Promoting student learning using constructive alignment with intended learning outcomes in LUMES

> Kim Nicholas 29 August 2019

TL;DNR (read this + slides 3-4)

- Intended Learning Outcomes are the red thread of teaching and learning. They represent both what a student should be able to do upon course completion, as well as our legal obligation as teachers to deliver.
- All LUMES course responsibles should fill out the templates on the next 2 pages to demonstrate how course activities and key literature are aligned with Intended Learning Outcomes.
- These templates should be reviewed by the Director of Studies and at the teacher's meeting as part of approving a course. This is especially important for new teachers and for major revisions of courses.
- Once DoS and teachers' meeting have approved these templates, it should be shared with the LUCSUS board along with course syllabus (listing learning outcomes), study guide (listing activities and what happens when) and full literature list to inform course approval.

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• These templates should be communicated to students in the study guide and on the first day of class to aid in their learning.

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Intended Learning Outcome	Activities	Foundational literature (selection from full list)
1. physical, chemical, and biological aspects of Planetary Boundaries	Lectures Problem set	Steffen et al., 2015 Burch & Harris 2014
2. Scientific research process	Breanäs field excursion Research design Poster Research project	Research Design workbook
3. visually and statistically represent, analyze, and interpret quantitative data	Data tutorials Poster project Problem set Final paper	Making Data Meaningful, 2016
4. Demonstrate skills in academic writing	Pre-course Assignment Peer tutoring Peer reviews Papers	Nicholas et al., 2016 Writing guide materials on Live@Lund
5. Leadership, communication, and effective group work	Breanäs Groupwork with Amanda	(none, but there should be!

Activity	Contribution to Final Grade
Pre-Course Assignment revisions (Submitting	Pass necessary to pass the
Draft 3 with strong claim and correct APA referencing)	class
Data Project	
Data Tutorials (3 total, 5% each)	15%
Quantitative Project Poster	20%
Problem Set	25%
Research Paper	
Revised Research Proposal	5%
Peer review of partner's paper	5%
Final paper	30%
activities should be designed for students to a	develop and demonstrate they



Why do I need Intended Learning Outcomes?

- To improve student learning and teaching effectiveness: Pedagogical theory taught at Lund University is based on using constructive alignment with intended learning outcomes for high-quality teaching and learning.
- Course responsibles (overseen by LUMES Director of Studies) are legally obligated to deliver a course that meets the Intended Learning Outcomes in the syllabus approved by the LUCSUS Board and S-fac.

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What is Constructive Alignment?

"Constructive alignment is the process of ensuring that course learning goals, activities, and assessment tasks are coordinated to produce the intended outcomes for student learning (Biggs and Tang, 2011). Critically, this approach places student learning (rather than teacher activities) at the center of the class, and ensures that the course focuses on essential skills, content, and mastery levels expected of the students. These should be made clear at the outset, and can be used to check the importance of various course activities."

Source: Nicholas 2013, final report LATHE 2. http://www.kimnicholas.com/uploads/2/5/7/6/25766487/nicholas-ess-proposal-final.pdf

Shoe-Tying & Constructive Alignment

"Biggs and Tang (2011) give a clear example of constructive alignment from real life. In teaching a child to tie her shoe, the intended learning outcome is that the child is able to tie her shoe independently and with proficiency so that the shoe stays on her foot. The activity used to achieve this outcome is lots of practice tying her shoe (not listening to long instructions on, or reflections about, shoe-tying, or watching a sildeshow about how other people have tied their shoes). The assessment is based on whether or not she can tie her shoe.

This simple example illustrates many important points about intended learning outcomes, and about the process of constructive alignment. First, learning outcomes represent an absolute rather than a relative bar. To pass the class, or to be considered a proficient shoe-tier, the student must be able to demonstrate a sufficient level of proficiency. The important thing is not how well a student performs relative to other students, but how well they perform relative to the standards established by the learning outcomes. Second, learning outcomes must contain a verb that specifies the activity that the student is expected to perform, and this skill must be practiced through the design of thoughtful teaching and learning activities that allow the development of skill and the opportunity (for self-reflection on learning, as well as teacher and peer feedback, some of the most important terms for promoting student learning (Biggs and Tang, 2011). Finally, it is important to "start with the end in mind," knowing what it is that you want students to be able to do as a result of your course (that is, what is the learning that you want to take place), so that you can design the class to achieve this."

Source: Nicholas 2013, final report LATHE 2. http://www.kimnicholas.com/uploads/2/5/7/6/25766487/nicholas-ess-proposal-final.pdf

Formulating Intended Learning Outcomes

"Biggs and Tang (2011: p. 125) state that learning objectives should be formulated to stipulate the verb at the appropriate level of understanding, the topic content that the verb addresses, and the context and level of quality in how the verb is performed. In other words, we should specify what it is that the student should be able to do after the learning process, what subject it is that the student should be able to do after the learning process, what subject it is that we want them to apply their action, and the level of mastery that is demonstrated in performing the skill in relation to the content. To ensure that each of the three elements are present, we learned in the LATHE course that it is helpful to highlight them to allow quick visual inspection. Here I have highlighted verbs in yellow, **substance in green**, and **quality level in blue.** For example, an example from the LATHE class stated that an ILO for a course on economic history might state that students should summarize and analyze academic texts **about economic history in a comparative, evaluating manne**

Source: Nicholas 2013, final report LATHE 2. http://www.kimnicholas.com/uploads/2/5/7/6/25766487/nicholas-ess-proposal-final.pdf

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Pedagogical Theory for ILOs

"To support curricular alignment, it is helpful to select the active verb from a taxonomy of learning verbs, such as Bloom's revised taxonomy (Krathwohl, 2002), or the structure of the observed learning outcome (SOLO) taxonomy (Hattie and Purdie, 1998). These are classification systems that go from more simple, memorization-focused skills, such as "recall or name", to more sophisticated, multistructural skills, such as "apply, compare, and analyze", eventually culminating in extended abstract skills such as "hypothesize, synthesize, or design." This allows designing ILOs to exhibit progression and ensure the intended outcomes are at an appropriate level of mastery. While there is room for developing many skills, at the master's level, the focus should be on higher-order skills that are linked with the higher level of understanding expected at this stage, where students have moved from multistructural to relational and extended abstract abilities (Biggs and Tang, p. 125), and are able to apply functioning rather than declarative knowledge (Biggs and Tang, p. 81-83). For more information on these two taxonomies and a comparison between them, see Appendix 1."

Source: Nicholas 2013, final report LATHE 2. http://www.kimnicholas.com/uploads/2/5/7/6/25766487/nicholas-ess-proposal-final.pdf

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Old example slides from class

 I present the following slides to students on the first day of class so they are aware of what the ILOs are in the class and what kinds of activities they will do to achieve them.



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Course Learning Outcomes

(Scientific process knowledge and skills)

 A capacity to understand the scientific research process, including such aspects as problem formulation, analytical reasoning, experimental design, data collection and analysis, and presentation orally and in writing;



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Course Learning Outcomes

(Communication and information skills)

4. Skills in academic writing, and the independent use of academic libraries and resources, including bibliographic databases, to critically evaluate, process, and compile information as needed,



