description of the learning outcome is the basis for assessment. Since assessments are linked to credits, measuring of achieved learning outcome will happen at the course level.

Expected learning outcomes for a study program must be described in the categories knowledge, skills and general competence. These are defined as follows:

Knowledge: Understanding of facts, concepts, principles, procedures and theories within subjects, subject areas and/or professions.

Skills: Ability to apply knowledge to solve problems and tasks. There are different types of skills – cognitive, practical, creative and communicative skills.

General competence: To be able to apply knowledge and skills independently in various situations by showing cooperation, collaboration, responsibility, ability to reflect and critical thinking in studies and profession.

The qualifications framework aims to shift the emphasis from teaching to learning, focusing on learning outcomes rather than inputs.

The examples that follow below, however, demonstrate that it is still up to the teacher how these general description (or recommendations?) should be interpreted, understood and implemented. There is currently not available any specification at national level in Norway, describing what a minimum standardization for learning outcome descriptions should contain, and how the structure of the learning outcomes descriptions should look like.



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1. COGNITIVE PSYCHOLOGY AT THE INNLAND UNIVERSITY OF APPLIED SCIENCES (Fall 2024)

Course content

The course provides a general introduction to cognitive processes that are involved in and affected by perception, attention, memory and language, and how these processes are distributed in the brain. Some of the main topics are attention, automatic and controlled processes' effects on behavior, memory processes and systems, decision making, problem solving, language and cognitive disorders. Students will also learn how cognitive psychology can be applied in everyday situations (e.g. media and advertising, environmental behavior or criminal investigation).

Learning outcomes

Upon passing the course, the student has achieved the following learning outcomes:

Knowledge

The student

- understands theoretical approaches and explanations of cognitive processes
- has knowledge of measurement and research methods in cognitive psychology
- has knowledge about evaluation of specific cognitive functions
- has knowledge of how individual differences, experience or disorders affect cognitive processes

Skills and abilities

The student

- can explain terminology and theoretical approaches in cognitive psychology
- be able to discuss theories and empirical research results analytically and critically
- be able to use measurement tools for cognitive functions
- be able to plan and carry out a research project in cognitive psychology, as well as analyze and report research results

General competence

The student

- understands the interaction between biological, psychological and social factors in cognitive processes
- can communicate about the factors that influence cognitive processes

Work and teaching methods

Lectures, seminars, practical exercises and evaluations, problem solving, cooperative learning, case-based learning and supervision.

Compulsory activities

Participation in compulsory seminars and approved submission of written work or oral presentation of a research project. Further information (e.g. number, scope, time, content and form) will be provided by the course coordinator at the start of the semester.

CONTENT (The curriculum is transformed into short descriptions of the course content.)

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GENERAL LEARNING OUTCOMES (The content is transformed into brief, clear and specific measurable statements including knowledge, skill and competences.)

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2. PROJECT MANAGEMENT AT THE INNLAND UNIVERSITY OF APPLIED SCIENCES (Fall 2024)

Course content

- Initiation and design of projects, including feasibility studies, pre-projects and sub-projects
- Functions and roles in a project
- Stakeholder analysis
- Budgeting, follow-up and resource management
- Dealing with uncertainty and risk
- Project management tools
- Learning and competence transfer in projects
- Communication and conflict resolution

Learning outcomes

The course will provide knowledge, skills and understanding of various aspects of leadership and management of projects in different types of businesses, including planning, implementation and evaluation of projects.

Work and teaching methods

- Lectures
- Streamed lectures
- Group work
- Self-study
- Writing assignments
- Use of digital learning platform
- Use of templates for project management

Compulsory activities

3-5 assignments consisting of hand-in assignments and multiple choice assignments

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3. INFORMATION SYSTEM AT THE UNIVERSITY OF BERGEN (Fall 2024)

Objectives and content

The course will provide the theoretical basis for participation in work with information systems, whether it concerns administration, investigation or assessment work or planning and implementation of projects.

The course presents different types of information systems on an individual, group and organizational level and discusses how they support modern businesses in different ways. Key issues related to the administration, development, acquisition, introduction, operation and further development of information systems are presented and discussed, together with issues related to security, privacy and ethics. A practical project is carried out as a mandatory course assignment.

Learning outcomes

Upon completion of the course, the student will have the following learning outcomes defined in terms of knowledge, skills and general competence:

Knowledge

The candidate

- has a basic understanding of the role of information systems in organizations and society.
- has knowledge of the purposes and architectures of information systems.
- has knowledge of security, privacy and ethics in relation to information systems.
- has knowledge of the development of information systems.

Proficiency

The candidate can

- discuss information systems from a strategic, user and process perspective.
- explain the differences between different ways of developing information systems.

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4. 3D DIGITAL MODELLING AT THE NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (Fall 2024)

Course content

Teaching in lecture room, field data collection and labor experiments.

Learning outcome

Knowledge: The candidate should have knowledge of:

- the working principle of a laser scanner, the classifications and parameter settings, the error sources and calibrations
- the differences of laser scanning and photogrammetry
- the data format and characteristics of Laser scanning point clouds
- the process of data preprocessing including noise filtering, strip adjustment and data registration
- principles and algorithms of classifications and segmentations, and the object detection as well

Skills: The candidate is able to:

- process the raw data acquired directly from an airborne laser scanner and terrestrial laser scanner
- model fittings by using RANSAC or improved RANSAC
- merge point clouds acquired from UAV borne and terrestrial laser scanner by using different registration methods
- adapt and apply filters from digital image process for 3D point clouds
- detect buildings, trees, street lights and power lines from 3D point clouds
- modelling the detected objects in CityGML

General competence: The candidate can:

- understand the relations and transformations among different coordinate system induced by the sensors (GNSS, INS, Laser transmitter, scanner)
- classify 3D point clouds into several classes (bare earth, cars, buildings and other man-made objects, power lines, pole-like objects)
- segment the 3D point clouds of a building into individual plane or curved facets and model them in 3D either by using data-driven method or model-driven method
- generate CityGML data files for the 3D objects
- understand and use professional terminology within the discipline
- work independently and in team and take the necessary initiatives
- identify common fields between this discipline and other professional disciplines and be open for inter disciplinary approach and cooperation

Learning methods and activities

Teaching in lecture room, field data collection and labor experiments.

Further on evaluation

The students will be given one project with individual task and data under the same topic. Students will be asked to develop their own algorithm based on the knowledge taught during the lecture and implement their algorithm for experimental test. A final report together with digital results are expected for the final evaluation.

Portfolio assessment is the basis for the grade in the course. The portfolio includes a report (70 %) and evaluation of two exercises (30 %). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. For a re-take of an examination, all assessments during the course must be re-taken.

CONTENT (The same principles applied as in example no. 3.)

Teaching in lecture room, field data collection and labor experiments.

GENERAL LEARNING OUTCOMES (The same principles applied as in example no. 3.)

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5. ELECTROMAGNETISM AT THE UNIVERSITY OF OSLO (Fall 2024)

Course content

The course describes basic electrical and magnetic phenomena, as well as laws for electrical circuits, both at direct current and alternating current. The course gives a thorough introduction to Maxwell's equations, and how to use them to derive the characteristics of electromagnetic waves.

Learning outcome

After having completed the course:

- you have extensive knowledge of electrical and magnetic fields, sources of fields, Maxwell equations in integral and differential form, and you can calculate such fields using analytical and numerical methods.
- you can account for electrical and magnetic forces, as well as energy stored in electrical and magnetic fields.
- you know basic phenomena in electricity and magnetism and can account for a range of technological solutions that many use daily.
- you can analyze a linear electric circuit and calculate currents and voltage differences in different parts of the circuit, both for DC and AC.
- you have knowledge of why both traditional and numerical solution methods are important to the subject and have experience in applying both types of methods to electromagnetic issues.
- you can present a chosen topic from relevant physics for fellow students.

Teaching

The first lecture is mandatory. If you are unable to attend, the Department of Physics has to be informed no later than the same day, or else you will lose your place in the course.

The course extends over a full semester with 6 hours of teaching per week:

- 2 hours of interactive lectures
- 2 hours of full class seminars
- 2 hours of full class tutorials with numerical and theoretical assignments

The course includes the following mandatory exercises that must be approved before you can sit the final exam:

- Approved completion of a minimum of 30 learning activities, consisting of: Submission of assignment and correction of a fellow student, both of which must be approved (2 points each, 20 possible); participation in seminars (2 points each, 20 possible); participation in tutorials (1 point each, 10 possible); submission of projects (10 points each, 20 possible)
- Written submission and oral presentation of Computational Essay

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RECOMMENDATIONS FOR FURTHER WORK

A STUDENTS EXPERIENCE

As a student it is important to know what is expected from you in every course. As these examples show there is a lack of standardization in the different course descriptions. This makes it unnecessarily difficult for students to figure out what the course contains and what it delivers. The lack of standardization can lead to students having to guess what the teacher will teach in class. Not knowing how assignments and classes will be set up creates uncertainty and many questions for every student as well as an unnecessary difficulty in maneuvering the course and course materials.

If there was a standardized layout for every course description, the students would better know and know where to find the information they need. In addition, the amount of questions from students to the teacher would be reduced. Students often end up sending numerous emails to the teacher if something is unclear. Having a standardization in the description of the courses would reduce the amount of emails with different questions from the students. The overall experience from the course will be better as well. Anything that can help a student understand what is expected from them is much appreciated. Especially because students often study several courses simultaneously and a standardized system description will lower the levels of stress related to practical information about the courses.

EMPLOYERS NEEDS

Rather than focusing on learning activities and how students will learn, the emphasis should be on the competencies students achieve. It can be helpful to view employers as the target audience, as they are typically more interested in the problems and tasks students can solve using their skills than in the specific activities or assignments completed during their education. What is in particular relevant for employers are descriptions that are highlighting practical abilities, such as problem-solving, teamwork, communication, and technical skills, directly applicable to the workplace.

The description of knowledge should outline the theoretical understanding required for a specific industry or job role, ensuring graduates are prepared to handle job-specific challenges. The ability of transferring skills in the descriptions of learning outcomes, should address broader skills like adaptability, critical thinking, and time management, which are valuable across various roles and sectors. Last but not least, performance based results containing descriptions that focus on what learners can achieve or produce, showcasing their ability to meet professional standards is of added value.

ALIGNING LEARNING OUTCOMES WITH EMPLOYERS' NEEDS IS AN OPTION

An well structured industry collaboration and cooperation program involving employers in designing qualifications ensures outcomes are relevant and aligned with current job market demands. This includes applying a competence focus that is emphasizing measurable, practical competencies prepares learners to perform effectively in real-world settings. Employers value outcomes that demonstrate learners' ability to apply knowledge and skills to resolve workplace outcomes that demonstrate learners' ability to apply knowledge and skills to resolve workplace challenges is supported by including a problem solving orientation of the

CONCLUSION

learning outcomes descriptions. Learning outcomes should prepare graduates for evolving industry needs and encourage continuous learning by underlying the importance of adaptability and application of lifelong learning methodologies.

Employer aligned learning outcomes will help securing that graduates are better equipped to meet job requirements, increasing their chances of securing employment. It means that the employers clearer expectations and more easily assess whether a candidate's qualifications match their job roles and needs. This indeed enhances relevance of the training programs, since the they remain up-to-date with industry standards.

In summary, aligning learning outcomes with employers' needs helps bridge the gap between education and the workplace, ensuring graduates are well-prepared to excel in their chosen fields.

ASSIGNMENT DESCRIPTIONS

Incorporating assignment texts into learning outcome descriptions serve as an effective alignment tool. It allows the assignment itself to clarify the broader purpose of the task for students. This approach also encourages students to reflect on what they are learning, how they are learning it, and why it matters. Additionally, it helps students identify which aspects of the learning outcomes are most relevant to the task and consider the best ways to demonstrate their competence through the assignment.

Clear and well-understood descriptions, paired with assessment methods designed to accurately evaluate whether the intended competencies have been achieved, can help prevent unexpected challenges for students during their education. In this way learning outcome descriptions will serve as a shared agreement between the institution, lecturers, and students, since they clearly outline expectations for both the staff and the students.

In most subjects, the emphasis on knowledge, skills, and general competence will vary. Some courses are primarily designed to provide students with a fundamental knowledge base to build upon in future courses. Others focus on developing practical skills and proficiency in specific methods and techniques. Still, others aim to equip students with training and competence in interdisciplinary collaboration. While it is important to have clear and specific learning outcome descriptions, they should not be so rigid that any changes in the study program would require revisions of the learning outcomes.

Competence descriptions at the course level must be designed to effectively evaluate the skills and knowledge acquired. Additionally, the learning activities and assessment methods should be clearly aligned with these competence descriptions. It is essential for course descriptions to clearly outline the core aspects of the course and for the learning methods to effectively support the development of the intended competencies. Throughout the course and at its conclusion, assessment methods should accurately measure whether students have achieved the expected competencies. The choice of teaching methods significantly influences what students perceive as important within the subject, and the assessment methods must be both relevant and aligned with the way students have been taught, what they have learned and the work-based training received.