

Course Analysis EK2380 Medical Sensors 2021

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Course design

EK2380 was given the first time 2021 to eight students. The course consists of 11 lectures, four laborations and a project work. In the course the students meet eight participating teachers with specific expertise related to Medical Sensors. Also, in the laborations and the project work the assistants have specific expertise related to the content.

Prior to the course start, we sent out a form to assess the students background and give specific study material in medicine/biology or measurement technology if the students lack one of these. As course responsible, I continuously discuss with the students about course content to align to the intended learning outcomes.

Description of the course evaluation process

EK2380 was given the first time 2021 to eight students. Evaluation was carried out continually during the course and as an online form after the course. Due to the low number of students, we could not carry out specific investigations related to gender and student disabilities. 2021 three of the students were female. 2021 three of the students had carried out there whole undergraduate education at KTH and five had bachelor education from other countries. After the course, we arranged a course evaluation meeting (26th November) where four of eight participating teachers, four of seven course assistants participated.

Description of meetings with students

In the course the students meet eight participating teachers with specific expertise, as course examiner I discussed with the student if they could grasp the content of the lectures after the course.

Students' workload

According to the course evaluation 50% of the students spend less than 50% study time for the course. A reason can be that the students did not spend the suggested time on studying the supplied literature.

Students' results on the course

All students passed the course, the grades were distributed from A to E.

Students' answers to open questions

What does students say in response to the open questions?

What was the best aspect of the course?

The fact that we were able to follow lectures from different lecturers from various fields provided a very interesting perspective for the course content. In addition, the lab work along with the visit to a company was one of the most beneficial aspects of this course.

How involved the different professors were, especially the lab assistants and the course responsible. They made it easier to learn and understand. Also, the different visiting lecturers helped us to understand different aspects of the course as well as giving as a picture of the current industry.

Interesting with different lecturer that was specialized on their topic.

The best aspect was that we were few students attending it and so we could have a good interaction with the professor or with whom has held the classes.

I liked that there were a lot of different ways to learn, such as labs, project work, study visit and lectures with different lecturers.

Well organized schedule: different teachers gave us different information in their own style; lab works are long but interesting

What advice would you like to give to future participants?

To follow every lecture closely and to engage in discussions during the lectures as it helps to better understand the main concepts.

Engage from minute 1 with the course, ask as many questions as possible and make the most out of the lab sessions.

Read lecture material continuous during the course.

Attend all the lectures and make sure you understand what the lecturers are talking about.

Write lab reports for the labs directly after doing them, this will make it easier to remember the labs for the exam.

Check the schedule often, don't miss the early lab; read more literatures

Summary of students' opinions

Overall, the students gave the course high grades. Some lectures needed more depth others less, overall, the students appreciated the different lecturers and laboratory exercises. Details are appended.

Overall impression

Overall, both teachers and students ranked the course highly. The teacher and students commented on the challenge with different prior knowledge and the importance of reading the supplied materials. Practical laborations and the project will be developed to better accommodate different prior knowledge.

Analysis

The strong aspect of the course is the involvement of several experts in sensors and biomedicine that creates different learning environments. The weak aspects is accommodation of very different prior knowledge which demand self-studies of supplied material.

Due to the low number of students no categorization of the analysis can be done with respect to gender etc.

Prioritized course development

In short term 1) the laborations and 2) project work will be developed. For 1) more extensive lab instructions will be provided. For 2) the project will be introduced earlier to allow for more iterations and less workload at the end of the course.

In long term more structured self-study material will be developed to guide students lacking electronics, biology or chemistry background.

Appendix 1 - LEQ Course evaluation.

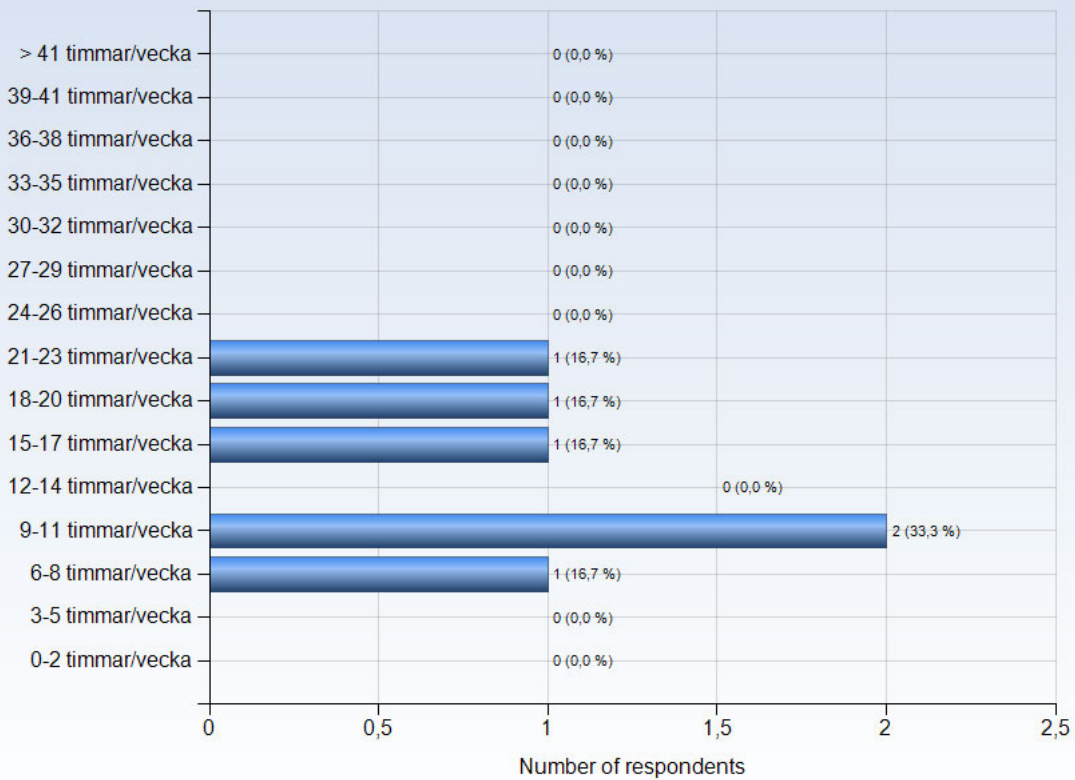


EK2380 - 2021-10-25

Antal respondenter: 8
Antal svar: 6
Svarsfrekvens: 75,00 %

ESTIMATED WORKLOAD

On average, how many hours/week did you work with the course (including scheduled hours)?



Comments

Comments (I worked: 9-11 timmar/vecka)

Most of the hours were spent in the project work which helped me to prepare for the final exam as well.

Very little time in the beginning of the course and very much towards the end so I would say that 9-11 h/week is the average from both beginning and end. In the start I worked with the course maybe 6 h/week but towards the end with all the labs and project work it was around 20 h.

Comments (I worked: 15-17 timmar/vecka)

Just attending the classes allows not to spend too many hours on the books at home. The project required more time and maybe having one week more for it would have been better.

Comments (I worked: 18-20 timmar/vecka)

There workload varies quite a lot from week to week, with lots of additional reading material that will take a lot of time to read through. The latter part of the course is more workload heavy since there are lots of labs and also the project work. I spent more hours per week during the last 3-4 weeks of the course than in the beginning.

Comments (I worked: 21-23 timmar/vecka)

Most of time is for searching and reading literatures



LEARNING EXPERIENCE

The polar diagrams below show the average response to the LEQ statements for different groups of respondents (only valid responses are included). The scale that is used in the diagrams is defined by:

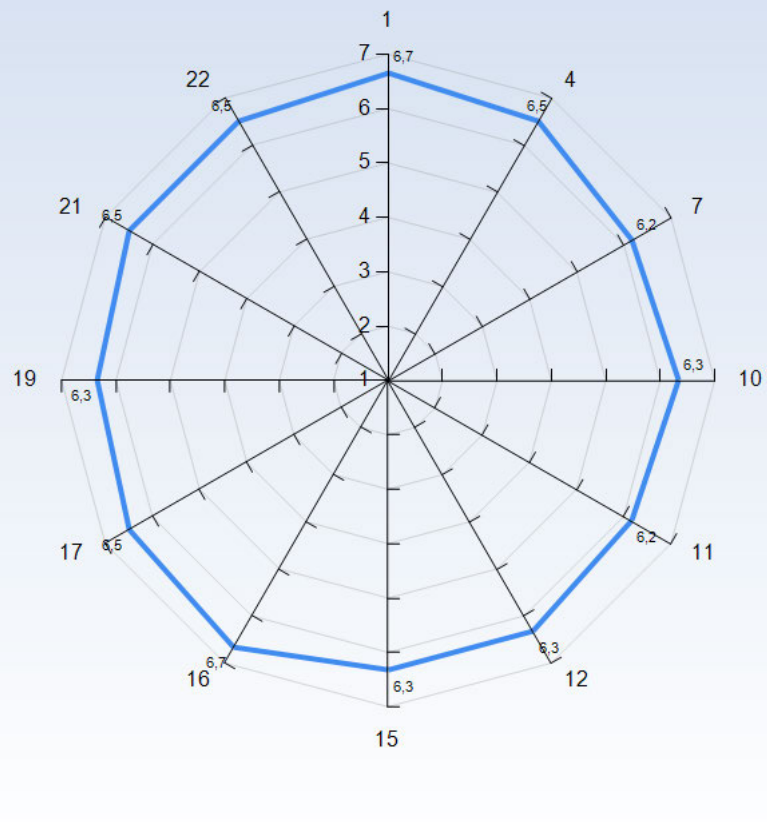
1 = No, I strongly disagree with the statement

4 = I am neutral to the statement

7 = Yes, I strongly agree with the statement

Note! A group has to include at least 3 respondents in order to appear in a diagram.

Average response to LEQ statements - all respondents





KTH Learning Experience Questionnaire v3.1.4

Meaningfulness - emotional level

Stimulating tasks

1. I worked with interesting issues (a)

Exploration and own experience

2. I explored parts of the subject on my own (a)

3. I was able to learn by trying out my own ideas (b)

Challenge

4. The course was challenging in a stimulating way (c)

Belonging

5. I felt togetherness with others on the course (d)

6. The atmosphere on the course was open and inclusive (d)

Comprehensibility - cognitive level

Clear goals and organization

7. The intended learning outcomes helped me to understand what I was expected to achieve (e)

8. The course was organized in a way that supported my learning (e)

Understanding of subject matter

9. I understood what the teachers were talking about (f)

10. I was able to learn from concrete examples that I could relate to (g)

11. Understanding of key concepts had high priority (h)



Constructive alignment

12. The course activities helped me to achieve the intended learning outcomes efficiently (i)

13. I understood what I was expected to learn in order to obtain a certain grade (i)

Feedback and security

14. I received regular feedback that helped me to see my progress (j)

15. I could practice and receive feedback without being graded (j)

16. The assessment on the course was fair and honest (k)

Manageability - instrumental level

Sufficient background knowledge

17. My background knowledge was sufficient to follow the course (f)

Time to reflect

18. I regularly spent time to reflect on what I learned (l)

Variation and participation

19. The course activities enabled me to learn in different ways (m)

20. I had opportunities to influence the course activities (m)

Collaboration

21. I was able to learn by collaborating and discussing with others (n)

Support

22. I was able to get support if I needed it (c)



Learning factors from the literature that LEQ intends to examine

We tend to learn most effectively (in ways that make a sustained, substantial, and positive influence on the way we think, reflect, act or feel) when:

- a) We are trying to answer questions, solve problems or acquire skills that we find interesting, exciting or important
- b) We are able to speculate, test ideas (intellectually or practically) and learn from experience, even before we know much about the subject
- c) We are able to do so in a challenging and at the same time supportive environment
- d) We feel that we are part of a community and believe that other people have confidence in our ability to learn
- e) We understand the meaning of the intended learning outcomes, how the environment is organized, and what is expected of us
- f) We have adequate prior knowledge to deal with the current learning situation
- g) We are able to learn inductively by moving from concrete examples and experiences to general principles, rather than the reverse
- h) We are challenged to develop a true understanding of key concepts and gradually create a coherent whole from the content
- i) We believe that the work we are expected to do will help us to achieve the intended learning outcomes
- j) We are able to try, fail, and receive feedback before, and separate from, each summative assessment of our efforts
- k) We believe that our work will be considered in an honest and fair way
- l) We have sufficient time for learning and devote the time needed to do so



m) We believe that we have control over our own learning, and not that we are being manipulated

n) We are able to collaborate with other learners struggling with the same problems

Literature

Bain, K. (2004). *What the Best College Teachers Do*, Chapter 5, pp. 98-134. Cambridge: Harvard University Press.

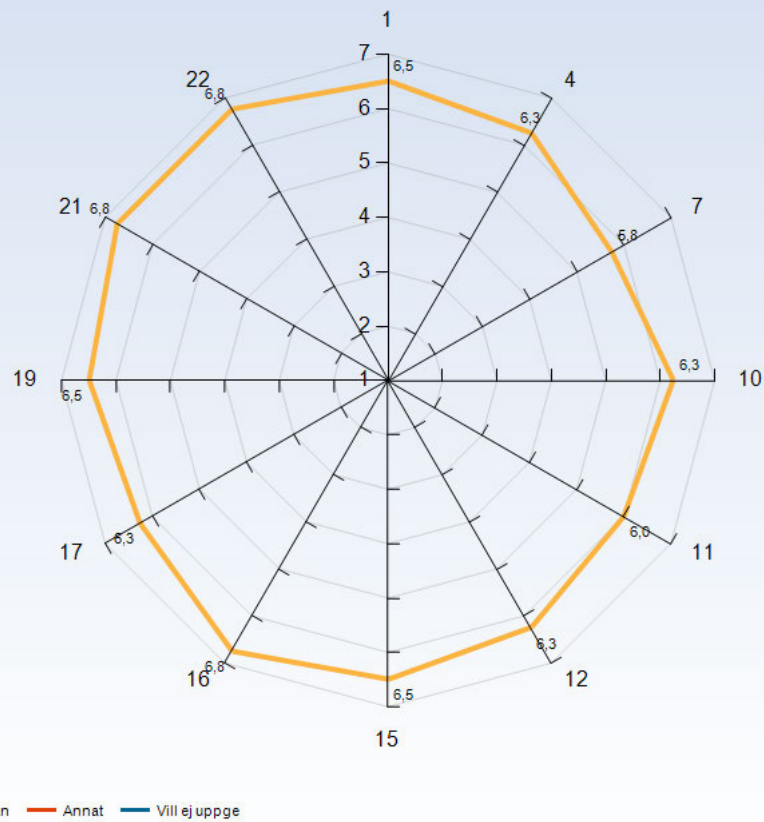
Biggs J. & Tang, C. (2011). *Teaching for Quality Learning at University*, Chapter 6, pp. 95-110. Maidenhead: McGraw Hill.

Elmgren, M. & Henriksson, A-S. (2014). *Academic Teaching*, Chapter 3, pp. 57-72. Lund: Studentlitteratur.

Kember, K. & McNaught, C. (2007). *Enhancing University Teaching: Lessons from Research into Award-Winning Teachers*, Chapter 5, pp. 31-40. Abingdon: Routledge.

Ramsden, P. (2003). *Learning to Teach in Higher Education*, Chapter 6, pp. 84-105. New York: RoutledgeFalmer.

Average response to LEQ statements - per gender

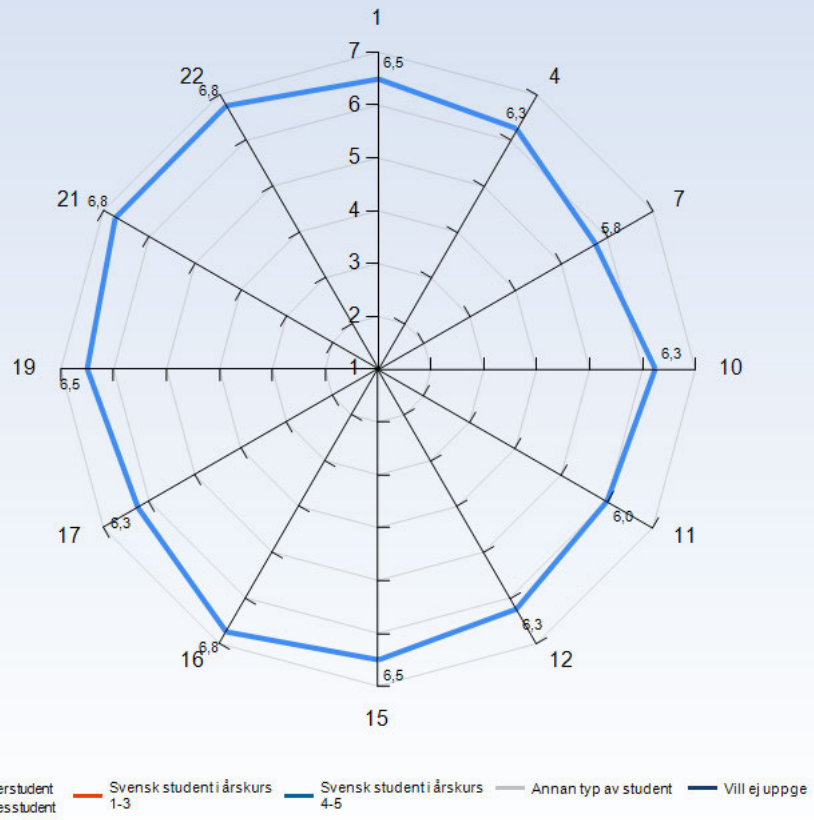


Comments

Comments (I am: Man)

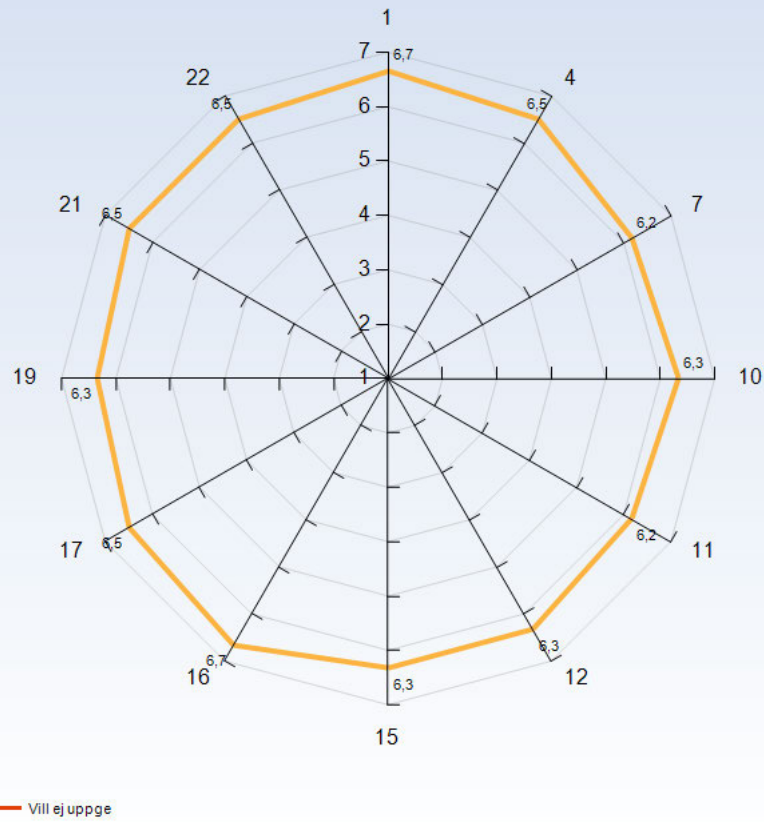
4 girls and 4 boys attended the course and I feel that we studied on equal terms.

Average response to LEQ statements - per type of student



Comments

Average response to LEQ statements - per disability



Comments



GENERAL QUESTIONS

What was the best aspect of the course?

What was the best aspect of the course? (I worked: 6-8 timmar/vecka)

The fact that we were able to follow lectures from different lecturers from various fields provided a very interesting perspective for the course content. In addition the lab work along with the visit to a company was one of the most beneficial aspects of this course.

What was the best aspect of the course? (I worked: 9-11 timmar/vecka)

How involved the different professors were, specially the lab assistants and the course responsible, Anna. They made it easier to learn and understand. Also, the different visiting lecturers helped us to understand different aspects of the course as well as giving us a picture of the current industry.

Interesting with different lecturer that was specialized on their topic.

What was the best aspect of the course? (I worked: 15-17 timmar/vecka)

The best aspect was that we were few students attending it and so we could have a good interaction with the professor or with whom has held the classes.

What was the best aspect of the course? (I worked: 18-20 timmar/vecka)

I liked that there were a lot of different ways to learn, such as labs, project work, study visit and lectures with different lecturers.

What was the best aspect of the course? (I worked: 21-23 timmar/vecka)

Well organized schedule; different teachers gave us different information in their own style; lab works are long but interesting

What would you suggest to improve?

What would you suggest to improve? (I worked: 6-8 timmar/vecka)

To provide the students with additional study material to the extent that it is possible

What would you suggest to improve? (I worked: 9-11 timmar/vecka)

There are some topics covered in the course that may have needed more lecture time than what was given to them.

Maybe some lab could have been earlier in the course. It was very much towards the end.

Better lecture material and state what's important to know more clear. For some lectures we had almost nothing to read and for some there was 8 papers so it was very uneven from lecture to lecture.

What would you suggest to improve? (I worked: 15-17 timmar/vecka)

I would avoid to deal with some introductory part and focus more on the working principle of the sensors and also on the readout. We have seen a lot of different possible sensors that we could use but I would have liked to go more in details at least in couple of them.

What would you suggest to improve? (I worked: 18-20 timmar/vecka)

Maybe spread out the labs a bit more over the entire course so that everything doesn't end up at the end of the course. It was a lot to have both project work, lectures and labs at the same time.

Also, for the exam, it would have been good if we would have been provided with the graphs from the 3rd lab.

What would you suggest to improve? (I worked: 21-23 timmar/vecka)

It will be better if we can have more time for project work. We can have more ideas if there are some advised topics and challenges before we started

There can be more discussions during class about some small but practical issues, which is fun and interesting



What advice would you like to give to future participants?

What advice would you like to give to future participants? (I worked: 6-8 timmar/vecka)

To follow every lecture closely and to engage in discussions during the lectures as it helps to better understand the main concepts.

What advice would you like to give to future participants? (I worked: 9-11 timmar/vecka)

Engage from minute 1 with the course, ask as many questions as possible and make the most out of the lab sessions.

Read lecture material continuous during the course.

What advice would you like to give to future participants? (I worked: 15-17 timmar/vecka)

Take this course if you want to have only an overview on what biosensors or medical devices are. If you already have this kind of knowledge I wouldn't take the course.

What advice would you like to give to future participants? (I worked: 18-20 timmar/vecka)

Attend all the lectures and make sure you understand what the lecturers are talking about. Write lab reports for the labs directly after doing them, this will make it easier to remember the labs for the exam.

What advice would you like to give to future participants? (I worked: 21-23 timmar/vecka)

Check the schedule often, don't miss the early lab; read more literatures

Is there anything else you would like to add?

Is there anything else you would like to add? (I worked: 6-8 timmar/vecka)

No additional comments.

Is there anything else you would like to add? (I worked: 9-11 timmar/vecka)

Special thank to Anna for making possible the study visit to a company.

Is there anything else you would like to add? (I worked: 18-20 timmar/vecka)

I liked the structure of the course and the content. I also liked that there was a home exam and that we were examined on how well we could use the material provided on the lectures to solve modern problems in sensor technology and medicine.

Is there anything else you would like to add? (I worked: 21-23 timmar/vecka)

It is an interesting and useful course. We can interact with other students and teachers often. Not many homework or reports to push students. It is the best experience to take the course.

SPECIFIC QUESTIONS

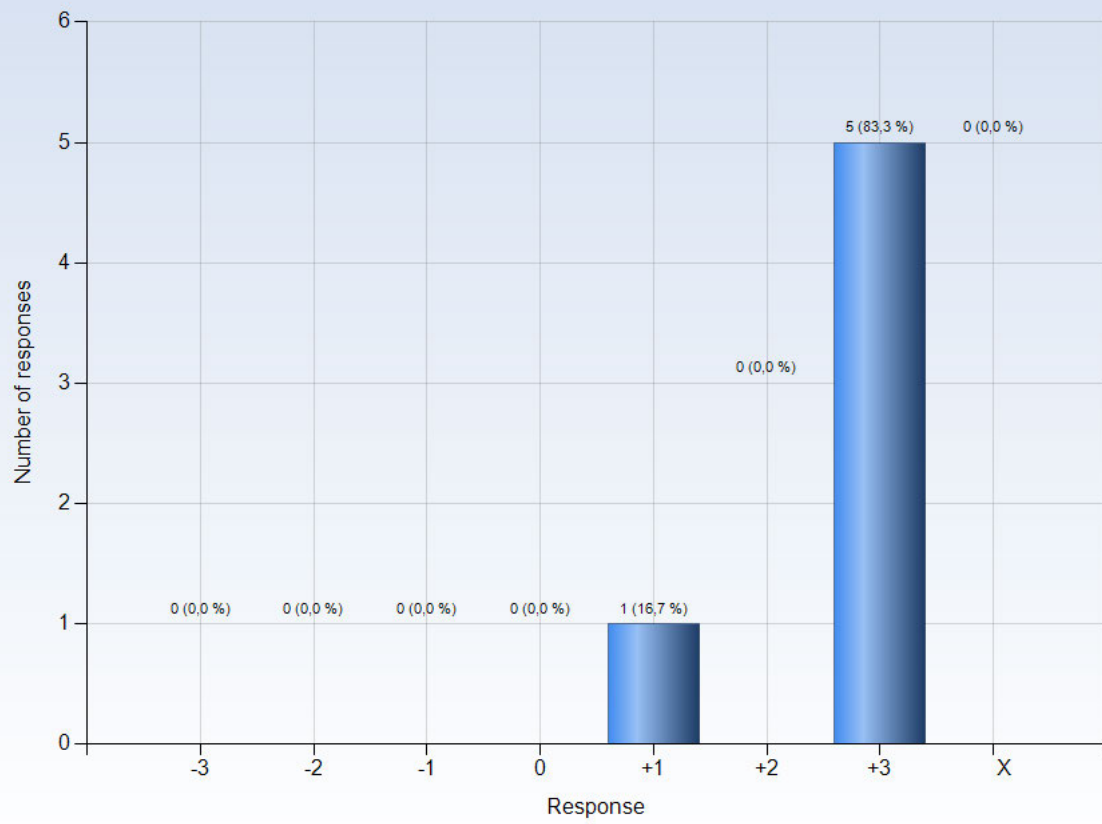
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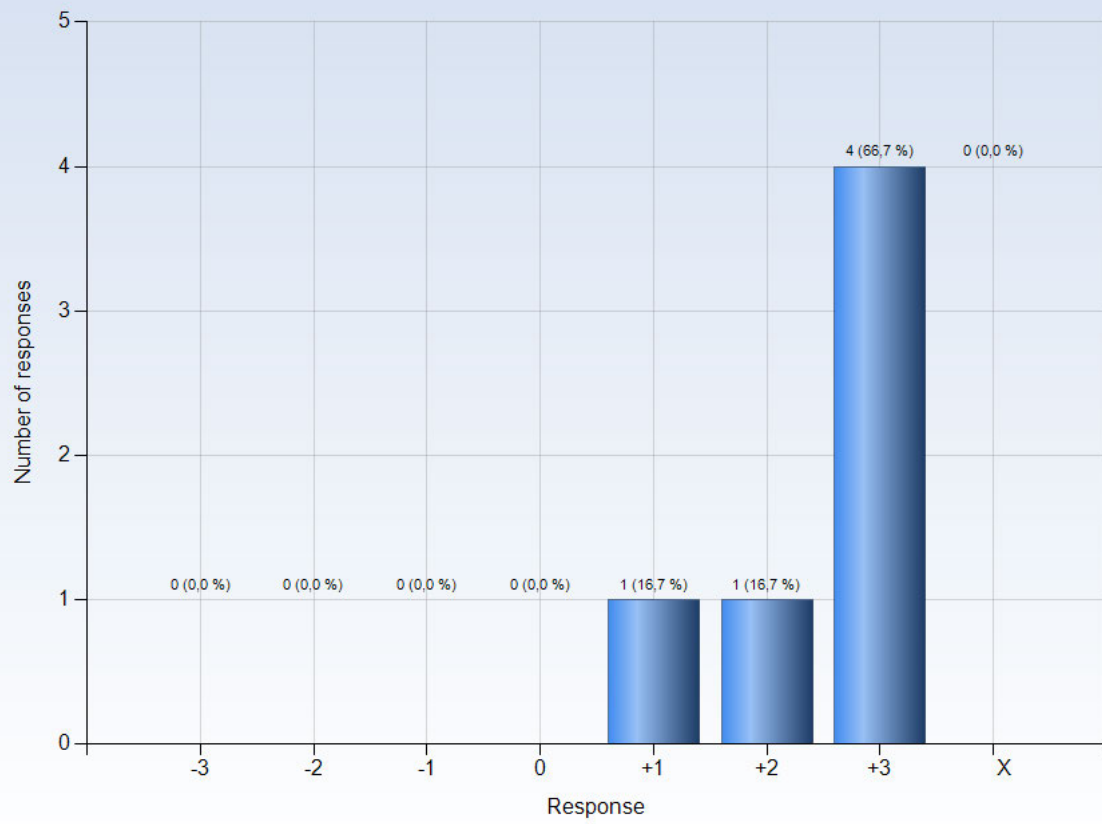
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1. I worked with interesting issues



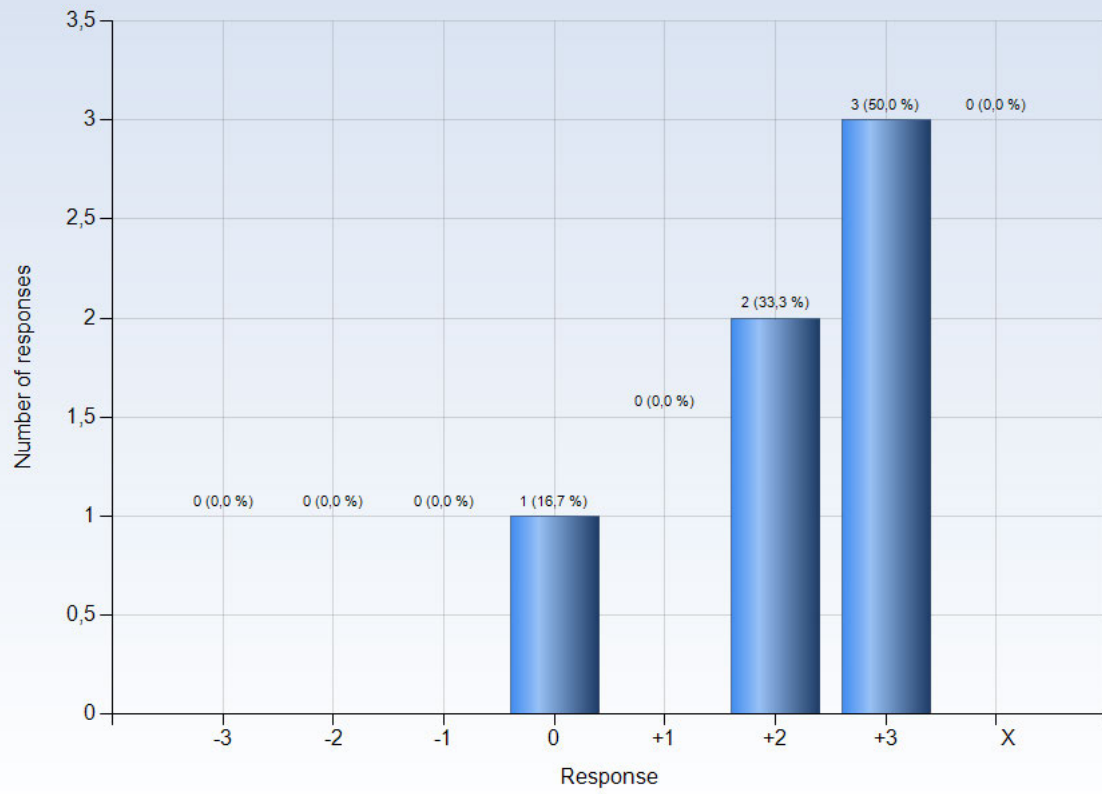
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4. The course was challenging in a stimulating way



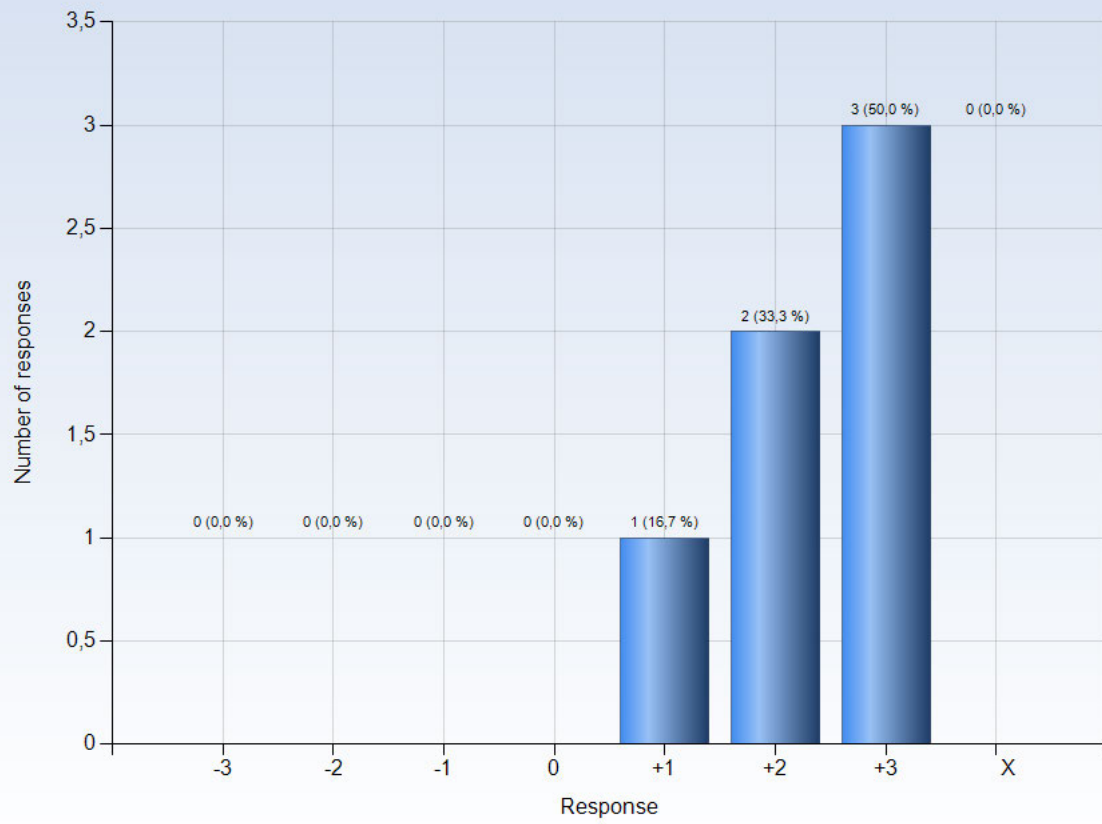
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7. The intended learning outcomes helped me to understand what I was expected to achieve



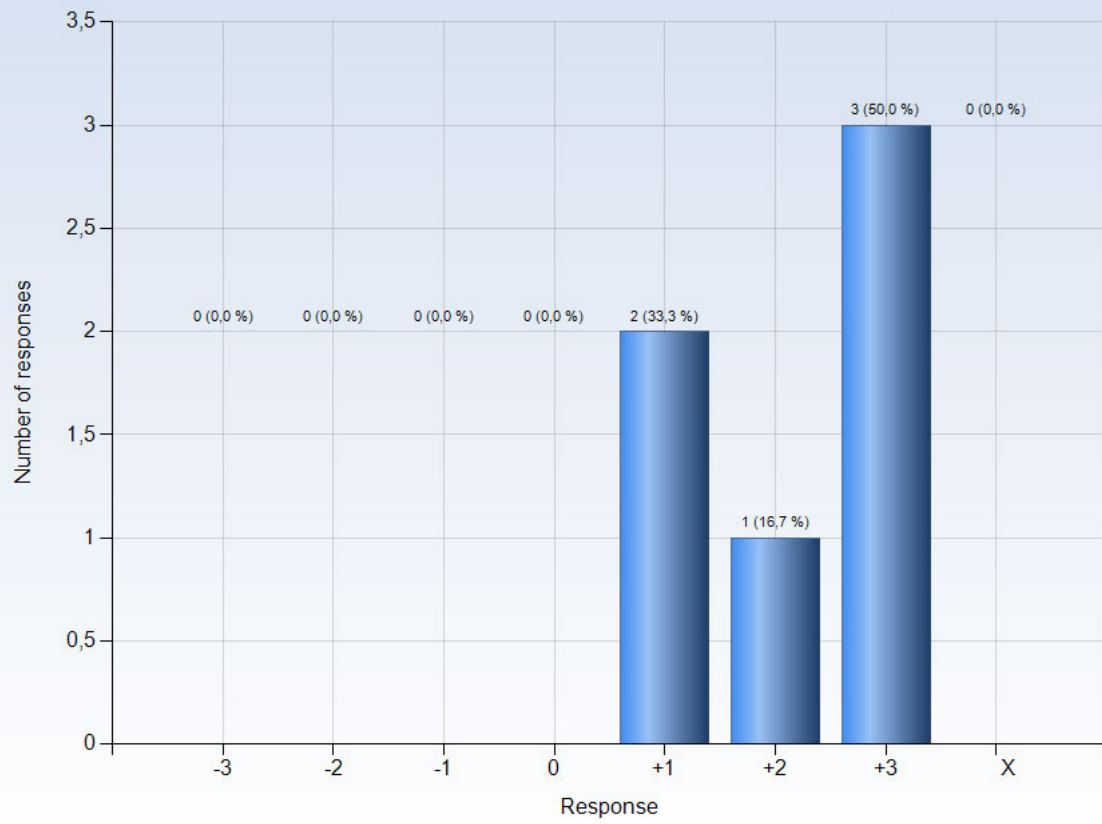
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10. I was able to learn from concrete examples that I could to relate to



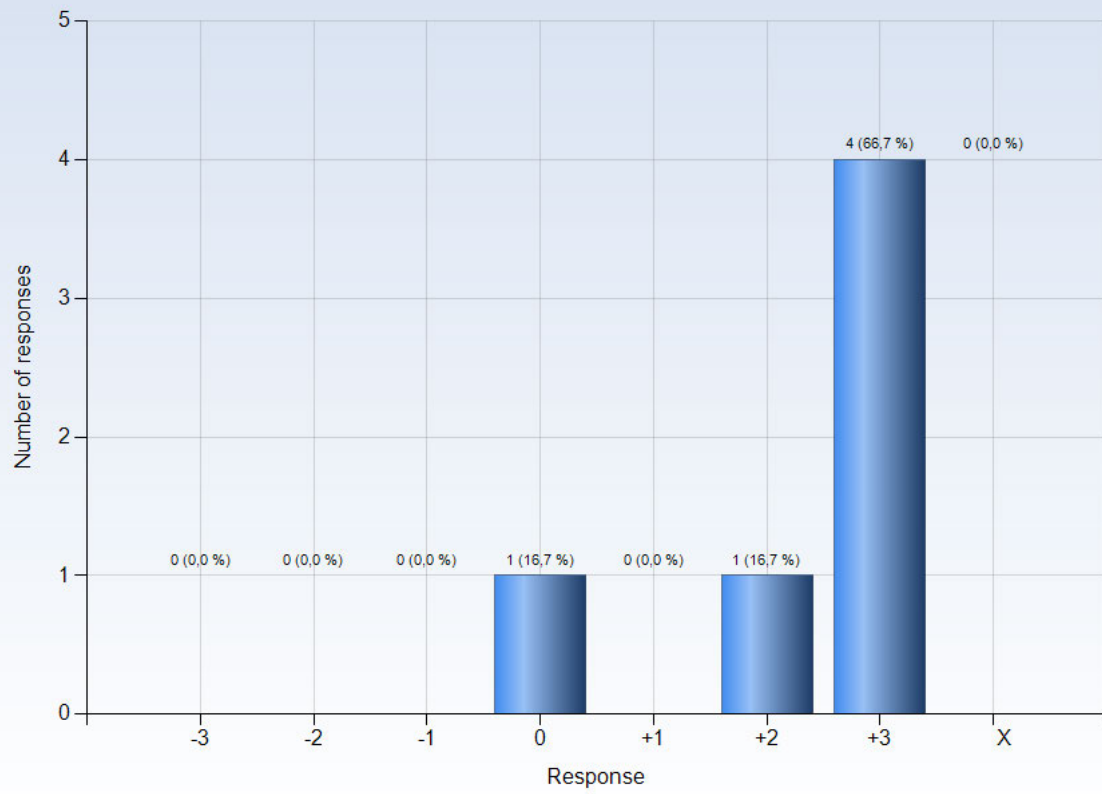
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11. Understanding of key concepts had high priority



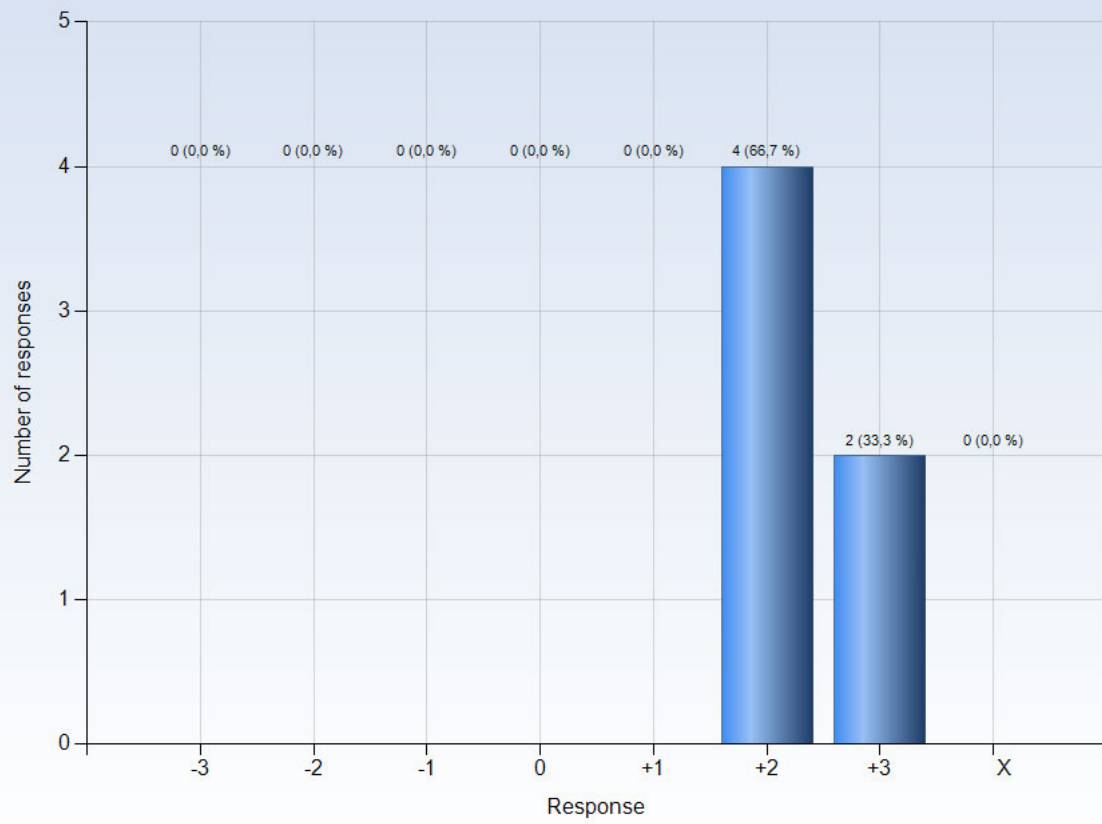
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12. The course activities helped me to achieve the intended learning outcomes efficiently



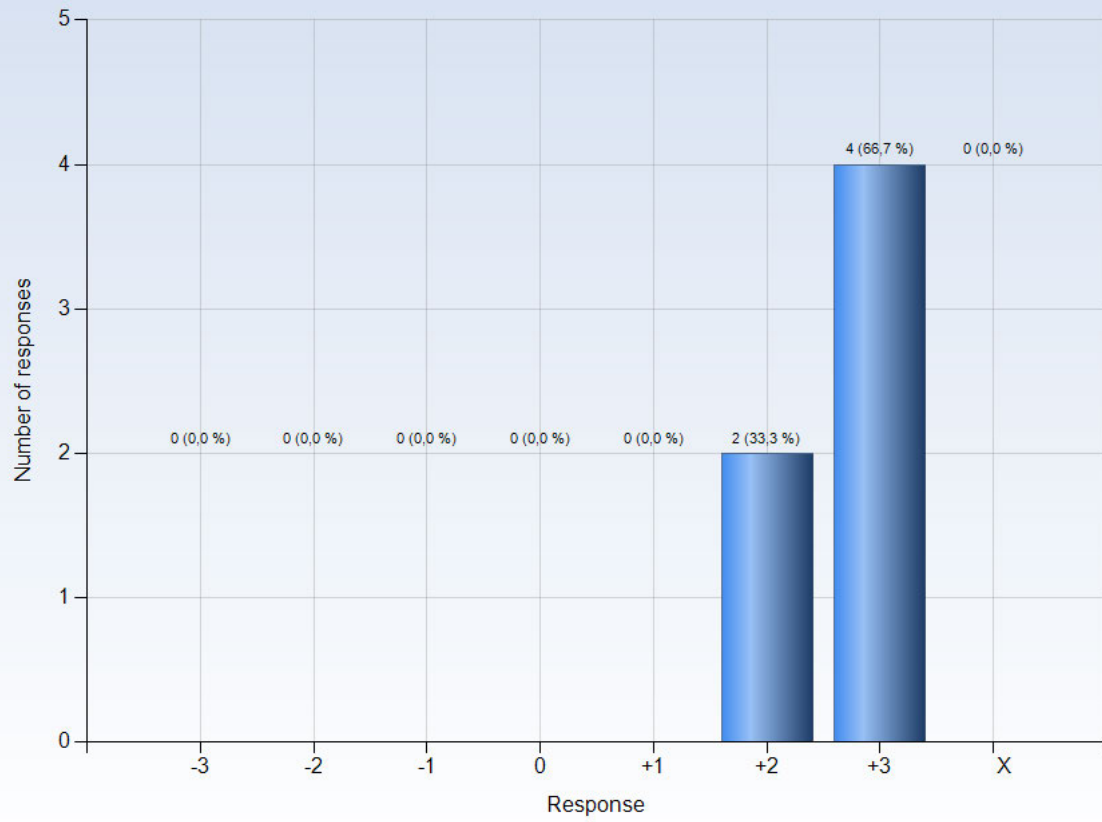
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15. I was able to practice and receive feedback without being graded



Comments

16. The assessment on the course was fair and honest

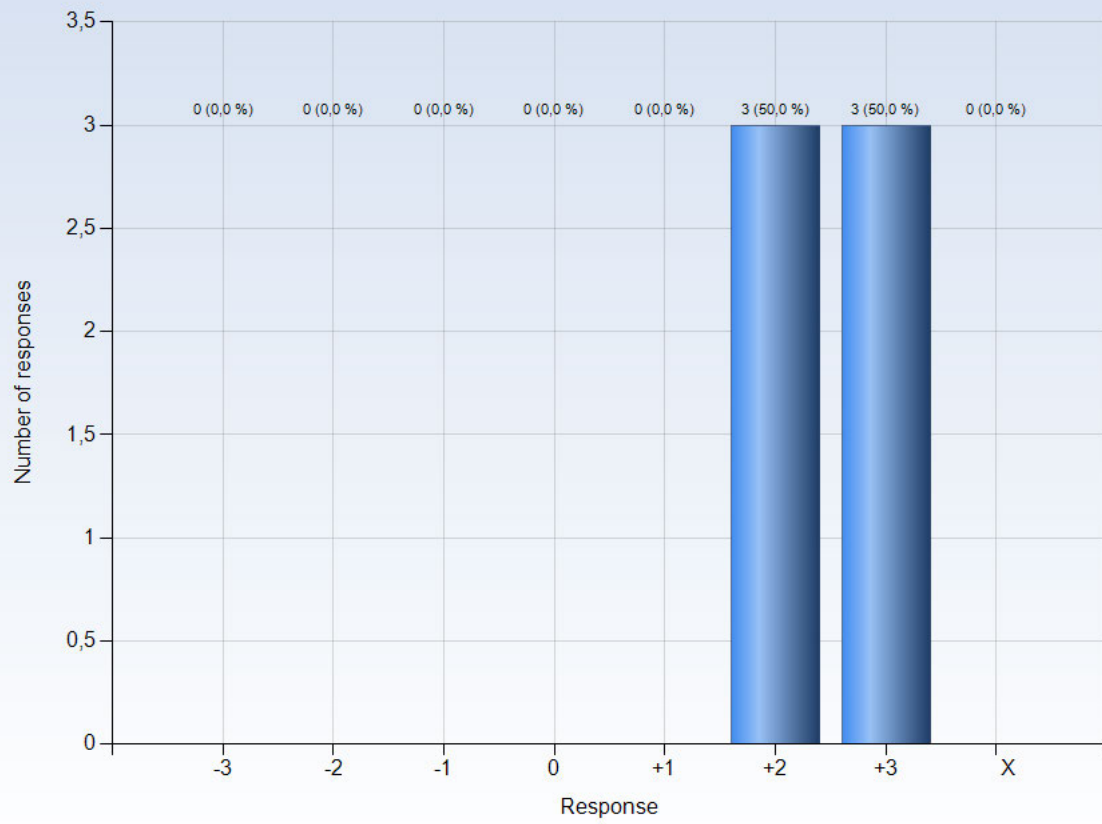


Comments

Comments (My response was: +2)

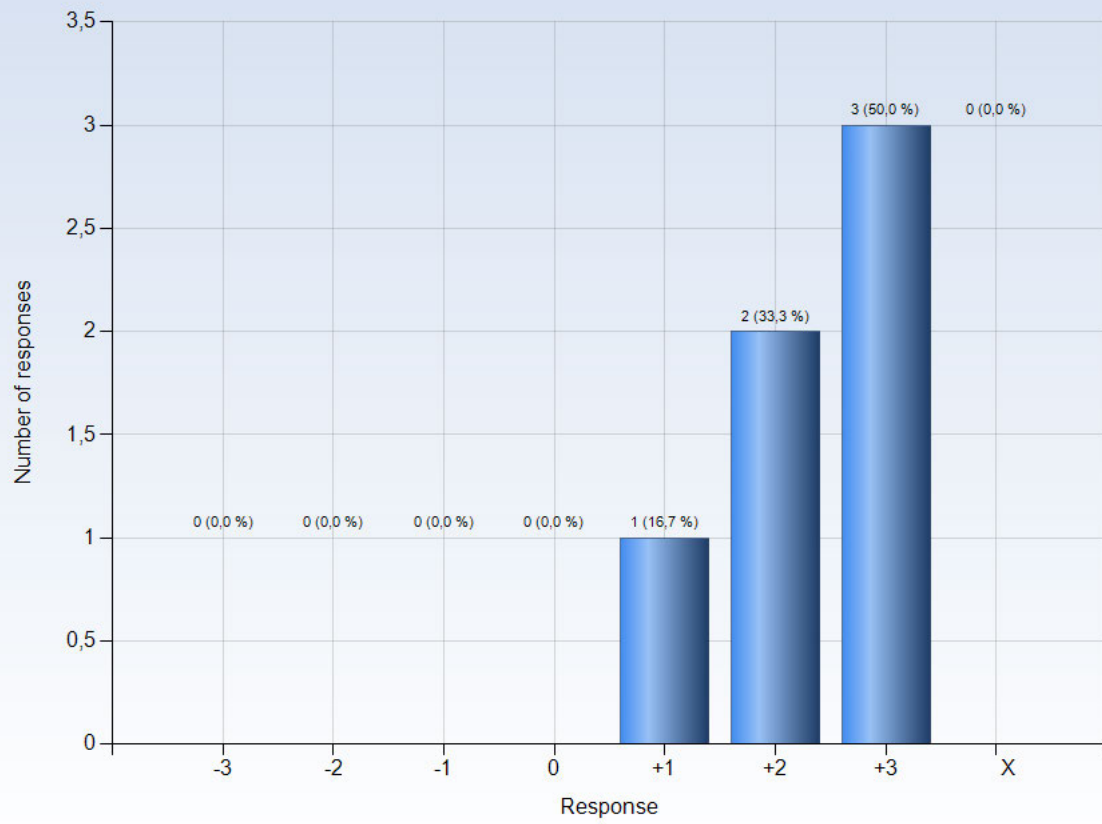
We did not get the graphs from the lab that was questioned in the exam, that made it a bit hard to write about it since we did not have any graphs to relate to.

17. My background knowledge was sufficient to follow the course



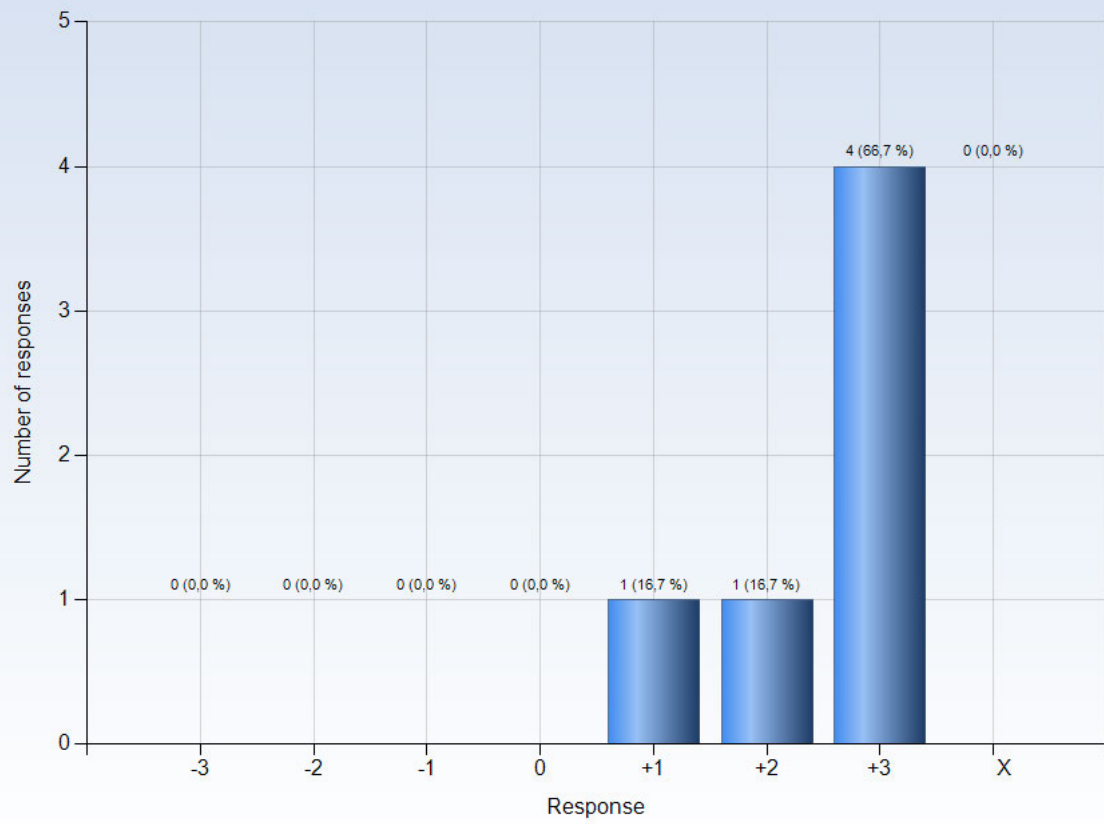
Comments

19. The course activities enabled me to learn in different ways



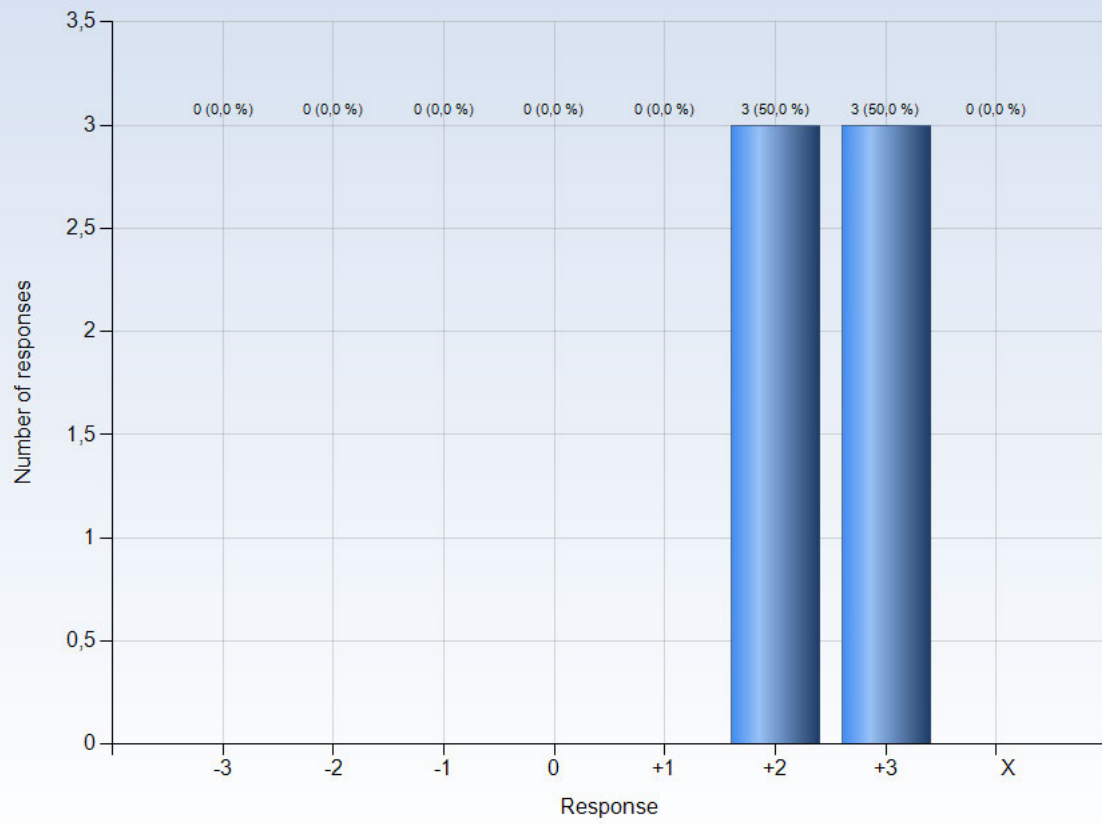
Comments

21. I was able to learn by collaborating and discussing with others



Comments

22. I was able to get support if I needed it



Comments