Analysis of NS Intro course

Using given course design principles

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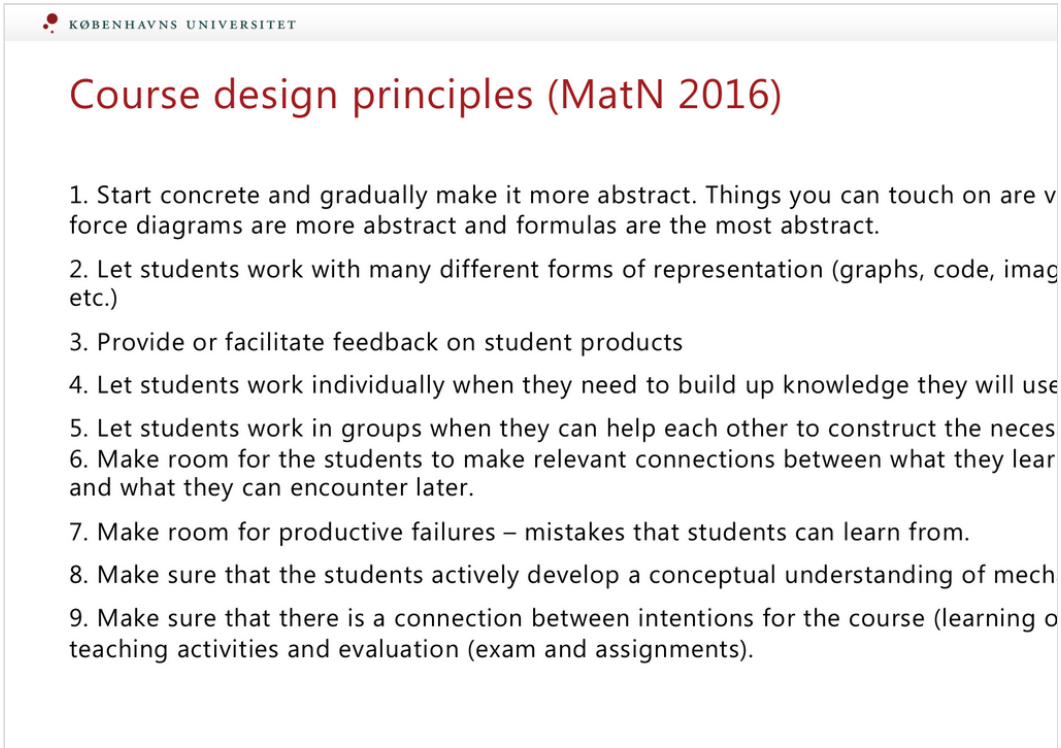
Task

The principles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Course design principles (MatN 2016)

1. Start concrete and gradually make it more abstract. Things you can touch on are v
force diagrams are more abstract and formulas are the most abstract.

2. Let students work with many different forms of representation (graphs, code, imag
etc.)

3. Provide or facilitate feedback on student products

4. Let students work individually when they need to build up knowledge they will use

5. Let students work in groups when they can help each other to construct the neces
6. Make room for the students to make relevant connections between what they lear
and what they can encounter later.

7. Make room for productive failures – mistakes that students can learn from.

8. Make sure that the students actively develop a conceptual understanding of mech

9. Make sure that there is a connection between intentions for the course (learning o
teaching activities and evaluation (exam and assignments).

CourseDesignPrinciples
PDF document
PADLET DRIVE

Group task 1

1. Find the NS intro course: https://pan-learning.org/moodle/course/view.php?id=34
2. To what extent does the course align with Principle 1? What (if anything) could be done to increase this alignment in bleded/purely digital course (choose one)
3. Select one of the other principles and repeat.

Working Group 7

Principle 1: Start concrete

We thought the course starts a little abstract. It could be more concrete if it started with examples of what can be measured with neutrons (e.g. protein structures, magnetic structures) - something students can relate to.

Making Readings easier

Have alternative formats of the same text material. E.g. if students can't face reading a large amount of wiki text, it might be good to have a pdf which can be printed out and annotated by hand.
Or also a video of a lecture giving the same material.

Principle 2: Many representations

intro-ns has some of this - it shows graphs of SANS and reflectivity data, and has diagrams of set-ups, and relevant equations.
It could be improved by adding small elements of coding - e.g. by having a small script whose parameters users can change which plots the result.

Layout / ToC

On Moodle, this is a forbiddingly long list of reading and quizes.
It might be more amenable if there was a diagram in the learning goals page about which topic depends on which others - e.g. if SANS is independent of neutron sources and instruments or not.

Principle 3: Feedback

How to provide this on Jupyter notebook?
There are some hints / feedback on quiz in intro-ns.

Working Group 3

Imaging course

Principle 1

The course adheres to this principle in the sense that it gradually introduces the students to the theory of neutron imaging by going from practical examples to more abstract examples including formulae

We looked at the imaging-section in the intro-ns course.

Clear manifestation of principle 1 and 2

Principle 2

Use of many different types of representation, text, graphs, images, formule

Principle 5

Is present at the end in the form of a wiki problem / pen & paper exercise

Working Group 4

We are looking at the SANS course

Principle 1
The first "lesson" after the Learning Goals is a lectures on SANS theory
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This could be improved by showing what SANS can be used to study; colloids, biomacromolecules
This can be linked with scattering curves (real data) and how these are related can be introduced.

Principle 2
There is very little interactivity.

Having examples of scattering curves, maybe with interactive elements (ie. changing the radius of a sphere and getting new scattering curves as a result).
Fewer formulas, more conceptual descriptions.
Images in the existing material are good.

Principle 3
There are some questions in the form of "wiki quizzes".

These do not enable "student feedback" but can offer hints. It would be more useful for these to be in the form of a Moodle quiz where answer-specific feedback is available.
Possibly a student comment box can create informative feedback for the teachers.

Principle 4
This aligns well with the SANS course because the pan-learning platform is designed with lone working in mind.

Principle 5
This does not align well with the SANS course, as the pan-learning platform is designed with lone working in mind.

Principle 6
Not clear if the course achieves this.

The volume of equations could be useful for use later in career. For example, in the model-dependent fitting of data.

Additionally, the "virtual experiment" offers an analogue to the "real thing".

Principle 7
Not a lot of places to "fail", and those that exist the student gains little from the failures that exist.

Feedback in the Moodle quiz could facilitate "positive failure", using the "try again" functions. Useful to get feedback during the quiz, not as helpful at the end.

Principle 8

There is some kind of "live" exercise at the end, but the teacher will not get feedback.

Working Group 5

Observation 1: Prerequisites not detailed enough

In the NS topic: For a nuclear physicists the course starts with some very concrete examples. From a non-physicist view these are already quite abstract.

Give an example early

For non-physiscist at least, it would be valuable to start with an example of the phenomenon.

The NS course would benefit from a simulation

Allowing learners to play around with the parameters and being able to observe the resulting output image would increase engagement and understanding. One could even let participants play around to match the output to a given target image.

Adding application of the formulae examples

Having some application of the formulae on concrete cases before the exercise

Wiki page links

Many of the links point to different sections of the same wiki page. It's not obvious where a student should stop reading & return to Moodle for a quiz or similar.

Show how the formulae are derived

A formula is good for application but how it gets derived helps more for understanding.
Or let students derive them from a given outset (group work?) which also allows the teacher to judge whether students understood the related context or had to improvise some steps.

Working Group 6

We take basics of neutron scattering

The first paragraph tries to be catchy quoting Nobel Price winners and stating main scientific fields that are served. This could be elaborated more with examples and introducing the breadth of techniques/parameter space...Instead of a warning how rare and complicated it is...Scaring people

meaning of "concrete"

concrete could also mean "something that you already know" then from this, you go to something "abstract", which is something you dont know

Ask questions as a good way to make it concrete

Use a didactic quiz before going to the extensive text. For example, on this part: "One of the remarkable consequences of quantum mechanics is that matter has both particle- and wave-like nature[1].", one could ask first: "is teh neutron a particle or a wave?"

The paragraph "Five reasons to use neutrons" comes to late and should appear eary inthe beginning.

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