

DH2413 2023 Advanced Graphics and Interaction Course Analysis

Alessandro Iop, Ingemar Markström, Marko Petrovic, Mario Romero, Björn Thuresson

Started: 2024-04-12. Ended: 2023-06-24.

Description of the course analysis process

The course instructor and examiner, Mario Romero, together with course assistants, Alessandro Iop, and Marko Petrovic, analyzed the results of the course evaluation. They synthesized the main topics and included them in this report.

Changes introduced in 2023 (from 2022)

1. Introduced interviews
2. Presented in Kulturhuset instead of Tekniska museet (Tekniska cancelled)
3. No more theme for project 2
4. Better scheduling of equipment loans
5. Extra credits for project handovers
6. Removed the SIGGRAPH reading assignment (instead it is past projects)
7. Initiated and finished talks on Ladok/Kopps course structure changes (ILOs still need an update)
 - a. new description: <https://www.kth.se/student/kurser/kurs/DH2413?l=en>
 - b. Still need to update
 - i. Content and learning outcomes
 - ii. Intended learning outcomes
 - iii. Fix grammar on “recommended prerequisites”
 - iv. Literature
 - v. Equipment
8. Increased engagement for course evaluation through systematic reminding by Mario coupled with a 0-point assignment
9. Project 1 final deliverable is now worth 10 points only
10. Changes in vehicle rental for external exhibitions
11. Mario met with individual groups outside of planned agile meetings
12. Ale mentored a specific group

Proposed changes towards 2024

1. Final deliverables (websites)
 - a. Final deliverable for P1 should have a single deadline, and therefore a single grade. I.e. no opportunity for second grade in January. (Done)
 - b. Simplify requirements for project description and “making of” documentary in final deliverables. (Take a look)
2. Individual contribution assignments
 - a. remove requirement for students to record interviews, but keep it as an option in assignment description.
 - b. Make interview slots longer (15m).
 - c. Plan a few extra interview slots, for rebookings or delays.

- d. Clarify that the interview is mandatory for the assignment to be graded, and the assignment should be submitted on time before the interview takes place.
 - e. Marko and Ale attend each other's interviews in the first round to sync up the grading criteria.
 - f. Formal point deduction if the deadline for assignment is missed.
 - g. Stricter and clearer requirements for references to useful resources.
 - h. Increase emphasis that the assignment is about **individual** contribution and learning, not a group objective.
 - i. Improve the explanation of requirements during the course intro.
3. Hello World Demos
 - a. Modify workload distribution table to reflect core interests. (Make it simpler)
 - b. Add a list of desired learning objectives for each team member.
 4. OH & Tekniska
 - a. Assign 2 project managers among students for extra credits (FCFS).
 - b. Earlier dress rehearsals for OH. (2-3 days?)
 5. [Marko] Invite knowledgeable students to host micro-seminars for extra credits.
 6. Scheduling presentations
 - a. Doodle/calendly polls for booking slots.
 7. [Marko] Faculty tests and grades projects during dress rehearsal.
 8. [Marko] Reformulate ILOs to better reflect what the students actually learn.

Analysis of the course evaluation with planned developments for the next round of the course

Estimated Workload Analysis

The course is a 9HP course. Using 27 hours of work per credit, that amounts to 243 hours of work which, distributed over 17 weeks from week 35, 2023 to week 2, 2024, gives approximately **14 hours** of work per week. Students reported working 17.5 hours per week, and increase of .5 hours per week compared to the previous year. Relevant statements from students, verbatim:

- Comments (I worked: 0-2 timmar/vecka)
 - The course itself is incredible in the way it teaches in a fun way, with materials and teachers and assistants who are very attentive and professional. The only downside I can find is that **this method of learning isn't for everyone: working completely in groups isn't always effective when there isn't a certain "pressure" on everyone to work**, which can lead some to rely on the enormous motivation and involvement of the other people in their group, which was my case, but that's only a special case because for my part I need responsibilities that push me to act for the project. Obviously it's something that's difficult to change, because to remedy it would require each student to have individual compulsory assignments, which would completely change the spirit of the course and certainly make it too academic.
- (I worked: 15-17 timmar/vecka)
 - Could be more, I think I spent more than enough. But I did stuff because it was fun.
- (I worked: 18-20 timmar/vecka)
 - This course had very few tasks that you had to do just for the course's sake. Instead, virtually all the work you did was towards the project for the course.

This meant that we could achieve a lot in a short timeframe, especially in the second half of the course. We all courses it is a good idea to work in a team where you are aligned on how much work you should put in but in the course it was more true the ever.

- (I worked: 27-29 timmar/vecka)
 - Given the nature of the course, **even though occupied half or less of the credits in each period, I was so invested in my project** (partly out of enthusiasm for the project but also the necessity to churn out a finished product by the deadline) **that I spent more hours than credits I was awarded per week.**
 - I think that the course doesn't require you to perform this many hours, but I think that the projects and the environment motivates you to create awesome projects which you will be willing to spend time on.

Analysis of comments of estimated workload

1. The workload distribution and work pressure can be managed by project and group managers. We proposed up to 2 per group for extra credit / for replacing for example one interview. If the management is not working, we need to recruit a new manager quickly and re-distribute the extra credits.
2. Continue to ask group members to have an honest discussion about grade expectations and to balance them within the group.
3. Make it clear again that many of the group members decide to work more than is needed for the credits in the course to develop their projects to where they can showcase them as a portfolio piece. This is the way the course is designed. We promote spending more time on the projects for the development of professional portfolios more than for passing the course or getting a grade. We are clear on that and make it clear again.

Learning Experience Survey

All these statements do not include formal statistical analysis. We ran the LEQ survey with 22 questions. In 2021, we ran it with 10 questions. All the LEQ survey statements were above 5.0. This is better than last year. All average entries are positive. The six statements we will focus on to analyze are 7, 8, 10, 11, 12, 13, and 20, which received the lowest scores, between 5.2 and 5.8 or were lower from 2022. We are focusing on all the questions with a score below 6.

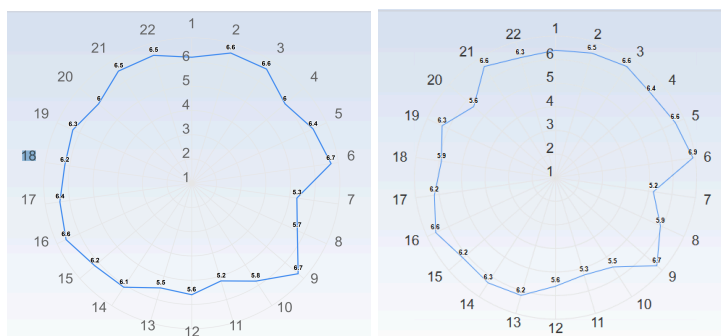


Figure 1. Left - 2022. Right - 2023. Key questions to focus on are 7, 8, 10, 11, 13, 20 (the scores below or equal to 6).

Statement 7 (score: 5.3):

“The intended learning outcomes helped me to understand what I was expected to achieve”.

Comments:

- (My response was: -2) The learning outcomes suggest that I should have a much deeper and more broad knowledge of lower level things than I was encouraged to work with in the course. They should probably be updated to closer match what we actually do in the course.
- (My response was: 0) As I said, it's really dependent on the implication

Reflection:

We need to update the ILOs with concrete examples in the course memo.

Statement 8 (score: 5.7):

“The course was organized in a way that supported my learning”.

Comments:

- (My response was: -3) The group composition had a role in it.
- (My response was: 0) As above

Reflection:

Make sure the members of each group agree on the work and grade they want to achieve, as much as possible. Also, the group managers could help mitigate this.

Statement 10 (score: 5.8):

“I was able to learn from concrete examples that I could relate to”.

Comments:

- (My response was: 0) As above

Reflection:

We need more VIC tours and hands-on interaction with projects from previous years. We need to fit these tours into the calendar or into the work students must complete for the first assignment where they evaluate past years' projects. We can also consider demos and explanations of our research. The big limitation here is to get time to do this. We have to engineer it.

Statement 11 (score: 5.2):

“Understanding of key concepts had high priority”.

Comments:

- (My response was: -3) There weren't really any key concepts to learn. "Advanced is what's advanced *to you*," is a poorly defined scope to have for a course
- (My response was: 0) More self led course, no real key concepts as such

Reflection:

Show more examples of what we mean by key concepts to grasp through the creation of the projects. For example:

1. Design and testing of interactive graphics in AR and VR
2. Development of interactive graphics using a game engine
3. Integration of 3D models with interactive applications
 - a. Models
 - b. Textures
 - c. Materials
 - d. Shaders
 - e. Rigging
4. Effective use of sensing technologies to implement user interaction
 - a. Infrared
 - b. RGB
 - c. Sound
 - d. Touch
 - e. Gesture
5. Become familiar with deployment and testing using AR, VR, mobile, tabletop hardware

We will include these examples of concrete key concepts into our ILOs. This inclusion will improve students' understanding of what are the areas to focus on learning.

Statement 13 (score: 5.5):

"I understood what I was expected to learn in order to obtain a certain grade".

Comments:

- (My response was: 0) I understood what to *do* to get a certain grade. Not what to learn.

Reflection:

Same as the comments and reflections for Statement 11 above.

Statement 20 (score: 6):

"I had opportunities to influence the course activities".

Comments:

- (My response was: X) I didn't care to try and change course activities so I didn't pay attention to this

Reflection:

Course activities are set and it is difficult for students to change them, but they can propose partial activities such as one-on-one meetings, individual group demo rehearsals, etc. We can make it clear that while students cannot remove or change activities in the schedule, they are welcome to ask for partial activities to practice their learning without being evaluated or graded.

What was the best aspect of the course?

To the general question “what was the best aspect of the course?“, we received a number of replies. Here are all responses, unedited other than spelling and punctuation:

Unfiltered answers

- (I worked: 0-2 timmar/vecka)
 - The environment and atmosphere of the course are perfect, it's very fun and pleasant.
- (I worked: 6-8 timmar/vecka)
 - **Working with the group and progressing** through the project, to finally present at e.g. Kulturhuset.
- (I worked: 12-14 timmar/vecka)
 - The sense of **community**
- (I worked: 15-17 timmar/vecka)
 - Doing **public presentations**. And that the presentations were live demos, not super boring slideshows.
 - This course has a high degree of freedom, and everyone is free to explore their own inner thoughts.
 - The **freedom** to explore what we wanted to try and achieve. We were allowed to try and experiment with interesting new things. I also really enjoyed the public presentations, the ability to showcase our projects to others and to become more comfortable with presenting to strangers.
 - The atmosphere in class and in group are friendly and inclusive, giving me a lot motivations to work on this course.
- (I worked: 18-20 timmar/vecka)
 - Working in groups, creating **challenging projects** and presenting them
 - That by **removing many of the merely administrative parts that are present in many courses we were able to focus on working with exciting technology and test new ideas**. There was also ample opportunity to show what we had produced to the general public.
- (I worked: 21-23 timmar/vecka)
 - The second project was very fun. Most groups had gotten into the groove by then and we all knew what we were expected to do.
- (I worked: 24-26 timmar/vecka)
 - Being able to work on some fun projects together with others was a blast. We made some fun games with interesting interactions, while enjoying our time creating them and seeing others try them at different venues.
- (I worked: 27-29 timmar/vecka)
 - Freedom to pursue what you are interested in

- The group, we had a really engaged and sort of a community where everyone collaborated and could reflect on projects and ideas.
- (I worked: 33-35 timmar/vecka)
 - **Interacting with other students and learning from each other**, especially at public presentations

Reflections:

These key features of the course need to be protected.

What would you suggest to improve?

For the question “What would you suggest to improve?”, we have a number of answers which we synthesize below.

- (I worked: 0-2 timmar/vecka)
 - I don't know, it's difficult to suit every way of working.
- (I worked: 6-8 timmar/vecka)
 - I understand that the open house is supposed to display all the work we have done, but **I think it would have been more appropriate to only present project 2 at the open house**, both in terms of time but also because the first project has already been presented before.
- (I worked: 12-14 timmar/vecka)
 - **Make the learning outcomes more relevant to what we actually do in the course. Include public presentations and portfolio piece creation. Have someone good with graphics techniques on staff. Don't force people into both graphics and interaction, let them focus on one of them.** Maybe per project. **Do cross-group meetings** so that the graphics people can learn from the other groups' graphics people and the interaction people can learn from other groups' interaction people.
- (I worked: 15-17 timmar/vecka)
 - **Make the course 6 HP in P1 and 6 HP in P2.** Gives the students more time on the course because during P1 you don't have to read two other courses as well.
 - The project evaluation section hopes to add more professional evaluations.
 - **The public demo time could be shorter**
- (I worked: 18-20 timmar/vecka)
 - **One big project instead of two**
 - A minor detail but it would have been reassuring to know at the start of the course where we would be presenting.
- (I worked: 21-23 timmar/vecka)
 - It was a little bit **unnecessary to have both interviews and quizzes for reflection I would suggest that the next version of the course do interviews only.**
- (I worked: 27-29 timmar/vecka)
 - Hard to improve due to the collaborative nature of the project and compromises you have to make with it. But somehow **incentivise going deeper into graphics.** The course incentivises doing interesting interaction, but graphics wise it's hard to work on a specific technique you want to learn without feeling like you're not contributing to making a finished product.
 - I liked the idea of themes, although we never followed through. I think that maybe as **a class we could have decided on a theme.**
- (I worked: 33-35 timmar/vecka)

- As I wrote in the Menti after the Kulturhuset presentation, **I wish we had more time to try out each others' projects** (I didn't get to test some of the projects from other groups). I think that one or two hours dedicated to us presenting to each other would have been incredibly insightful. I would maybe have **one less public presentation (or a smaller one)**, but have a presentation to the students of the course.

Reflections:

- It could be an option to present only one of the projects at Open House if all agree. Some groups opt out of presenting project 2 due to lack of progress, for example. Some will opt out of project 1 because there is nothing new to present and they want to focus on Project 2.
- We could have more time sharing during public presentations so that individuals have to present less time. In other words, some projects are presented at some times of the day, not all day long. This could also be optional, as some people may want to present for as long as possible in public venues.
- Give clear motivations and perhaps extra credit for going deeper into graphics.
- Give more opportunities / grading for peer evaluation of projects. (To be worked out).
- For a theme, we could have a set of ideas and let them vote. If a theme gets above a preset threshold, it is approved. We can give them a few weeks to think about this. This could be done in October. Give them opportunities to polish and define the scope of a theme with discussion boards.

What advice would you like to give to future participants?

For the question "What advice would you like to give to future participants?", we list all the answers as we find all them valuable.

- (I worked: 0-2 timmar/vecka)
 - **Avoid being left behind** by your project because of the implication of the other group members
- (I worked: 6-8 timmar/vecka)
 - It's always fun with creative and ambitious ideas, but be **realistic** with regards to the limited time that you have.
- (I worked: 12-14 timmar/vecka)
 - Don't wait with what you want to do until the conditions are clear within the project. **Just do it and adapt** the project to your feature.
- (I worked: 15-17 timmar/vecka)
 - If you really want to do VR/AR, sure do it. But keep in mind it's a headache.
 - **Don't go overboard with your ideas.** Make sure your **project is achievable.**
 - Try out things **outside of your comfort zone.**
 - Just enjoy
- (I worked: 18-20 timmar/vecka)
 - Take this course! Find a group that you are aligned with regarding how and what you want to work on and that is balanced regarding skillsets. Better to create new friendships than to test old ones.
- (I worked: 21-23 timmar/vecka)
 - Have fun! Make sure to keep the mood up in the group!
- (I worked: 24-26 timmar/vecka)
 - Don't hesitate to work on things that you may not have any prior experience with. This course gives you plenty of room to explore advanced topics in interaction and/or graphics, and is a great time for learning some new things that could be of interest.

- (I worked: 27-29 timmar/vecka)
 - **Stay hydrated**
 - Explore ideas! Don't limit yourself to a technology like a VR Game. Most things are possible and there is technology to do it so create an idea and figure out the platform later.
- (I worked: 33-35 timmar/vecka)
 - **Don't be scared about all that technology that you don't know about :)**

Reflections:

We should put these into a slide during the intro.

Is there anything else you would like to add?

Finally, to the question "is there anything else you would like to add?" We included some representative replies and also those that we found particularly encouraging.

- (I worked: 15-17 timmar/vecka)
 - Best course at KTH.
 - No.
 - No
- (I worked: 18-20 timmar/vecka)
 - Great work on a course well run!
- (I worked: 21-23 timmar/vecka)
 - This is a very fun course. It is a lot of work. But very fun!

Reflections:

We could put these comments into a slide at the end of P1 or the entire course. In the beginning we should actually warn people that it may be more work than they are used to.

Specific questions

Questions added to the standard questionnaire. Each question had a 7-point likert-style rating, plus an open question to motivate the answer.

Public exhibitions vs. traditional exams

On a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree, rate the following statement. I prefer to replace the public events in this course with traditional written exams.

Results:

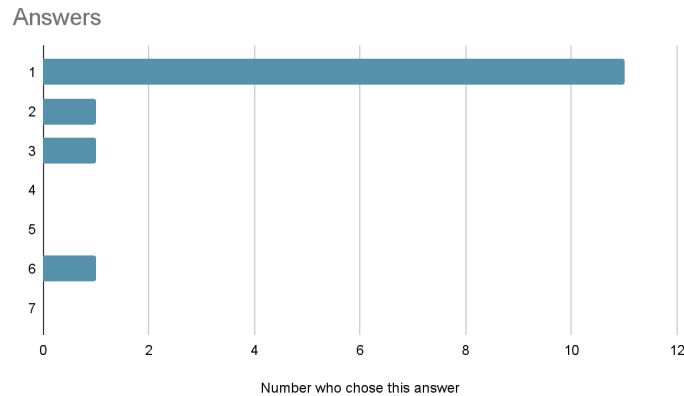


Figure 2: answers to the first extra question.

Comments:

- This question was asked several times during the course. The demos are a unique way of learning and make the work a lot more rewarding. Having traditional exams when everyone has done different things would be difficult.
- I [think] this for this course public presentations are much more suitable for the course contents and allows the students to affect their learning goals. A test for this course makes very little sense to me.
- nononono, the public presentations were great. I can't imagine what a traditional written exam would be like. How the F. would you exam a project that way??? I felt like doing these live demos is so valuable because it gives you direct feedback from the users and this is probably the first time you as a student see other, random people, test your creations. It's very eye opening to see how people react and interpret the things you built and are responsible for.
- I still prefer demos, but I think there were too many of them. In that sense I would rather switch out some of them for tests, but I don't see any way of making tests work in this course either.
- I loved the interaction with the general public since their feedback is so different to someone who has a background in computer science
- I think that the subject is ill suited to being examined on a written test. However! I'm not sure how the presentations being public contributes to them being a good examination. And I feel like they would not lose out on examination potential with regards to fulfilling the course goals, if they were only presented at KTH instead. (The kulturhuset presentation did feel a bit like doing advertising for KTH in exchange for a grade).
- I absolutely don't want to see any traditional exams in a course like this. I think the public events were a great experience, and was something unlike anything I've had yet in my 5 years at KTH. They're very exhausting at times, but I think it's a great experience to have if you may end up working in areas where such may occur from time to time.
- Because game development involves too much knowledge, each student has a field of good work. It is difficult to pass a test to detect the level of technology and knowledge. A person can develop a game that can run smoothly even if you carry down the entire unity development manual.
- First, the public events were both exhausting and also really fun to be at. You get to practice presenting in public among other things. Second, said events in the course are a much more appropriate way of examining the grading criteria than written exams in my opinion; it feels natural to present the projects that we worked on as

opposed to writing an exam. Another problem with a written exam would be the outline of it; projects explored advanced graphics and interaction differently, so it feels like the exam would have to be very general in that case.

- I believe that for a subject like this, experimenting and creating your own games/applications is much more useful and important than studying theory for a test.
- These events are incredible for so many reasons (contact with the public, feedback from unknown people of different ages, ...). Nevertheless, exams can also provide students with a basic grounding and a more structured environment rather than being completely self-directed.
- I don't think that an exam would fit this course at all. I would maybe reduce the number of public presentations, but definitely not replace them with exams.
- Demos are a much better way (and more fun) to show your knowledge than exams. They are also much closer to situations that participants will face in the real world. Exams would have very little value in this course.
- because test does not represent what we learn from this kind of project course, demo is more related and direct to show the result of our learning

Journals vs. interviews

For students who took DH2321 Information Visualization. On a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree, rate the following statement. I prefer to document my individual learning and contributions in a journal, as in IVIS, than through an interview, as in AGI.

Results:

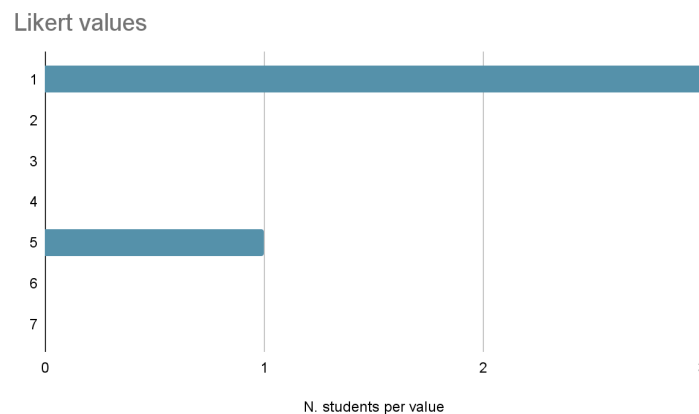


Figure 3. Answers to the second extra question.

Comments:

- I preferred the interview. It's much easier to get your work shown in an interview and it is also easy to miss out on points on honest mistakes in the journal which can be explained in an interview.
- I preferred the interviews. It felt more personal and the regular meetings acted as nice milestones through the project
- Since my spoken English is not very good, I actually record in the document every time, and then dictate my personal learning and contribution. However, if the teacher has a small talk with me about some details later, it may cause me to be a little embarrassed.
- The journal was way too long and I forgot to keep it up to date from time to time. Importing all the material and writing down what I did was time-demanding and

sometimes too "mechanical". The interviews provide instant feedback and the only thing you need to do is to collect the stuff you did. Much easier and more effective I would say!



Figure 4. AGI23 Open House.

Conclusions

We need to make a few updates to Ladok in 2025. We have synthesized a short list of updates and have also included a few suggestions to work out. Overall, the course does not significantly change.