Course Analysis – DM1588 – Spring 2021

Author: Marianela Ciolfi Felice. ciolfi@kth.se

1. Description of the course evaluation process

The students had two student representatives that collected feedback before the länkmöte. The feedback was presented at the meeting by the Study Board president. The course evaluations were filled in by around 14% of the students (10/71), from which 90% were men (9/10) and 10% were women (1/10); and 10% declared having a disability (1/10). Students did not make specific comments on gender or disabilities in their evaluations.

Each student also had the opportunity of writing personal reflections about their learning experience, as well as filling in the anonymous course evaluations. I, the course responsible, reminded them about these different channels during class meetings. The personal reflections were an optional assignment on Canvas, available towards the end of the course, and were submitted by 49.3% of the students (gender and disability data were not collected in this case, since it would not be anonymous).

Once the course evaluations were closed, I held a Course Analysis Meeting with two other course responsibles to discuss the results and analyse what needs to be improved for the next course round.

2. Description of meetings with students

Due to the Covid19 pandemic, meetings face to face were restricted, thus individual feedback was collected via the methods described in point 1.

3. Course design

The course has 7 class meetings consisting primarily of lectures given by the course responsible or guest lecturers; 6 lab assignments to be done in pairs during 7 lab sessions where students can get support from the course responsible and student teaching assistants (TAs); and one project where two lab pairs collaborate to create an interactive installation, and where they can get support from a teacher during 3 supervision meetings (this year, two on-demand supervision sessions were added closer to the project deadline) before presenting a demo video.
The first week, the groups (self-made) are given a kit with all the material they need to complete the course.
This year, the students had access to extra support from the teachers via email; from teachers and peers via the Discussions forum on Canvas; and from MIDDLA managers by booking slots with them on campus (for example, to get support in soldering their electronic components). No scheduled session was mandatory (as established in the syllabus), and each was conducted over Zoom due to the pandemic (except the soldering).

Regarding the constructive alignment, each of the class meetings and lab assignments contribute to one or more intended learning outcomes (ILOs) and building blocks of the project, so that succeeding in the labs equips the students to succeed in the project, where they further acquire team working and presentation skills. The students receive continuous formative feedback when they submit each lab until they get a "pass", as well as during project supervision. The project's grading criteria is designed to assess that the ILOs have been achieved, and the project is graded only after students have the opportunity of getting peer feedback and improving their final submission.

This is the second time that the course was run, and with a new course responsible. I substantially developed the course, based on feedback from last year's students (directly from their personal reflections and course evaluations) and from last year's TAs.
Changes implemented to address such feedback include: creating 3 lectures from scratch, to take a deeper look at sensors and actuators, as well as design/prototyping methods for physical interaction;

maintaining only 2 of the 4 original guest lectures (and offering the rest as complementary material); improving the description of the assignments; creating and uploading demo videos for the labs (e.g. how to use a multimeter, how to wire and program a basic resistive sensor, a voltage divider, etc.); coordinating a grading schedule among the teachers so that students' work was graded right after each assignment deadline (to allow students to incorporate corrections before the new lab started without having to pull apart their circuits); and offering a course outline on Canvas, with the week-by-week activities and preparatory tasks, from the beginning of the course.

In addition, I dealt with getting back last year's equipment kits, and created a stock of the available material, incorporated a signup sheet to track who has the material, coordinated with this year's students to return it before the end of the semester, and ordered new sensors, actuators, and general electronics supplies to make sure each kit was varied enough to achieve the ILOs.

4. **Students' workload**

The course has 4-6 scheduled hours per week, plus an estimated load of 10 hours per week to dedicate to the project, which starts half-way through the course. From those who filled in the course evaluations, most students (7/10) spent the expected amount of time, i.e. between 12 and 17 hours a week. They did not comment on varying workload across the course.

5. **Students' results on the course**

All the students who followed the course and submitted their work have successfully passed both the labs and the project. Only one student did not submit the assignments (did not have the time to do it so far), and only one student did not take part in the project (did not plan to do so).

6. **Students' answers to open questions**

In the course evaluations, several students highlighted how interesting and fun it was for them to work with sensors and actuators, as well as having the freedom to be creative and choose the project topic on their own. They also emphasised having learnt a good deal and getting support from the teachers. Some students did not like having to do group work during a pandemic, and some wanted more specific requirements for assignments as well as more explanations of basic electronics concepts given that they had not studied this topic in English before.

7. **Summary of students' opinions**

The course evaluations show that several students appreciated the course. The most critical feedback might be explained by a combination of running a course heavily based on hardware and group work during a pandemic, and the fact that this is a very new course that is starting to be developed after being run only once before, so there is room for improvement.

The personal reflections (completed by roughly half the students), show a generalised positive outcome and constructive feedback that will indeed improve the course for the next round. The questions included in the reflection were complementary to those in the course evaluations (to avoid redundancy): they were mostly about their personal experience while doing the project, and also asked the students to identify their main take-away from the course as well as any concerns they had about their participation.

Unsurprisingly, many students would have preferred to follow this course in person. However, several commented that the format worked well or well enough in Zoom, and one even appreciated being able to work at home without distractions and at their own pace.

The answers show that many really enjoyed the course and listed a variety of take-away learnings that not only align with the ILOs but also go well beyond them. For example, several students ended up buying their own Arduinos after the course and said that they will be creating projects for fun this summer, and to use in design projects later in their studies. Moreover, some students said this course made them realise they want to pursue the interactive masters track at KTH; and some gave specific arguments on why this was either the best or among the top courses they had taken so far. For example, a student wrote: *"I really liked this course. It felt like I got the chance to explore this subject. That I could go as far as my ambition let me and always had someone to ask if I needed help along the way. It's probably how I would want to learn everything at KTH."*
Some mentioned acquiring or refining general skills through this course, such as: systemic thinking, creative thinking, problem solving, team work, taking an active role in learning, managing their time, getting a broader understanding of how software and hardware work, searching for information effectively, etc. Finally, some students reflected upon an increase in their self-confidence when it comes to manipulating hardware and wiring, programming, and in general undertaking practical projects.

8. **Overall impression**

My overall impression is that the course was well received, accounting for the students' feedback as well as their attendance to class meetings in spite of them not being compulsory, and their requests for the recordings whenever they could not attend. Several groups of students got inspired by a lecture on physical materials and went on to create their own homemade sensors, which they used in quite creative ways.

The design methods introduced this year seem to have worked very well in relation to group work and social dynamics. For example, according to several students, the 'one silly idea' rule that I encouraged to use during brainstorming made them relax about having to come up with good initial ideas, and generated a larger number of ideas; and the 'yes, and…' method allowed some students to be less judgmental with their own and others' ideas and build upon rather than discard them too quickly.

It was expected that students would find group work during a pandemic challenging. Sharing equipment was needed due to KTH not offering individual kits. Still, students had the chance to collaborate via Zoom, to meet in outdoors spaces with face masks (for example, to test radio communication they could be 100m apart), and to buy their own extra equipment to further practise alone.

9. **Analysis**

After analysing this course round, I consider that the ILOs (currently 11) should be simplified to avoid redundancy, to better reflect that the course is 6 credits, and to be more realistic and in line with later courses (for example, covering too much ground in electronics is too much to handle in less than one period, whereas higher-level knowledge about concrete sensors can be more valuable in their studies and when working in research or industry). Identifying and updating the core ILOs would allow the teachers to deal with them in more detail during the course.

Only one student with a disability filled in the course evaluations but did not comment anything about this, so it is not possible to extract any conclusions. Similarly, only one woman filled in the course evaluation, so dividing the analysis by gender does not offer representative insights. Still, when reading the project reports, I noticed a pattern in groups that appeared to be mixed gender (gender data was not collected for project groups, so this comment is based on the pronouns that students used with each other during the course, and in the report). In several instances of such groups, students' division of labour between programming and design/physical prototyping roles seemed to follow broader gender stereotypes in society. The reasons should be further explored at the programme level at KTH and not just in one course.

If the course were to be run again in a remote setting, team work with hardware should be rethought, and KTH should consider providing each student with one kit to complete their assignments without depending on other students' proximity, otherwise the ILOs risk to be not achieved. In addition, and even if the course is run in person, group dynamics should also be further addressed at the programme level, as some students seemed to struggle with this at a deeper personal level, regardless of the pandemic.

10. **Prioritized course development**

The assignments' descriptions will be further improved, together with the grading criteria for the project, to align them with the updated ILOs. Addressing a valuable piece of student feedback, I will consider adding optional content about sensors commonly used outside of the Arduino prototyping platform. Class meetings will be adjusted to cover more deeply a narrower scope and will include some practical in-class exercises. For example, theoretical speculations around how we might sense certain events/processes using basic sensors (e.g. how to sense wind using a potentiometer and cheap materials), design activities around how to creatively appropriate sensors and actuators, etc.