

DH2321 2024 Information Visualization Course Analysis

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Description of the course analysis process

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

Changes introduced in 2024

- Interviews on AGI model
- Final presentations on zoom for Infravis
- Sponsors:
 - a. Offers implemented
 - i. Angie Gapminder
 - ii. Rebase
 - iii. Mario CitizAir
 - iv. Ale Mocap surgery
 - v. Fernando Cossio breast cancer
 - b. Offers not implemented
 - i. Filip & Vania Ceccato
 - 1. In the future, we would like to create a mechanism where every offer is implemented. It is not easy, as we also want to give students freedom.
- Mario met with individual groups for feedback
- Extra credits for participation in MSc theses experiments
- FDK3260 shared the same lectures, but not the same assignments/deliverables
- Most lectures and events were recorded and uploaded on Canvas
 - a. The recordings are for the course only
 - b. In the future we want recordings of the lecture part of the meetings
- Presentation events
 - a. Doodle for scheduling groups
 - b. "Mandatory" to attend only part of the event
- In 2024, Mario did not record video feedback to the project hello world demos. We plan to return to this in 2025.

Comparing results with previous years

As stated in 2023, the online open house has become a yearly event where we invite InfraVis staff to give feedback. It was a very positive experience both for students as well as InfraVis experts.

Analysis of the course evaluation with planned developments its next round

Response to course evaluation

In 2024 the course evaluation participation was high at 41 responses out of 45 course participants. This year, we similarly made an assignment with 0 points simply to state "I have sent the evaluation" and this allowed the instructors to remind only those who had not stated it. We got 33/43.

Time spent on course activities

The course is a 6HP course. Using 27 hours of work per credit, that amounts to 162 hours of work which distributed over 9 weeks from week 3 to 11 gives 18 hours of work per week. In **2023**, students on average reported working **17.7** hours per week. In **2024**, students on average reported working **14.8** hours per week. This is expected, as the sample went from 8 to 41. Two students reported working between 3 and 5 hours per week while one, while no students reported working more than 35. Comments from students:

- Comments (I worked: 3-5 timmar/vecka)
 - The first weeks didn't take much of my time but at the last week of the final presentation, I spent around 5 hour per day which allocates to 3 - 5hour per week on average total.
 - If you have a balanced team, the work load becomes even
- Comments (I worked: 6-8 timmar/vecka)
 - Much more the final weeks
 - The workloads were designed reasonable.
 - a bit high, but generally good
 - The work load was balanced alongwith the lectures.
- Comments (I worked: 9-11 timmar/vecka)
 - The time spent seems reasonable.
 - The readings were sometimes a bit out to date but the rest of the time working for this course was very pleasant.
 - lectures aside, there are many theories and skills to learn for a non-CS student like me
- Comments (I worked: 12-14 timmar/vecka)
 - The time spent on the course varied a lot throughout the course, but you have to put in the time.
 - The coding caused it to go up in my perspective.
 - This could be wildly inaccurate
- Comments (I worked: 18-20 timmar/vecka)
 - I felt like id have to do more to balance out the team workload
- Comments (I worked: 21-23 timmar/vecka)
 - A lot of work!
- Comments (I worked: 24-26 timmar/vecka)
 - Kinda awful work distribution, got to 60 hrs/week for one week.
 - The course is intensive and fast-paced
 - As a project-focused course, it is very reasonable to spend a few hours every day with the course material. Some time was spent researching material and other times were spent implementing and contributing to the assigned projects. It is also dependent on the student's previous experiences which contributes to the workload. As I had some practical experience with the tools

used in the project, it significantly reduced the amount of time I had to spend learning the software and tech stack. I do believe this is very reasonable but for a 6.0 hp course, it is quite strange as I found myself more invested in this course than my other 7.5 hp courses, which is a combination of this course being the most interesting one I partook in this period, but also unexpectedly the amount of time needed to work on and developed on the project. It might make more sense for this course to also be 7.5 hp credits.

- Comments (I worked: 27-29 timmar/vecka)
 - The course was very intense, especially the first project. For the group project I had to effectively do all of the development alone, so that was a lot of work as well.

Analysis of LEQ survey statements

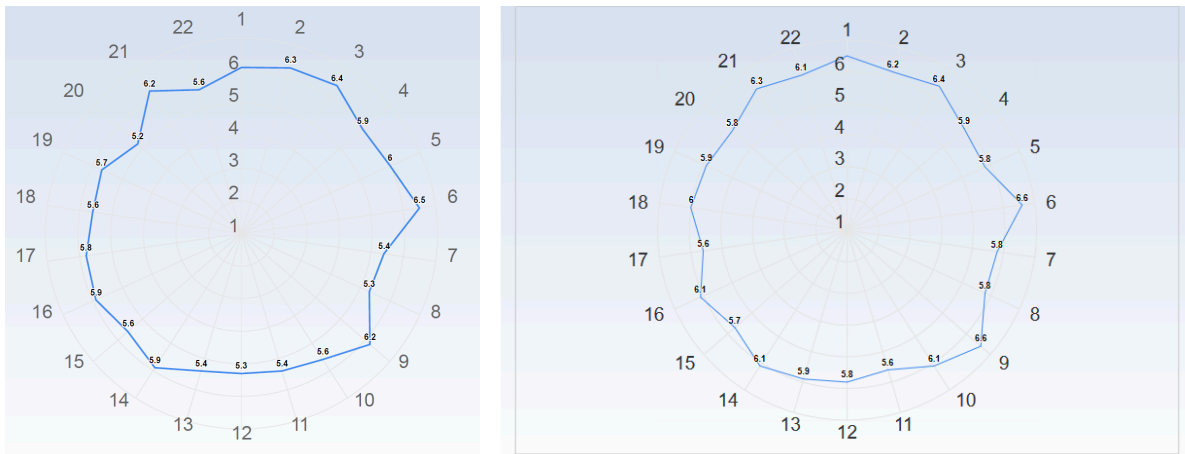


Figure 1: Course evaluation results. Left: 2023. Right: 2024. Improvement overall.

All the LEQ survey statements were 5.6 or above, meaning all average entries are positive. The three statements we will focus on to analyze are 7, 8, 10-13, 20, 22 which received the lowest scores. Comparisons with last year’s answers are avoided due to the great difference in sample sizes.

Statement 7 is “The intended learning outcomes helped me to understand what I was expected to achieve”. The average is 5.8.

- Comments (My response was: -2)
 - Vague statements, no info on the grading system available on canvas.

Reflection: Mario can make a point to give concrete examples of achieving ILOs and make a recording. Flip it. I would like to instantiate Sebastian Buvari’s MS thesis¹ where we visualize the ILOs together with the assignments and grades. Make the information on Canvas more visible and publish this information on Social as well. Communicate better during the intro and record a video with the ILOs and the grading criteria.

¹ Buvari, S. (2023). [Facilitating Student Achievement of Intended Learning Outcomes in Higher Education : Development and Evaluation of a Learning Analytics Dashboard \(Dissertation\)](#).

Statement 8 is “The course was organized in a way that supported my learning”. The average is 5.8.

Reflection: In the same flipped video, Mario can explain how the course structure is meant to achieve ILOs. Also, implement Buvari’s MS thesis.

Statement 10 is “I was able to learn from concrete examples that I could relate to”. The average is 6.1.

Reflection: We give concrete examples constantly. Could this be concrete examples of code solutions? We do not give tutorials on technical issues. But, perhaps we can give updated links to tutorials.

Statement 11 is “Understanding of key concepts had high priority”. The average is 5.6.

- Comments (My response was: +1)
 - While a majority of the visualisations and concepts were very useful to learn and implement within our projects, I find that some ideas are too outdated or unnecessary from the lectures

Reflection: we can be clearer about what “key concepts” means vs. particular examples of coding in specific languages, for example. We can also make it clearer that we are not going to cover specifics of programming. We can also update the reading material and bring the key concepts to current practices in 2025.

Statement 12 is “The course activities helped me to achieve the intended learning outcomes efficiently”. The average is 5.8.

Reflection: Again, we can specify how activities and the course structure support ILOs in a flipped video. This is a common problem with ILOs. They are high-level and abstract. They should not be specific to technologies, for example. The students want a map between what they are supposed to do to achieve an ILO.

Statement 13 is “I understood what I was expected to learn in order to obtain a certain grade”. The average is 5.9.

- Comments (My response was: +1)
 - Would be nice to have a bit more clear overview of the exact limits for certain grades of the points rather than the percentages so you can quickly see where you are.

Reflection: Flip all assignment descriptions and grading criteria and open a discussion in Canvas. Also, use Buvari’s tools to visualize ILOs with assignments.

Statement 20 says: “I had opportunities to influence the course activities”. The average is 5.8.

- Comments (My response was: +3)
 - Mario is very open to feedback and makes sure that everyone is heard.

Reflection: We gave early opportunities to change the structure of the course activities through mentimeter surveys. The students gave very concrete and actionable feedback which we implemented from the proposals to the hello world demo. This is a positive practice which we will continue.

Statement 22 is “I was able to get support if I needed it”. The average is 6.1.

We designed the course carefully to be structured in such a way that we can fit relevant activities that are structurally aligned with intended learning outcomes from the beginning. There are very few opportunities to have a flexible structure of activities supporting the students' learning. Yet, we think that we can engage the students in thinking about different activities that they can do that relates to their learning both as part of the regularly scheduled meetings and as part of events which students handle on their own as team members. It is important to note here that we aim at enhancing the richness of activities at the students to learn without increasing the responsibilities of and time required from the instructors.

Analysis of general questions

Best aspects

To the general question “**what was the best aspect of the course?**“, we received a number of replies. Here's a representative sample directly quoting the students:

- What was the best aspect of the course?
 - (I worked: 3-5 timmar/vecka)
 - The project and being able to work with real world data was the best part.
 - Having projects and frequent checkpoints with supervisors
 - (I worked: 6-8 timmar/vecka)
 - Fun content
 - The lecture is interesting which inspire me a lot.
 - Projektet, mycket frihet och eget ansvar!
 - Participation, Group Project related to reality data
 - Group project and individual evaluation was useful to have a holistic and continuous evaluation
 - (I worked: 9-11 timmar/vecka)
 - Freedom to work on the project of interest. Motivated teammates. Great teacher!
 - working with real life companies and getting hands-on experience with them
 - The project, I really enjoyed working with my team and building a project together. I think that was the best part of this course
 - It's very flexible. And the professor did consider our feedback carefully
 - (I worked: 12-14 timmar/vecka)
 - The project and the group forming / proposals / hello World Demo / final presentation! Great to see what the other people were doing and interact with the rest of the class.
 - The overall organization and structure, working on real world data.
 - Mario's lecture was a blast, excellent presentations that was involving and never felt dull.

- Mario's enthusiasm and the fun lectures and feeling of it not being so serious all the time
- (I worked: 15-17 timmar/vecka)
 - Mario interacting with new visualizations he had never seen before and walking us through his process of assessing them.
- (I worked: 18-20 timmar/vecka)
 - The lecturer was super engaging and charming which made the lectures easy and interesting to follow. The course itself was very informative and insightful as well.
 - For me it was the freedom to choose a project and who to work with, but also the engagement and positivity from Mario and the rest of the class :)
 - Fun subject, getting a final product in the end was nice
- (I worked: 21-23 timmar/vecka)
 - The group project
- (I worked: 24-26 timmar/vecka)
 - Getting to do something! Actually making an interactive prototype was the coolest part of the course!
 - With the amount of self-learning and freedom each student can partake in, the course felt less like a university course and more so an internship, where everyone obtains practical experience in a multitude of tools and software to develop a functioning prototype for clients, as well as developing each student's ability to collaborate which are extremely useful skills for anyone no matter their discipline and future career.
 - The open culture and possibility to pursue our own ideas.
- (I worked: 27-29 timmar/vecka)
 - The individual project! I heard that there were 3 last semester and I wished I did 3 as well.
- (I worked: 30-32 timmar/vecka)
 - Mario. So passionate and motivating. He made every part of the material sound interesting, encouraging me to be even more curious.

Reflections: Overall, the positive feedback focuses on the group project and the freedom the students have in executing it. Also, the structure of continuous feedback from multiple supervisors was highlighted. Finally, the content and delivery lectures is a positive mention, including the ability to present from Mario, but perhaps more importantly, the freedom to express ideas from the students during lecture.

Improvements

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

The feedback was very distributed. a selection of quotes:

- What would you suggest to improve?
 - (I worked: 3-5 timmar/vecka)
 - **the course does not cover the technical aspects.** For eg, turning raw data received from external partners into an organized structure for d3.js took a lot of time. **Hope the course had some space where we could go for technical advice.** we got a lot of advice on other matters and it was great. I just felt the technical expertise was lacking a bit. Data's are different for all projects so I dont have a particular

but time did not allow for my group members to try and explain their work and bring me up to speed to be useful. **More clear course description on kth website** about the need to know pretty deep code to fully utilise this course knowledge but that it is possible to get a passing grade with limited code knowledge.

- - **Write explicitly in the course description that programming skills** in Java-script, Css and HTML **is a requirement or highly recommended** to have. - Need **more time for the reading quizzes** in order to understand and find the correct answer with in the text. Also less specific questions in order to answer them probably without use of KI tools. Otherwise reading the text once and highlighting it is not enough. And deeper learning is not possible because of workload.
- **Sometimes the lecture tangents and sidetracks** were a bit too much
- (I worked: 15-17 timmar/vecka)
 - One lecture at the end where the students decide the task.
 - During lectures waaay **too much time was put into going through quiz results**. I felt like we rarely had time to actually discuss the actual lecture topic
- (I worked: 18-20 timmar/vecka)
 - The individual and group projects were interesting and gave hands-on experience. However, **the grading of interviews was not clear enough nor transparent enough to me**. My group didn't know that everybody needed to do hands-on activities in every single part of the project to get full marks in the interview. If this could be mentioned in the grading criteria or at the first proposal when we set the distribution and timetable, it would give clearer guidance in how to divide the work among group members more fairly
 - Allow for a **higher word count on the first individual assignment**.
 - The course was a bit **too open for my liking, the provided learning material wasnt that good. The presentation sessions was way to long**
- What would you suggest to improve? (I worked: 21-23 timmar/vecka)
 - The lectures. **Not just summery of quiz. Ad a reminder on the assignments. And there where to many assignments. The group project. Would be nice to have a more clear instruction what tools to use for coding.**
- (I worked: 24-26 timmar/vecka)
 - Maybe having **harder requirements for programming knowledge**, or having it listed more clearly. Nobody who attends this course should be unable to do any coding.
 - Possibly **update the learning material**, as some of the concepts and the way it is taught it quite old-fashioned. **Encourage students to find more ways to implement some of the visualizations that were taught** in the class, through possibly more practical exercises rather than quizzes to force students to memorise.
 - **Add a bit more information on the tools and how to use them**. Most importantly (especially for international students): on the course syllabus **it should be clearly stated what requirements are necessary** for attending the course (i.e. the exact programming skills with certain tools).
- (I worked: 27-29 timmar/vecka)
 - More individual projects. I would like to broaden my knowledge and not focus on 2 projects whose scope is limited.

- (I worked: 30-32 timmar/vecka)
 - I would inform the students to not undervalue themselves in the survey since figuring out who some students were wasn't so hard.

Reflections: The main area of improvement is the technical requirements to get started the course and technical supervision during the course. Many students stated that we should make it more clear that the course needs programming knowledge in HTML, CSS, and, in particular, Javascript. We can do that. Furthermore, students expressed the need for more technical guidance in preprocessing their data and perhaps some help with the Javascript libraries. We can address concrete questions, but in general we will defer guidance to self learning through tutorials on Youtube and other platforms. We can consider non-mandatory labs where we cover the basics of setting up a server, a web page, some HTML and CSS and some backend and front end programming with Javascript and other tools. We need to formally place this lab in the calendar and get accounted time for it.

The second point of feedback to improve the course is the structure and expectations of the interview. We need to be clear about what we expect them to do in the description of the assignment and mention it during lecture and on the video explaining each assignment. We need to clarify what we require about the references for grading criteria. Should we keep it as a requirement? The question is how and why to enforce. Is it just bureaucratic or are we aiming for a learning experience?

The third point which is well taken is the fact that the reading material has now, 2024 and 2025, become outdated. We need to renew the reading material and the quizzes. Mario wants to record lectures on new reading material during May - June.

Fourth, many people mention that we spend too much lecture time on quiz results. We will not do that again. We will record short lectures per reading and students can take the quiz, watch the videos, and retake the quiz if necessary. We need to rethink the way quizzes are graded. Currently, we pass the average score as the grade. We are considering passing the highest score as the grade and giving them five attempts. Also, we can give them more time to answer each attempt. The goal is to get them to investigate and learn if they don't know the answer. We can increase the time per attempt to 30-60 minutes and also increase the period where the quiz is open from one morning to several days.

Advice

For the question “**What advice would you like to give to future participants?**”, we list all answers as we find they are valuable.

- What advice would you like to give to future participants?
 - (I worked: 3-5 timmar/vecka)
 - Start early on your projects so that you can get feedbacks from your peers and teachers. Also, select a good team as project will consume a lot of your time.
 - **Learn D3.js before hand**
 - (I worked: 6-8 timmar/vecka)
 - **Make sure your group knows web dev**, otherwise you are kind of screwed

- **prepare some javascript programming skills** before joining the class
 - Att påbörja projektet i god tid och jobba i tydliga sprintar
 - Experiment with design, and do rounds of user testing
- (I worked: 9-11 timmar/vecka)
 - Have your visualization ready by the Hello World demo. The "final details" and a "few missing features" will consume the rest of the time at a crazy rate. It really does take 20% of the time to build 80% of the app and 80% of the time to finish.
 - Enjoy the ride, find a cool project and even though some sessions are very long it's very cool to see what the other groups are doing
 - learn the required skillset asap
- (I worked: 12-14 timmar/vecka)
 - Make a plan and stick to it. Try to get some user feedback early on. Don't forget to take notes of the learnings between the sessions, this will make the learning contribution interviews much easier. And remember to **focus on your individual learnings and achievements in the interviews rather than the group achievements.**
 - Don't be afraid if you don't know how to code. You will learn!
 - **Have a strong foundation and understanding of not only JS but many other parts of the coding infrastructure.** Get working early, and push hard in the beginning don't try to over-analyze start experimenting.
 - - **Have Knowledge in Java- Script, Css and HTML** or have much time and know course participants with it in order to learn from them
 - Working with a real company was surprisingly fun
- (I worked: 15-17 timmar/vecka)
 - Start work on the project early. Start with a lot of different approaches and then narrow them down.
- (I worked: 18-20 timmar/vecka)
 - Enjoy the course and you will get a lot out of it
 - **Start watching tutorials on D3 and whatever framework you choose early!**
 - You need to organize your own learning
- (I worked: 21-23 timmar/vecka)
 - Start with project one directly
- (I worked: 24-26 timmar/vecka)
 - **Find groups where everyone can actually work on the prototype/demo in terms of coding,** otherwise you will have to pull additional weight.
 - Be ready to dedicate a lot of your time outside of class if you want to properly contribute towards your projects, **your teammates will depend on you to assist them in collaborating on the project and you will be punished if you attempt to freeride,** set appropriate goals on what you want to achieve in this course with your teammates and supervisor as well. If you lack certain development skills, be ready to dedicate more time to the course to self-study, but it will be worth it as a lot of the experiences in this course are transferable to your future academics or work.
 - **Be sure about your own skillset and that there will be a lot of programming required in this course** that you have to learn by self study (or better you should know before taking the course).
- (I worked: 27-29 timmar/vecka)
 - **Start learning some programming beforehand.**

- (I worked: 30-32 timmar/vecka)
 - Put your all into this course.

Reflections: The main advice 2024 students give to posterity is to start early with the project, make a plan and stick to it and learn to program quickly if you don't already know web development and other foundational skills.

Additional comments

Finally, to the question “**is there anything else you would like to add?**”

- (I worked: 3-5 timmar/vecka)
 - Mario is great!
 - Mario is a great educator, a lot of passion
- (I worked: 6-8 timmar/vecka)
 - Enjoyed the course, the teachers and teaching assistant were really helpful
- (I worked: 9-11 timmar/vecka)
 - Thanks a lot for the great course. It is clear how much time Mario and the TAs spend making sure that the course is a great learning experience for the students
 - Really cool course, hope my feedback was useful to some extent :)
- (I worked: 12-14 timmar/vecka)
 - Amazing course, absolutely loved it! Good structure and Mario did a great job at catching my interest in this subject and motivate me to learn about it.
 - Hope you have a good day Mario
- (I worked: 15-17 timmar/vecka)
 - Mario may be the best lecturer I have had. He is willing to listen and engage with students during and after the lectures.
 - This was a great course! Mario's enthusiasm shines through.
- (I worked: 18-20 timmar/vecka)
 - I really enjoyed this course, and also learned a lot!!
 - Ok course, but could have learned more, but I guess my own responsibility
- (I worked: 21-23 timmar/vecka)
 - **Add in the description of the course that you need to have experience with coding an online application.**
- (I worked: 27-29 timmar/vecka)
 - Thanks for this course! Mario is a great teacher, the studio and its moderators are really cool and the lectures were interesting. During the individual project I'm pretty sure I developed a passion for information visualization and would definitely recommend this course to others.

Reflection: The positive comments praise the teaching and the support from the course team including teaching assistants and studio personnel. The advisory comments are, once again, to make it clear that basic web development is a must for excelling in the course.

Special consideration in 2024

- One group was initially 3 people only, then split up

- a. In the future we plan to avoid this situation by early intervention. One possibility is to split the group and have the 3 members join 4-person groups.

Proposed changes for 2025

- Change the reading list.
- Create a video of each reading as a lecture.
- Change the quiz to allow learning during the quiz.
- Do not cover the result of the quiz in lecture time.
- Place requirement for basic web development on course Canvas and Kopps page, the official syllabus.
- Make the requirements of individual learning and the grading criteria of the personal interview clearer and structurally aligned.
- Provide two opportunities to acquire the basic skills of web development
 - An official list of online tutorials
 - A voluntary workshop
 - Marko Petrovic takes the lead on the workshop
 - Structure of the workshop
 - List of activities
 - List of resources.
- Alessandro Iop will prepare and deliver a lecture on the future of visualization - 2 45-minute segments.
- Implement a scheduling mechanism to allow people to attend $\frac{2}{3}$ of the presentations during proposal and Hello World Demos. The final presentation remains mandatory at 100%.
- We would like to create a mechanism where every offer is implemented. We will think about this mechanism.
- Implement Buvari's visualization to track ILOs as an aggregation of assignments.