

Coordination and development of a master course with many teachers – using a “Competence matrix” for the planning process

Katrine Worsaae

Section of Marine Biology, Department of Biology, SCIENCE, University of Copenhagen

Introduction

Master and PhD courses at the University are often multidisciplinary or cover many scientific subjects. There may be multiple intended learning outcomes, some of which may span over several subjects. In these types of courses a high scientific level and research-based teaching is often accomplished by involving many different teachers. However, the course coordinator hereby faces many challenges in the planning and coordination process of the course.

The intended learning outcomes (ILOs) of the course have to be coordinated to supplement each other, build an overall unity, and possibly support more broad and cross-disciplinary competences with higher learning levels (according to the SOLO-taxonomy). The choice of teaching/learning activities (TLAs) should reflect not only an alignment with ILOs and assessment, but also a coordination of the contributions by the various teachers. This will ascertain that the ILOs are operational and that the course in total fulfills the ILOs with maximum learning level and minimal repetition. The highest level of understanding and structural complexity is often achieved through student centered TLAs combining several subject areas and encouraging a deep learning approach (Biggs and Tang; 2007). This requires a proper communication and coordination process involving all teachers in the planning of the course. This process is necessary in order to assure that the acquired competences and their level can be assessed.

In a course involving many teachers from different sections, the teachers will often see their individual role as being isolated assisting experts without overall course ownership. This situation may be underlined by the ongoing educational change from subject/content-determined education to competence-driven education (through definition of ILOs). They may therefore be less willing to engage (and spend time) in the coordination and development of the course and only feel responsibility for their specific ILOs and not the overall or broader ILOs of the course. It is therefore a challenge for the course coordinator to encourage the involved teachers to take responsibility and ownership in order to develop and coordinate the TLAs, fulfilling the entire course ILOs. The communication and coordination process has to be initiated and lead by the course coordinator, and must be engaging, open, constructive and time efficient.

In order to make competence-driven engineering education The Danish technical University (DTU) has employed an international engineering education strategy called CDIO (see www.CDIO.org). This strategy encourages cross-disciplinary teacher-teams to use a ‘competence matrix’ as a communication and structuring tool in the coordination and development of whole educations. According to the CDIO Handbook for DTU (under development; pers. com. Michael May): “The purpose of the matrix is to visualize the contribution by the individual courses to the competence objectives (ILOs) of the education as well as to visualize coherence among the courses. It thereby becomes an instrument for evaluating and adjusting the academic coherence of the courses and which competences they require and supply to each other. Furthermore, it becomes a tool for assessing and adjusting the overall flow of competences through an education, and e.g., avoiding unmotivated jumps in learning levels.” The report “Kompetencer og matematikl ring” by the Danish Ministry of Education (Niss and Jensen; 2002) likewise suggest a matrix-structure to relate subjects areas to competences (see <http://imfufa.ruc.dk/kom> or <http://pub.uvm.dk/2002/kom/08.htm>).

This project attempts to use an adjusted ‘competence matrix’ to optimize the coordination and level of learning outcomes of a single course, covering a lot of subjects taught by different teachers. The matrix was used to structure and focus the communication during a meeting with all involved teachers. The intention was to visualize the contribution by the individual subjects (teachers) to the overall competence objectives (ILOs) of the course as well as to visualize coherences, progression of common competences, and possible repeated or untreated subjects. The matrix was

furthermore expected to provide an engaging, neutral, intuitive, time efficient and focused frame for the communication and coordination process. The goal of the meeting was to encourage the teachers to take further ownership and increase their consciousness on learning level, hereby inspiring to improvements and pinpointing necessary adjustments of TLAs, specific and common ILOs (and their mutual alignment).

The specific master course has no assessment of students, except for active participation during the course. However, formative feedback is provided consistently throughout the entire course and after specific student activities. There are only 16 students allowed on this course (limits set by the space on the research vessel), which allows especially the primary teacher (course coordinator) who is present during most of the course to have a very detailed comprehension of the acquired competences of the individual students. Furthermore, an additional course evaluation was this year performed by the students on alignment of TLAs and acquired competences. This was achieved by letting them fill out the same matrix, marking which of the ILOs they had acquired, during which part of the course.

The course has run for many years under various forms and locations with different course coordinators, but some consistency in ILOs. The course coordinator is newly appointed, but has been allowed to markedly influence the course coordination throughout the last couple of years, assisting the former coordinator. Therefore the main ILOs and TLAs (and logistics) had already been developed by the author and others through several years of practice. Additional ILOs and adjustments of former course ILOs were suggested by the author in a former assignment this year during the higher education teaching course (“adjunktpædagogikum, KU”). These ILOs were included in the ‘competence matrix’ beforehand and at the meeting with the other teachers the matrix was mainly used to focus on alignment, additional TLAs and learning level. However, the matrix could as well be used as a tool for developing new courses.

Material and methods

Course

The course “Marine Faunistics – biology and diversity of marine fishes and invertebrates” is a one week intensive internee master level summer course taking place at a marine biological research station in Helsingør, Denmark

(Section for Marine Biology (MBS), Department of Biology, University of Copenhagen). The course includes field work and collecting of fresh material every day (either with a research vessel or from the beach), exploring the various marine biological collecting and processing techniques. The collected material is examined in the field and/or is brought back to the laboratory for further study and identification. Theory on the various marine groups and group work on various relevant subjects and overall perspectives takes place in the field as well as the laboratory facilities. The course is run by one primary teacher (the course coordinator, author), present most days, and seven additional teachers (from MBS and the Natural History Museum, University of Copenhagen) that each teach from a few hours to up to two days during the course depending on their area of expertise and its treatment in the course. The course involves extensive logistics and many different intended learning outcomes, some of which are cross-treated or build up over several days. The collecting and processing of samples often provide material useful for several different subjects during the course, why an optimal coordination of logistics, subjects and learning outcome is crucial. The primary teacher secures this organization, coherence and continuity during the course.

Competence matrix

A new method or instrument, a ‘competence matrix’ was used in the coordination and developmental process during planning of the course this year. The matrix was made so that the course ILOs were presented as row headings and each course day (= subject area) as column heading (see Appendix 15.1).

An additional evaluation by the students of the constructive alignment of intended learning outcomes (ILOs), teaching learning activities (TLAs) and acquired competences was performed by filling out the same ‘competence matrix’ with marks for acquired ILOs.

Results

During a meeting with all course teachers, everyone commented in the competence matrix (Figure 15.1) on their covering of ILOs and indicated their predicted learning level: increasing numbers 0-5 according to increasing learning level, following the ranks of the SOLO taxonomy (see Biggs and

Tang 2007). Ownership, development of TLAs in order to maximize learning levels and achieve ILOs, as well as phrasing of ILOs and operational TLAs were discussed. A few missing teachers filled out their part of the matrix afterwards.

A few additional challenges were discussed during the meeting:

1. Very different backgrounds and qualifications among the students. Suggestion: more group work implemented in the TLAs, constructing the groups with students possessing different qualifications.
2. Last year students warranted even more activating and independent problem solving (despite the time consuming collecting and identification in itself should be experienced as activating, and three major student assignments including presentations (Tuesday, Friday /Sunday,) were already incorporated last year). Suggestion: more time during three assignments to perform independent problem solving, student presentations, further institutionalizing by teacher and formative feedback – to make students realize their actual achievements.
3. How to limit lectures and at the same time secure common high level of qualification before practical work. Suggestion: encourage literature study before course start, and more theory delivered during practical work – not lectures.

The ‘competence matrix’- meeting with the teachers resulted in very focused suggestions for adjustment of the course. During the course this summer all teachers were very engaged, well-prepared, incorporating their knowledge on the intended learning outcomes of other teachers in their own TLAs to achieve their own ILOs and support the common ILOs. Several teachers had adjusted their lectures to a more appropriate level and length, and some had prepared new student centered TLAs to fulfill the ILOs and higher learning level (hereby also including more group work and activation of students).

In addition to the more broad evaluation scheme filled out by the students every year the students also filled out the ‘competence matrix’, setting a mark for achieved ILOs under specific course days (number of marks indicated by shading in Figure 1). This additional student evaluation showed an overall satisfying alignment of ILO and TLAs and an interesting congruence with most marks for the student centered TLAs, implementing a deep learning approach. Furthermore, minor necessary additional adjustments of the ILOs were pinpointed through this written evaluation in combination with an oral evaluation.

Afterwards the answers of the common course evaluation scheme were compared with the results of the previous year evaluation. The adjustments performed had clearly improved the evaluation of the course, even for a course already positively evaluated the previous year. This year the course was highly praised for the organisation, coherence and good balance of different types of TLAs. The students further recognized the exceptional good working spirit and atmosphere of the course. It was also the impression of the course coordinator that the students were more engaged and conscious about their own acquired competences this year.

The improved logistics, organisation and coordination of the course this year can, to a large degree, be related to the optimized planning process employing the 'competence matrix'-meeting with the other teachers. Any type of meeting involving all teachers would of course have improved the coordination and planning of the course, but the use of a 'competence matrix' might have caused the high efficiency, focus and easy development of new improvements achieved through a single meeting.

Conclusion

A 'competence matrix'-meeting is definitely recommended as a tool for structuring the coordination of courses with many different teachers, ILOs and TLAs. However, to obtain full value of the information gathered it is suggested to specify the ILOs and TLAs as much as possible, and further than what was done in this project. In addition, the matrix was useful in engaging and inspiring the involved teachers as well as supporting the course coordinator in handling an otherwise possibly delicate discussion on the TLAs of other teachers. The matrix may prove even more useful for building new multidisciplinary courses, involving many teachers.

Course day/ Subjects/ TLAs:	Pre- pared	Mon: Fish & parasites	Tue: Fish	Wed: Crustacea/ Plankton/ Sand habitat	Thurs: Mollusca/ Epifauna	Fri: Annelida/ Mudd habitat/ Quant. study	Satur: Meio- fauna/ Tree of life	Sun: Student present./ Eval- uation	Learn- ing level: (only teach- ers)
ILO (in Danish):									
ILO 1: beskrive de største benthiske, pelagiske og parasitiske dyregrupper morfologi, biologi og taxonomi		3	3	3	3	3	3	3	0
ILO 2: kunne relatere ILO 1 til evolution		2	2	2	2	2	5		1
ILO 3: kunne relatere ILO 1 til bundtype (miljø).		3	4	3	4	3	2	5	2
ILO 4: artsbestemme danske marine fisk samt individer tilhørende de største danske marine benthiske inv.-grupper		5	5	5	5	5			3
ILO 5: opnå indsigt i de største marine dyregrupper fylogeni og evolution		1	1	1	1	1	5		4
ILO 6: Opbygge metodekendskab til indsamling af danske fisk og benthiske og pelagiske invertebrater		3	3	3	3	3			5
ILO 7: anvende teknikker til indsamling og ident. af marin meiofauna				3	3	3	5		
ILO 8: anvende teknikker til indsamling og ident. af holo- og meroplankton				5					
ILO 9: vurdere hvilket redskab bør anvendes på vilkårlig bundtype til vilkårlig faunaindsamling.		2	2	5	2	5			
ILO 10: skelne kval./ kvant. redskaber & ident. faunaundersøgelsers kvant. & redskabsmæssige udfordringer						3		5	
No. of students that marked they achieved this ILO during spec. TLAs (max. 14)	0	1-4	5-8	9-12	13-14				

Fig. 15.1. Competence matrix. Numbers indicate learning levels (the higher number the higher learning level, following the ranks of the SOLO taxonomy) predicted by teachers during the meeting (when irrelevant no number is marked). Shades indicate number of students agreeing under the course evaluation to have achieved the ILOs during the relevant course day (the darker shade the higher number).

All contributions to this volume can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/2008-1/

The bibliography can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/kapitler/2008_vol1_bibliography.pdf/