

Course Analysis

EQ2310 Digital Communications

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Course Data

Course name	Digital Communications
Course code	EQ2310
Credits	9 cu
Prerequisites	EQ1220/EQ1270 Signal theory, or equivalent.
Term	HT20, P2 and VT21, P3
Participation	35 registered students, 30 actively participating students Targeted student groups: TINNM, TSCRM, TEBSM, TIVNM
Teacher	Ragnar Thobaben (course responsible, examiner) Email: ragnart@kth.se
TAs	Hasan Basri Celebi Email: hbcelebi@kth.se Amirreza Zamanisiboni Email: amizam@kth.se
Lectures	14 lectures, 2h per lecture
Tutorials	14 tutorials, 2h per tutorial
Examination	TEN1, 7.5 cu, grades A-F – Continuous examination and written exam, 30 of 30 students passed PRO1, 1.5 cu, pass/fail grades – Project assignment, 28 of 30 students passed LAB1, 0.5 cu, pass/fail grades – Lab session, 26 of 30 students
Completion rate	25 of 30 students

Background

The course Digital Communications is a well established fundamentals course that is annually offered by the Division of Information Science and Engineering at the EECS School. Between 2010 and 2018, the course has been offered by Prof. Lars Kildehøj. In 2019, Assoc. Prof. Ragnar Thobaben has taken over the course responsibility. The course is offered to first-year Master students from the Master programmes TINNM, TSCRM, TEBSM, TIVNM, and it is usually followed by around 30 students per year on average. It is a mandatory course in TINNM and a recommended/optional course in TSCRM, TEBSM, TIVNM. The course gives a broad introduction to the principles of digital communication systems and summarises the underlying theory. Problem formulation and analysis with mathematical models are the most important aspects of the course.

The course goals are as follows; after passing the course, the student should be able to:

1. justify the fact that the implementation and the development of modern communication technology require mathematical modelling and problem solving

2. explain basic principles and theoretical concepts behind different technologies in modern digital communications, especially in modulation and detection, channel modeling, carrier modulation, channel coding and error protection
3. formulate a mathematical model that is applicable and relevant for a given problem in the area
4. use a given or individually formulated mathematical model for solving a given technical problem in the area and analyse the result and its reasonableness
5. compare different technologies in modern digital communication techniques, contrast different technologies against one another and assess the suitability of individual technologies in different situations
6. carry out, analyse and report simple hardware based experiments in the area
7. develop simple programme code, e.g., by means of the tool Matlab, and use this code to simulate and analyse problems in the area, and report the implementation and the result.

The course is based on the textbook “Fundamentals of Digital Communications,” Upamanyu Madhow, Cambridge 2008.

Course Design

The course consists of 14 lectures and 14 tutorial sessions in Period 2 as well as a small project and a lab in the beginning of Period 3. The lectures convey the main content of the course. The tutorial sessions provide additional examples and focus on mathematical problem solving. In the project, the students implement a simple communication system in Matlab and compare the performance obtained by simulations with a mathematical model, and in the lab assignment, the students conduct simple experiments on a USRP software defined radio platform. The examination of the course is based on a 5h written exam at the end of Period 2, which has been partly replaced in this course round by continuous examination as explained below, as well as completed project and lab assignments in Period 3. All assignments need to be passed in order to pass the course. The final grade is determined by the grade from the final exam and continuous examination.

Changes and Updates in HT20: Compared to previous course rounds we implemented the following changes:

1. **Adjustments for Hybrid Teaching due to the Corona Virus Pandemic:** The course was initially offered in a hybrid setting, giving the students the opportunity to join either in class or virtually in Zoom. In order to avoid crowded lecture halls and to avoid that students come to the campus without getting a seat, we used Canvas calendar functions for booking seats for lectures. To accommodate hybrid teaching, all lecture material was presented on PDF slides, and an iPad was used to substitute the whiteboard during lectures and to annotate directly on the slides. Tutorials were presented on a whiteboard in a meeting room and streamed in Zoom. After the first few lectures, new restrictions were introduced and all lectures and tutorials were moved into Zoom.
2. **Lecture Material:** The lectures generally follow a traditional format where the teacher presents and explains the main content of the course. To trigger discussions and to activate students, the solutions for Canvas preparation quizzes are discussed during the lecture. The lecture material was completely revised and restructured this year in order to allow

the students to develop a clear understanding on how the different topics and concepts build and depend on each other, and to make it easier for students to work with the material when preparing for the tutorial and examination. As part of the reorganisation, a lecture on source coding and information theory was added.

3. **Reading Assignments and Preparation Quizzes:** Following the reorganisation of the lecture material, reading assignments and preparation quizzes were rearranged as well. Compared to previous years and due to the added continuous examination activities (see below), we removed the option to earn bonus points on the exam by completing a certain percentage of quizzes.
4. **Video Recordings:** All lectures were recorded and provided to the students after the lecture in KTH Play. Subtitles were automatically generated.
5. **Continuous Examination and Written Exam:** As required by KTH, we introduced continuous examination activities and offered the written exam unsupervised in Canvas. The continuous examination consisted of:
 - **Essay (ES):** The essay is linked to ILO-1 and graded with grade a pass/fail grade.
 - **Oral Presentation (OP):** The oral presentation is linked to ILO-2 and graded with grades C, E, and F.
 - **Homework Assignment 1 and 2 (HW1+2):** The homework assignments are linked to ILO-3 to 5 and graded with grades C, E, and F.

The written exam (WE) links to ILO-4 and is graded with grades A, C, or F. It was carried out in Canvas and consisted of three problems similar to those in earlier exams. The problems were released in a scheduled way, and for each problem, students were given 60 min for solving the problem, 15 minutes uploading the solutions in Canvas, and a 15 minutes break between the problems. The students were unsupervised; however, the teacher was available for questions in Zoom all the time during the exam.

The grades from the essay, the oral presentation, and the homework assignments are reported together with the grade from the written exam in TEN1 as specified in Table 1.

6. **Lab Sessions:** The content of the lab sessions was not changed; however, in order to allow students who were out of country due to the pandemic to participate we arranged a Zoom connection to join the lab remotely. Due to technical problems, long delays in the technical support by IT, and sickness, the lab was delayed and offered in P4 instead of P3 as planned.

The format of the project assignment did not change.

Planned Changes That Have not Been Implemented in HT20: The initial plan for HT20 was to move the entire course to a switched class room format. Unfortunately, this change was not feasible in HT20 given the available time resources.

Student Performance in HT20

Table 2 shows the distribution of final grades in HT20 (aggregated results from the first exam in January and the re-exam in March) and the grades from HT19 and HT18 for comparison. Only 13 of 30 students chose to attend the written exam in order to acquire a higher grade A, B, or C. 11 of these 13 students passed the written exam with grade C or A. All 5 students

Table 1: Composition of the grade for TEN1 from the essay, presentation, and homework grades.

Grade TEN1	Requirement		
A	<ul style="list-style-type: none"> WE passed with grade A OP, HW1, HW2 all passed with grade C ES passed with grade P 		
B	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"> <ul style="list-style-type: none"> WE passed with grade A OP, HW1, HW2 passed, and at most two of them are passed with grade C ES passed with grade P </td> <td style="width: 50%;"> <ul style="list-style-type: none"> WE passed with grade C OP, HW1, HW2 all passed with grade C ES passed with grade P </td> </tr> </table>	<ul style="list-style-type: none"> WE passed with grade A OP, HW1, HW2 passed, and at most two of them are passed with grade C ES passed with grade P 	<ul style="list-style-type: none"> WE passed with grade C OP, HW1, HW2 all passed with grade C ES passed with grade P
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C	<ul style="list-style-type: none"> WE passed with grade C OP, HW1, HW2 passed, and at least two of them are passed with grade C ES passed with grade P 		
D	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"> <ul style="list-style-type: none"> WE passed with grade C OP, HW1, HW2 passed, and at most one of them is passed with grade C ES passed with grade P </td> <td style="width: 50%;"> <ul style="list-style-type: none"> WE failed with grade F (or not attended) OP, HW1, HW2 are passed, and at least two of them are passed with grade C ES passed with grade P </td> </tr> </table>	<ul style="list-style-type: none"> WE passed with grade C OP, HW1, HW2 passed, and at most one of them is passed with grade C ES passed with grade P 	<ul style="list-style-type: none"> WE failed with grade F (or not attended) OP, HW1, HW2 are passed, and at least two of them are passed with grade C ES passed with grade P
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E	<ul style="list-style-type: none"> WE failed with grade F (or not attended) OP, HW1, HW2 are passed, and at most one of them is passed with grade C ES passed with grade P 		
FX	<ul style="list-style-type: none"> One of OP, HW1, HW2, ES is failed with grade F 		
F	<ul style="list-style-type: none"> Two or more of OP, HW1, HW2, ES are failed with grade F 		

who have not passed the course yet, have passed TEN1 and are only missing the project or lab assignment (e.g., since they were out of country due to the pandemic). This is in contrast to previous years where usually the written exam was the main obstacle for completing the course. Compared to previous years, we can also observe a reduced number of grade A, which can be explained by the fact that we removed the option to acquire bonus points on the exam. We can also observe a large number of D grades. This is due to the fact that almost all students performed well on the continuous examination activities, which were sufficient to acquire the grades D and E, but only roughly 45% of the students chose to target a higher grade and take the written exam.

Table 2: Distribution of final grades in HT20 (30 students in total), HT19 (27 students in total) and HT18 (39 students in total).

	A	B	C	D	E	Fx	F
HT20	3	4	3	14	1	-	5
HT19	8	4	2	2	2	1	8
HT18	7	5	12	4	5	-	6

Course Evaluation

The course was evaluated using the online system provided by KTH social. The course evaluation was anonymous and based on the standard learning experience questionnaire used at KTH. The course evaluation was open until three weeks after the written exam. **7 of 30 students participated in the course evaluation.** The drop in response rate compared to previous years is due to the fact that in earlier years students have received a fraction of a bonus point on the exam when they filled out the course evaluation. This option has been removed in this course round.

Summary Generally, the answers to the questions in the course evaluation were very positive and very similar to responses in previous years. Most of the students gave very positive or at least neutral marks, and only in very few cases a negative mark was given by an individual student as it seems. A summary of the average responses is shown in Figure 1, and the dimensions are explained in the following: The students felt that they worked with interesting issues (dimension 1), the course was challenging in a stimulating way (dimension 4), their background was appropriate (dimension 17), understanding of key concepts had high priority (dimension 11), they were able to practice and receive feedback without being graded (dimension 15), the course activities enabled them to learn in different ways (dimension 19), they were able to learn from concrete examples that they could relate to (dimension 10), they were able to get support if they needed it (dimension 22), and the assessment on the course was fair and honest (dimension 16). The learning outcomes were clear, and the students felt that the course design helped them in reaching the goals (dimension 7 and 12). The responses also show clearly that restrictions due to the Corona virus pandemic have impacted the possibility to learn in collaboration with others negatively (dimension 21).

The responses left in the free-text comments confirm the overall very positive feedback by the students. Especially the continuous examination receives a lot of positive feedback; it promotes continuous learning, it provides students with useful examples, it reduces the stress, and it features a good variation of methods. The students point out that the course is challenging but interesting. The students also felt well supported by the teacher and TAs. Criticism and suggestions for changes are summarized in the following.

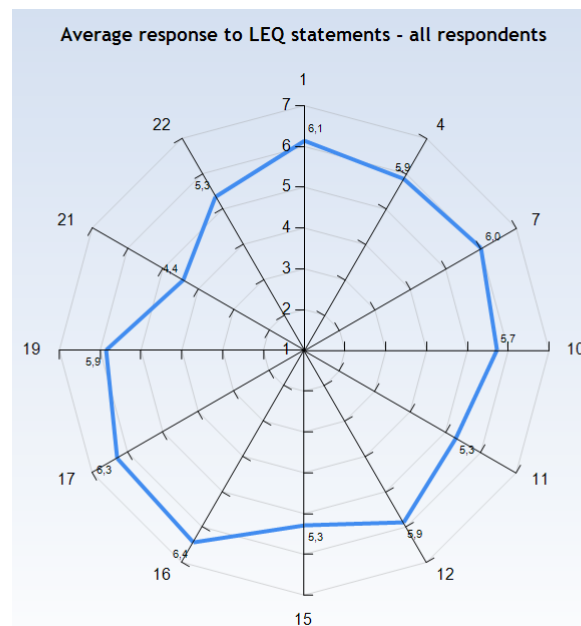


Figure 1: Average responses to the questions in the course evaluation on a scale from 1 to 7, where 4 corresponds to a neutral response.

Criticism and Suggestions The students identified the following weak spots in the course and suggest the following updates:

- Content of the Course:** The students perceive the volume of course content as a challenge and suggest to reduce the course content a little bit.
- Time management:** A good number of the lectures went slightly over time, and the students suggest better time management or a reduced course content.

3. **Group activities:** The students suggest to add group activities.

Workload in P2 The course credits of 7.5 hp in P2 translate into an expected full-time workload of 5 weeks and an average workload of roughly 22 hours per week over a 9-week period. The responses by the students show that the students stayed between 12 and 24 hours per week and only in a single case working hours around 34 hours per week were reported. Compared to previous years, the work load has increased, presumably due to the continuous examination, but it is now well aligned with the number of credits allocated to P2.

Personal Reflection

General Reflection Compared to earlier years, the course was more work intensive since the design of the continuous examination activities, the revision of the course material, and the editing of the lecture videos took more time than anticipated, which made it impossible to also implement the planned transition to a flipped class room course design (given the working conditions under the pandemic). All in all, the implemented changes worked very well, and a few reflections are as follows:

- The transition to teaching in Zoom went very well, and using the iPad as a substitute for a white board works very well. From my perception, it removes many of the barriers that are normally associated with white boards (e.g., cleaning the whiteboard, finding a functioning pen, running and jumping between whiteboard and projector screen, moving the whiteboards up and down without blocking them). As a consequence, I have explained much more than usual and in more detail compared to a traditional class room setting, and I will probably continue with that even if we go back to classroom teaching. A slightly negative effect was that many lectures went over time, which was criticised by the students. A more significant drawback of teaching in Zoom is the lack of immediate feedback by observing the students responses, and students also seem to be more passive and less interactive in a Zoom lecture. Part of the problem can be that lectures were recorded in this course round, and even though all student interaction was edited out in the published videos, many students were reluctant to actively engage in discussions.
- Developing the continuous examination format cost a lot of thought and a lot of time since the ambition was to create activities that are clearly aligned with ILOs, that provide students with new insights and useful experiences, that connect the examination activities to real-world problems, and that were at the right level of complexity and required a clearly individual effort. The positive feedback by the students indicates that these goals have been achieved. The increase in time that students spent on the course also confirms that continuous examination forces students to continuously work and engage with the course material. However, there are also some disadvantages beyond additional work load; e.g., assignments in different courses that are taught in parallel collide and compete for students attention and time, and it is not clear how re-exams and attempts to improve the grade should be handled in light of continuous examination as these concepts seem contradictory to the idea of continuous examination. Another disadvantage is that almost 60% of the students chose to not take the written exam to acquire higher grades A-C. Study conditions under the pandemic certainly play a role; however, if lack of ambition turns out to be a significant factor in this, then this is a problem that needs to be adressed in future course rounds.
- Even though the students did not explicitly mention the recorded videos in their responses to the course evaluation, the view statistics in KTH Play provide some insights into how

the students have used the videos for their learning. The number of views per video varies from lecture to lecture between around 15 to 75 views. Early lectures have received more views than later lectures, which seems consistent with lecture participation, and lectures that are critical for completing the continuous examination activities seem to get more views. Lecture videos are mainly watched during the lecture period and in preparation for the written exams and seem to be a useful resource for the students.

- The student performance in terms of grades seems to have dropped a little bit. However, compared to earlier years one needs to recognise that grades in HT19 were hyped by bonus points, and as explained above, many students chose to not take the exam which induced a large number of grade D.

Conclusions and Next Steps

We saw that especially the continuous examination had positive effects on the student's learning behaviour; the students spent more time on the course and the workload was distributed more evenly throughout the course. We also realised many benefits of hybrid and Zoom teaching and have now video material available for the entire course. From earlier course rounds the plan to move the course to a flipped class room design remains. This development goal was motivated by students' requests for additional real-world examples and in-depth discussions over the years, which however was not as strongly requested by the students in this course round. My conclusion here is that the continuous examination activities have by design filled this gap; e.g., the essays allowed students to explore how concepts of the course are applied in research papers and in the development of beyond 5G systems and to discover new use cases, and the homework problems were always phrased as end-to-end design problems which provided the students with an engineering experience. From this point of view, the need for course development towards flipped class room is not clear, and the increase in working time due to continuous examination by the students also indicates that there is not much room for this. That said, low interaction with the students during lectures remains one problem in the course, which I propose to address in the next course round by integrating elements of flipped class room teaching into the more traditional lecture style of this course (instead of moving to a completely flipped course design). The idea is to utilise the available video material from this course round to free 15-20 minutes lecture time by breaking out some parts of the lecture that need to be watched on video before or after the lectures. The gained time can then be used for additional discussions, examples, and interaction. Examples for lecture material that can be delegated to video are the high-level introduction to the topic of the lecture that needs to be watched before coming to class, or deeper derivations that can be watched after class in preparation for tutorials. In this way, the additional effort of the students is limited to additional 20 minutes of video lecture on top of the class-room session, which is in contrast to a fully flipped class room that would add at least two hours per lecture and 4-5 hours per week to the students' workload.

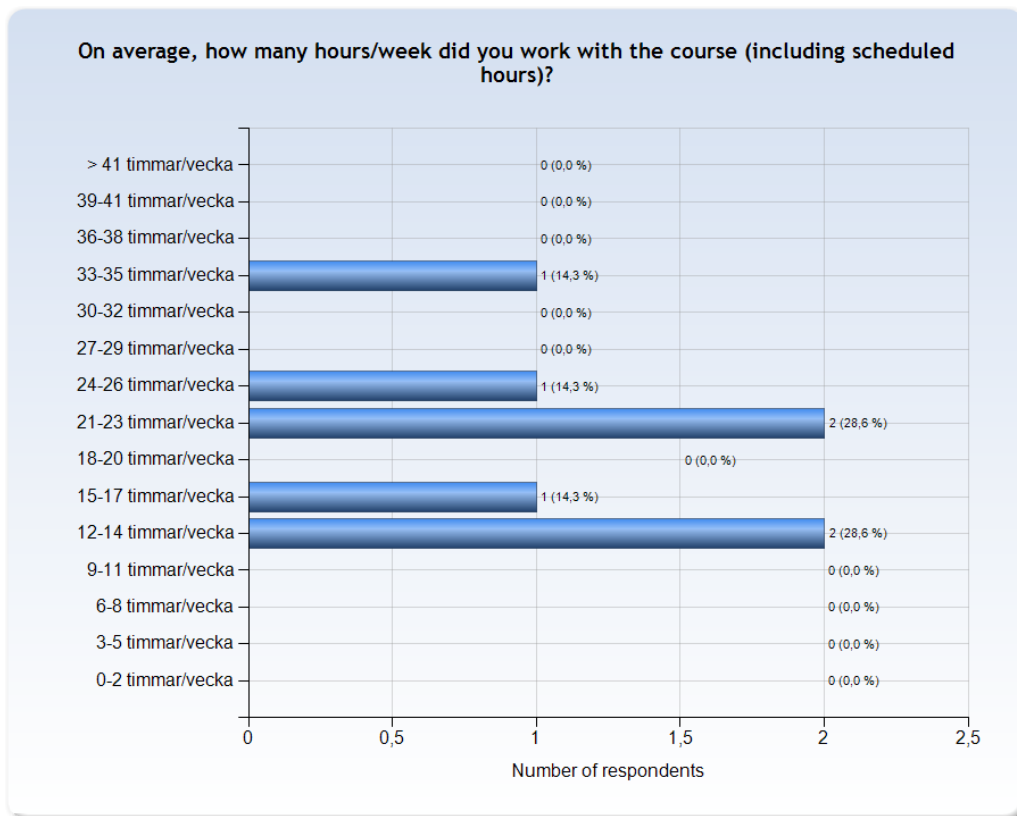


EQ2310 - 2021-01-19

Antal respondenter: 34
Antal svar: 7
Svarsfrekvens: 20,59 %



ESTIMATED WORKLOAD



Comments

Comments (I worked: 12-14 timmar/vecka)

Including hours for lectures and tutorials, 12-14 hours were still not enough to have a super grade from the course. Although topics are understandable in lectures, students should practically stay active on tutorial questions and exam questions in order to perform better in the exam.

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

There was a lot of material to cover in little time

Comments (I worked: 24-26 timmar/vecka)

It is a difficult course with a lot of material.

Comments (I worked: 33-35 timmar/vecka)

It was a fair amount of time considering the material of the course



LEARNING EXPERIENCE

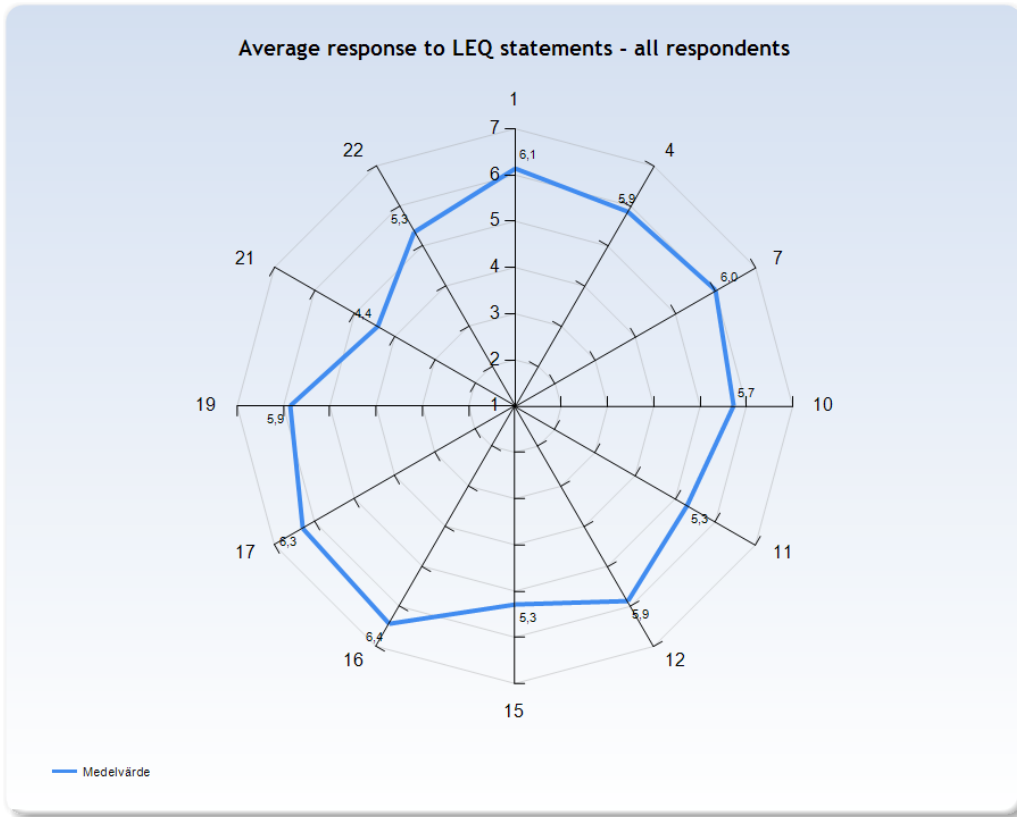
The polar diagrams below show the average response to the LEQ statements for different groups of respondents (only valid responses are included). The scale that is used in the diagrams is defined by:

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.





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

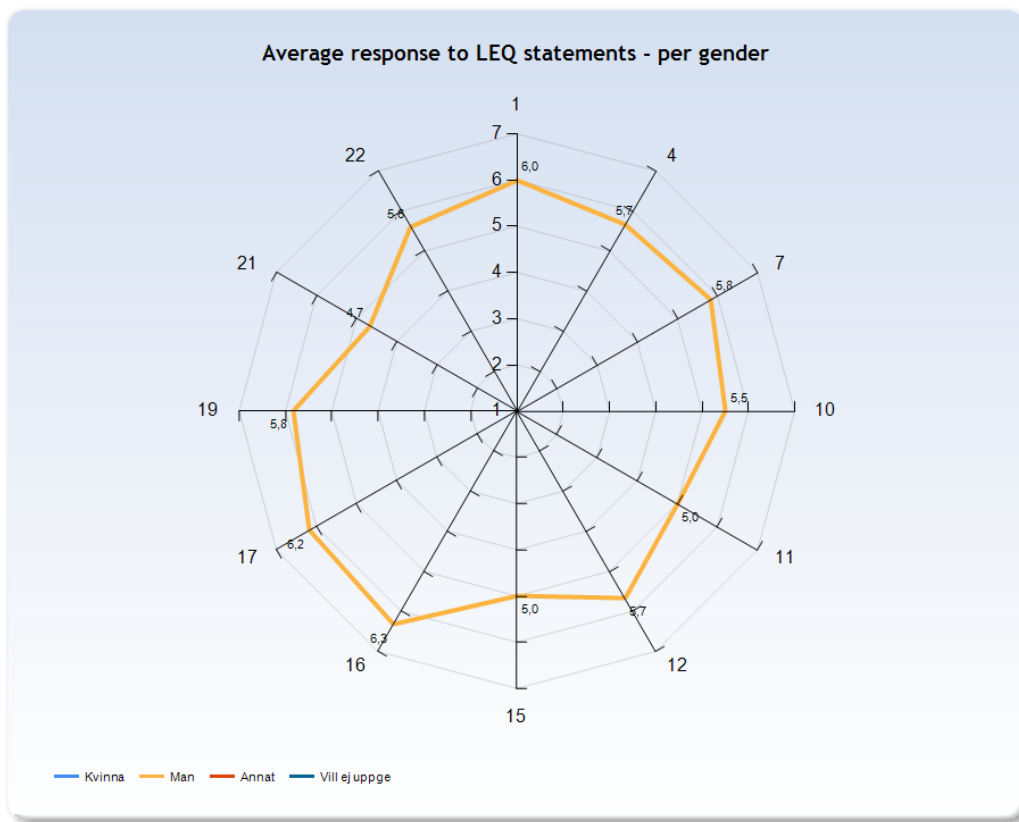
Bain, K. (2004). *What the Best College Teachers Do*, Chapter 5, pp. 98-134. Cambridge: Harvard University Press.

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.

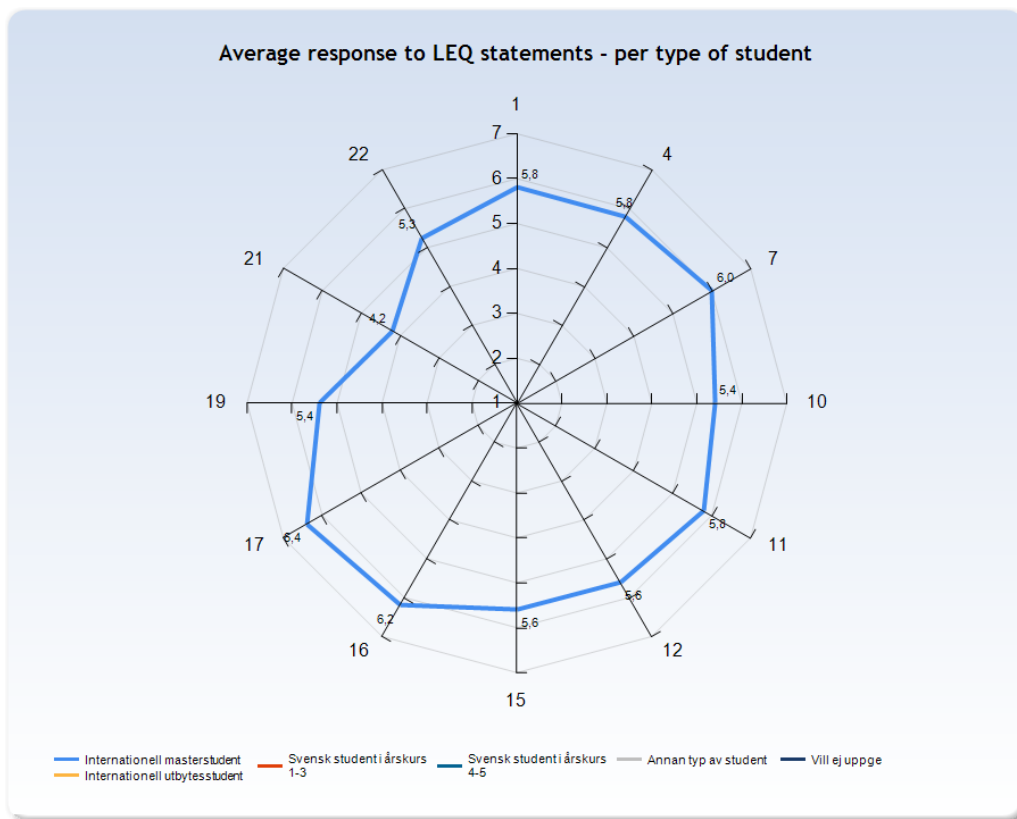
Ramsden, P. (2003). *Learning to Teach in Higher Education*, Chapter 6, pp. 84-105. New York: RoutledgeFalmer.



Comments

Comments (I am: Man)

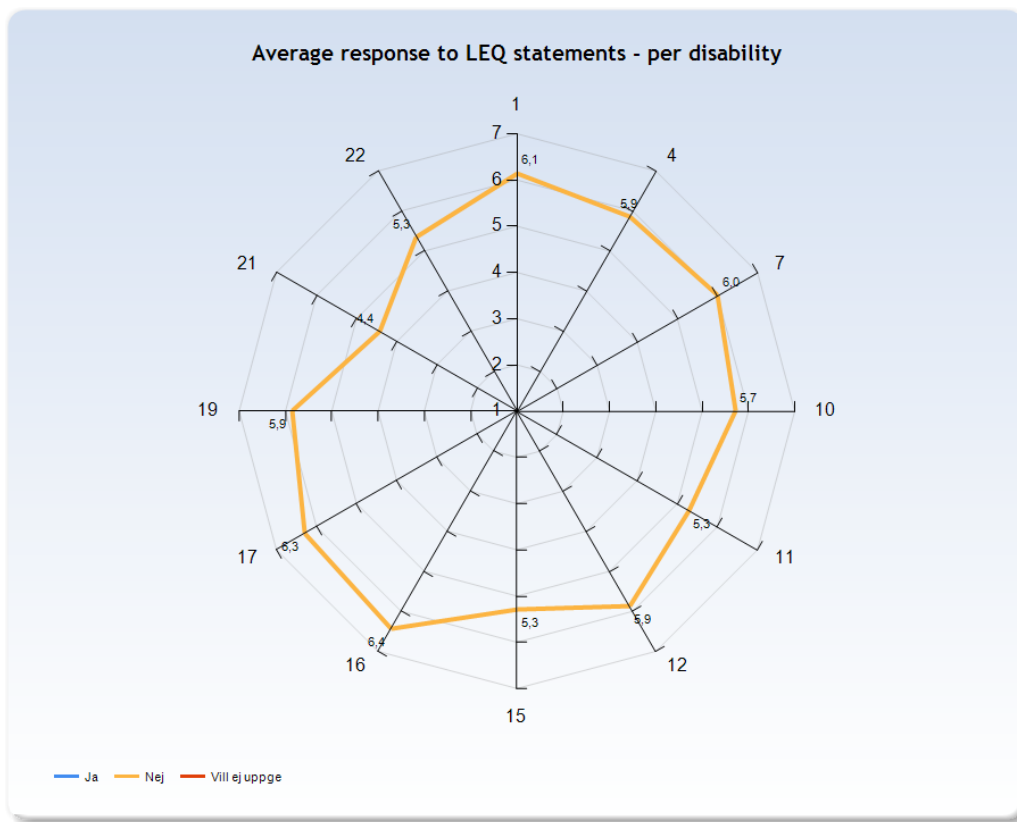
I had no problem about this perspective.



Comments

Comments (I am: Internationell masterstudent)

I had no problems about that perspective and both teacher and assistants were helpful to me as an international student.



Comments



GENERAL QUESTIONS

What was the best aspect of the course?

What was the best aspect of the course? (I worked: 12-14 timmar/vecka)

Even though I was not so interested in digital communications, I realized that it contained a lot of theoretical information that is actually used in huge variety of areas and having that background throughout this course was really contributing.

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

The continuous examination was time consuming but resulted in you keeping pace with the topics and the varied format was interesting.

What was the best aspect of the course? (I worked: 24-26 timmar/vecka)

Engaged lecturer who is very good at answering emails. Very good continuous examination, where I learned a lot by doing the assignments. Hasan held very good tutorials.

What was the best aspect of the course? (I worked: 33-35 timmar/vecka)

The way the material was presented and also the grading scheme. Not having stress for the final exam but instead showing the knowledge by different means was very nice.

What would you suggest to improve?

What would you suggest to improve? (I worked: 12-14 timmar/vecka)

I know that considering the course content it would be hard to decrease the work load of the lectures but after having around 13 lectures and around 12 tutorials, it feels a little bit tired. Maybe number of tutorials can be decreased.

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

Refine the content and communicate more thoroughly what the purpose and take-aways of each class is. Proper time management is hard but it can be crucial for students to walk away with a clear picture of the topic.

What would you suggest to improve? (I worked: 24-26 timmar/vecka)

The course is very scattered. I never felt like there was enough time in lectures to focus on the important stuff. I think this showed since lectures were rarely finished in time. Therefore, I would suggest scaling down some details in some aspects of the course. For example, transfer functions for a convolutional code and Viterbi with $\{-1, +1\}$ seem peripheral in comparison to other aspects like ML/MAP or information theory. Personally, I think I would retain more information if the course content was a bit more condensed.

I think Amirreza needs to improve his tutorials. The filming was often subpar and needs improvement.

What would you suggest to improve? (I worked: 33-35 timmar/vecka)

There should be more group activities instead of individual ones

What advice would you like to give to future participants?

What advice would you like to give to future participants? (I worked: 12-14 timmar/vecka)

I would advise them to start working on exam questions as they finish some certain topics. It will both help them on their exam and in their possible assignments.

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

The exercises are good if you participate properly. Prepare before classes so that you have time to work on understanding the concepts instead of taking notes.

What advice would you like to give to future participants? (I worked: 33-35 timmar/vecka)

Study a little bit of linear algebra before starting the course

**Is there anything else you would like to add?**

Is there anything else you would like to add? (I worked: 12-14 timmar/vecka)

I think inclusion of homeworks on grading helped really well in the end of the course. Although I was a little bit suspicious about their inclusion considering it would be heavier to always concentrate on the course for the whole period but they were really beneficial and their grading were also supportive and not so criticizing. I think such homeworks should be given in next periods as well.

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

I haven't completed the project or the lab yet so I cannot comment on the course from that perspective.

Is there anything else you would like to add? (I worked: 24-26 timmar/vecka)

I would say that the exam in the course was the most difficult I have taken during my 4 years at KTH. I don't know if that was intentional, but it was extremely challenging.

Is there anything else you would like to add? (I worked: 33-35 timmar/vecka)

The teacher and assistants were very nice also. I am thankful for their work.

SPECIFIC QUESTIONS



RESPONSE DATA

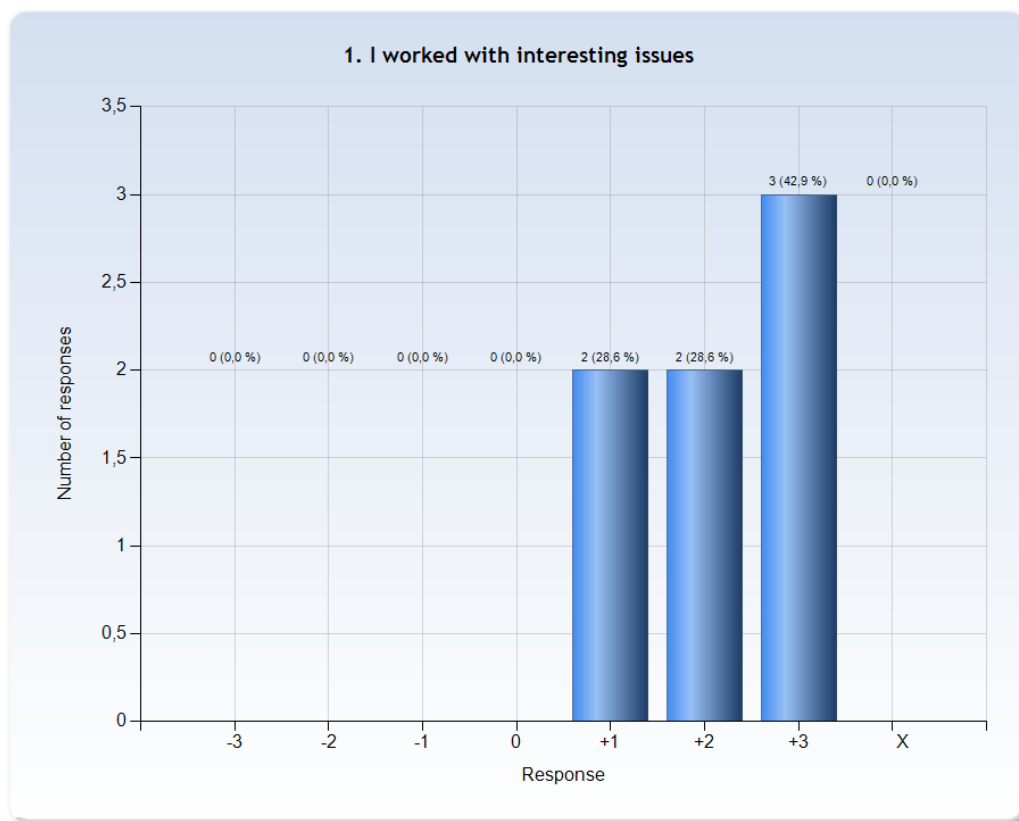
The diagrams below show the detailed response to the LEQ statements. The response scale is defined by:

-3 = No, I strongly disagree with the statement

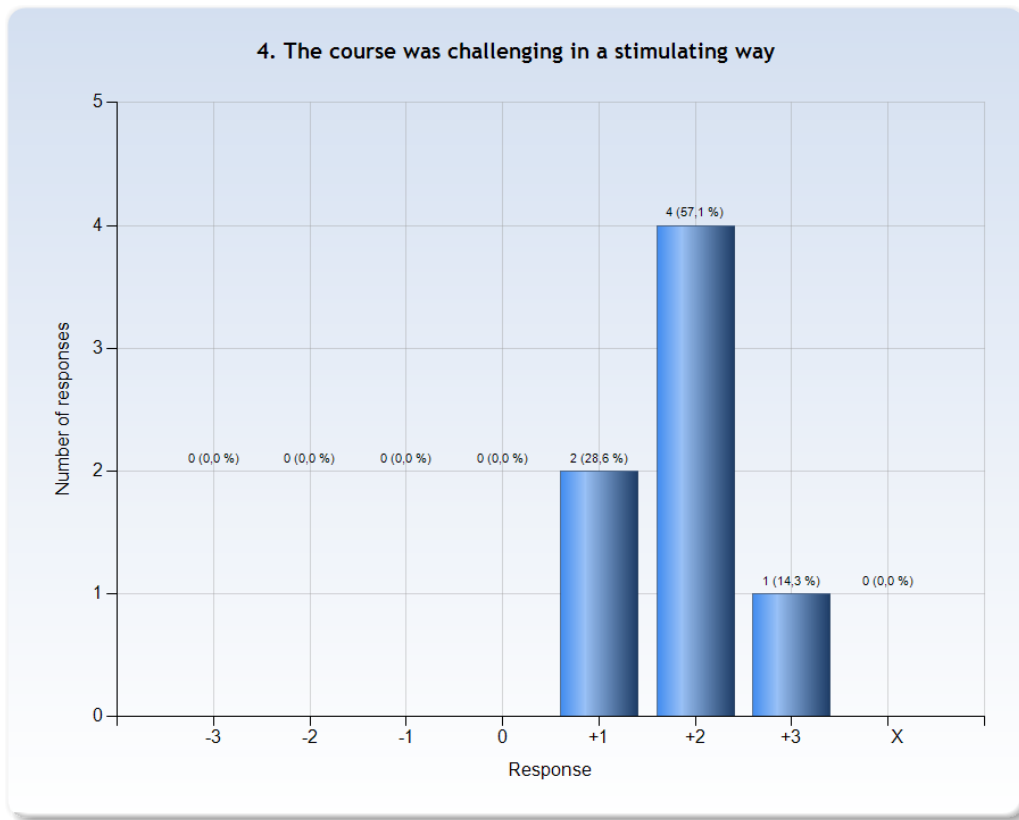
0 = I am neutral to the statement

+3 = Yes, I strongly agree with the statement

X = I decline to take a position on the statement



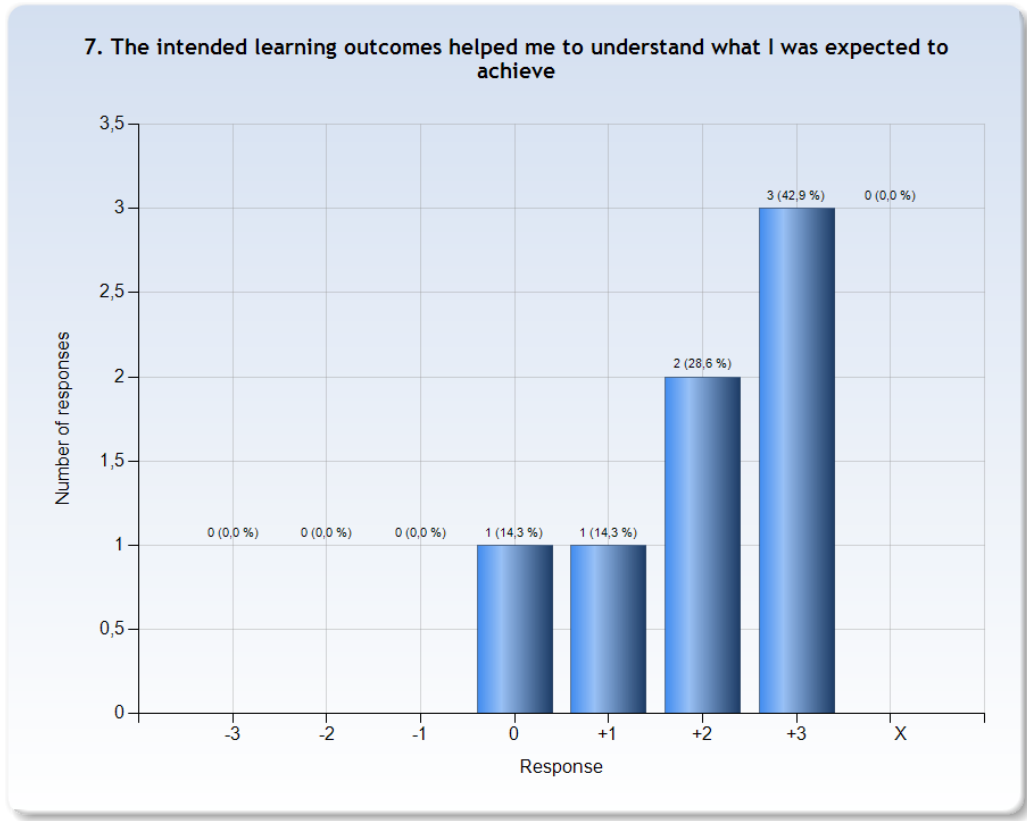
Comments



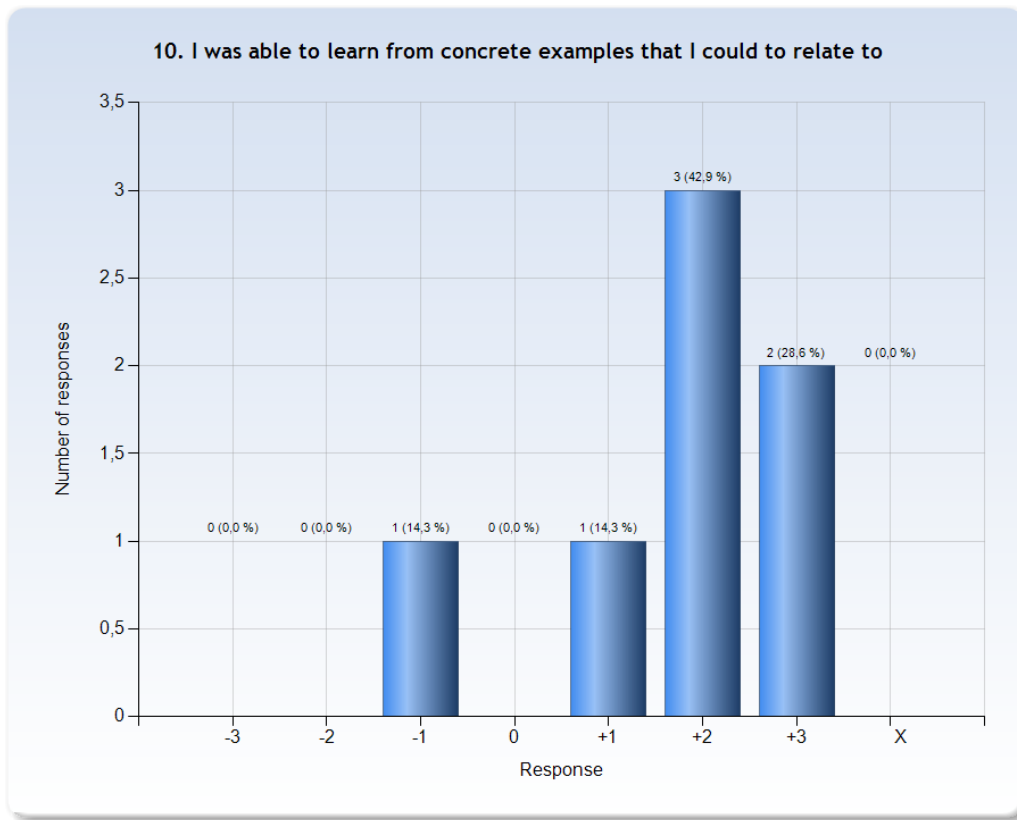
Comments



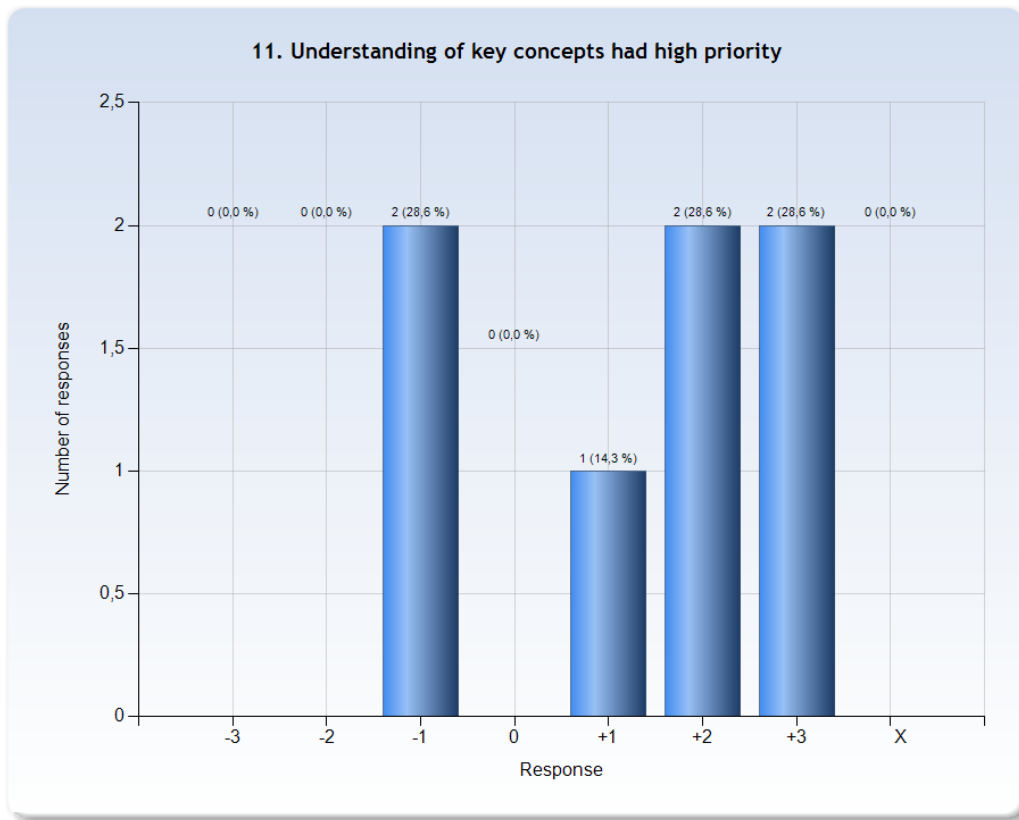
7. The intended learning outcomes helped me to understand what I was expected to achieve



Comments



Comments



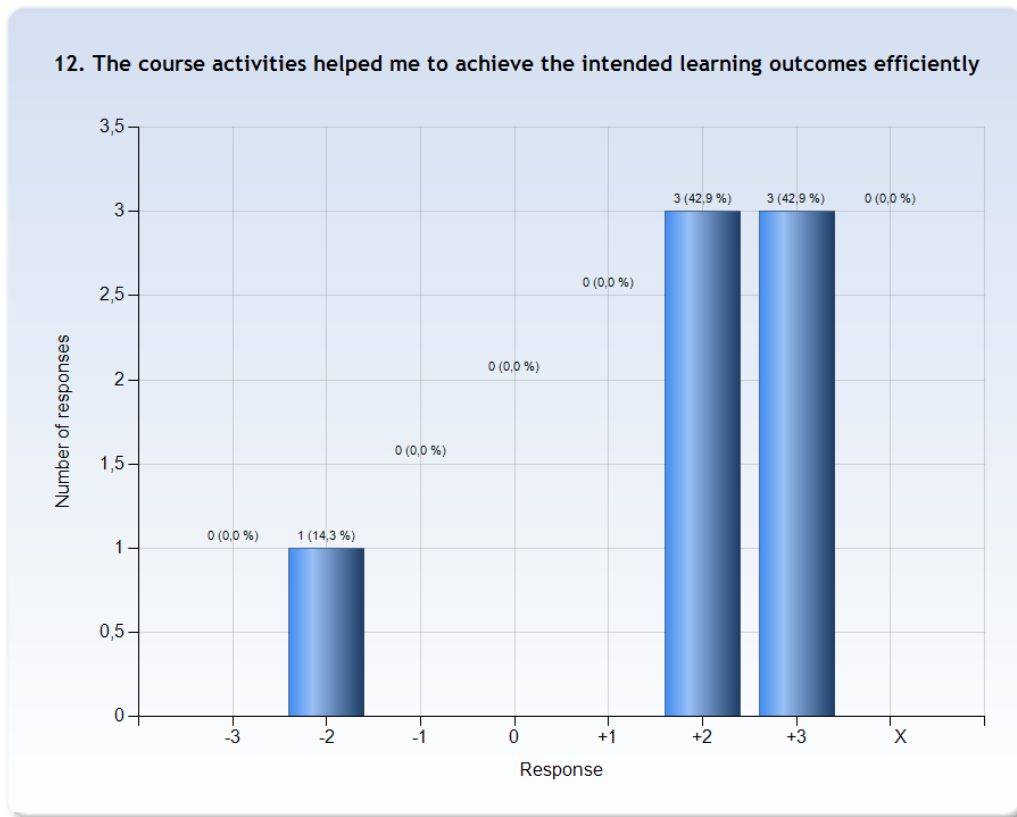
Comments

Comments (My response was: -1)

There was a lot of key concepts

Comments (My response was: +1)

I think the course is too broad for me to say that key concepts was prioritized.



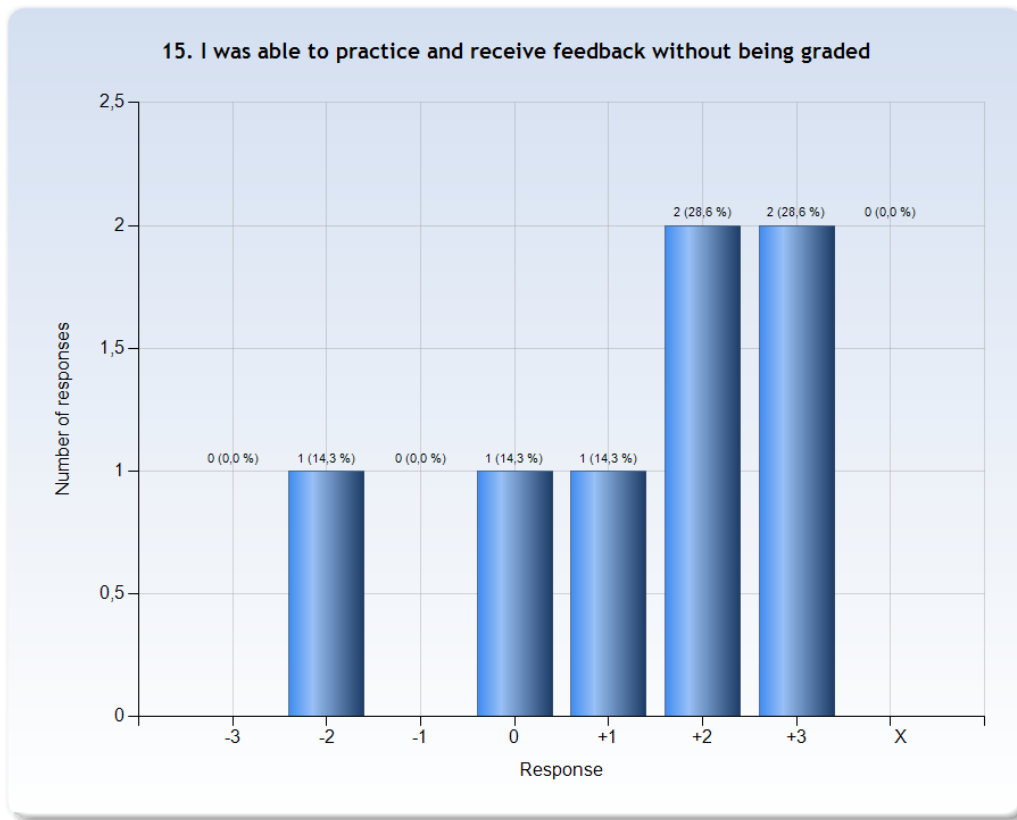
Comments

Comments (My response was: +2)

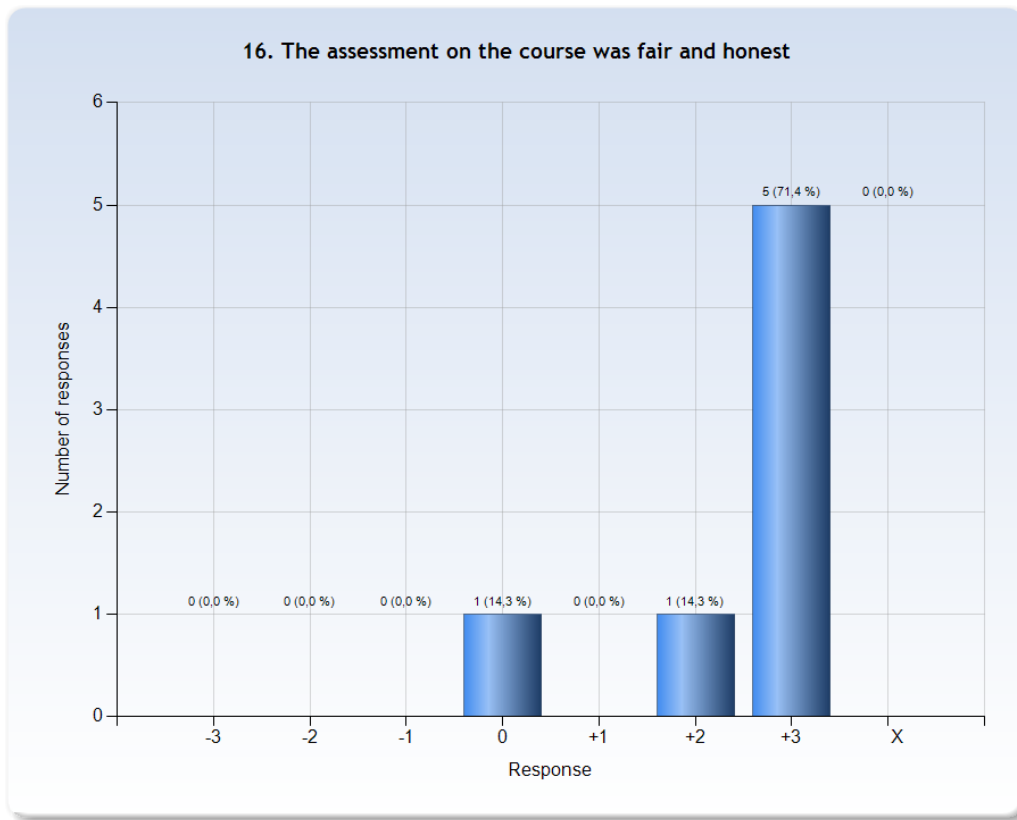
At the beginning I thought homeworks would be a huge load of work but as I started to work on them I realize how beneficial they are actually for understanding course content with real life problems.

Comments (My response was: +3)

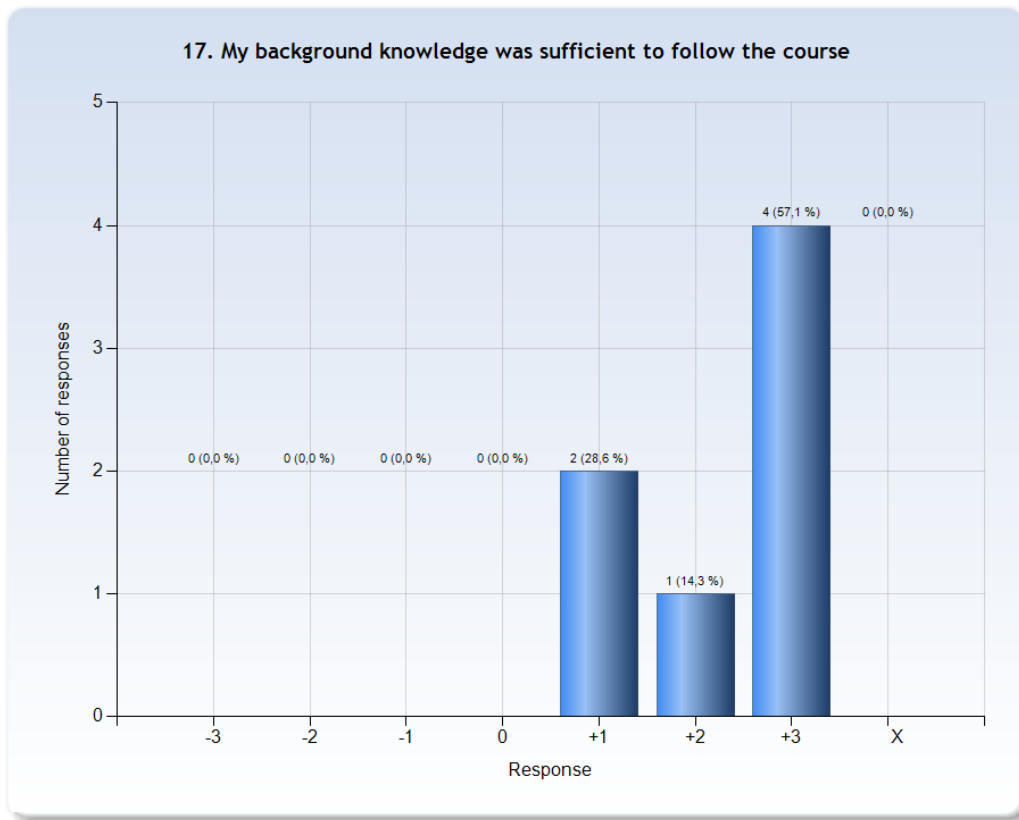
Nice adaptation to continuous examination.



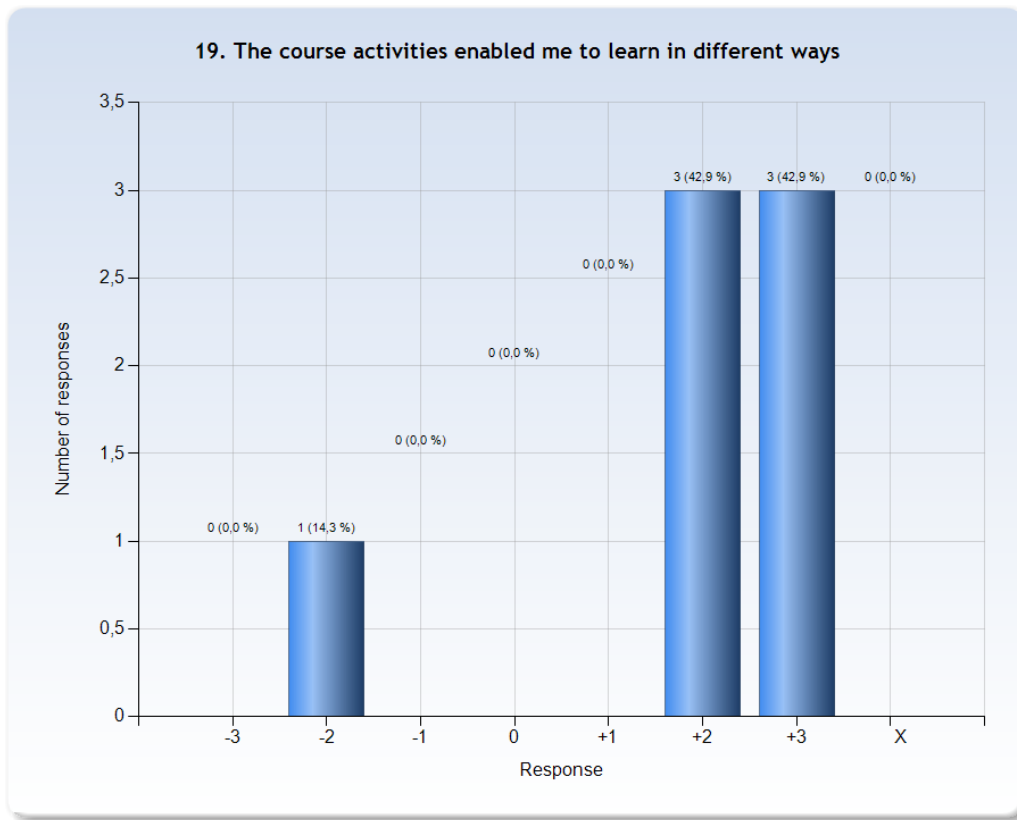
Comments



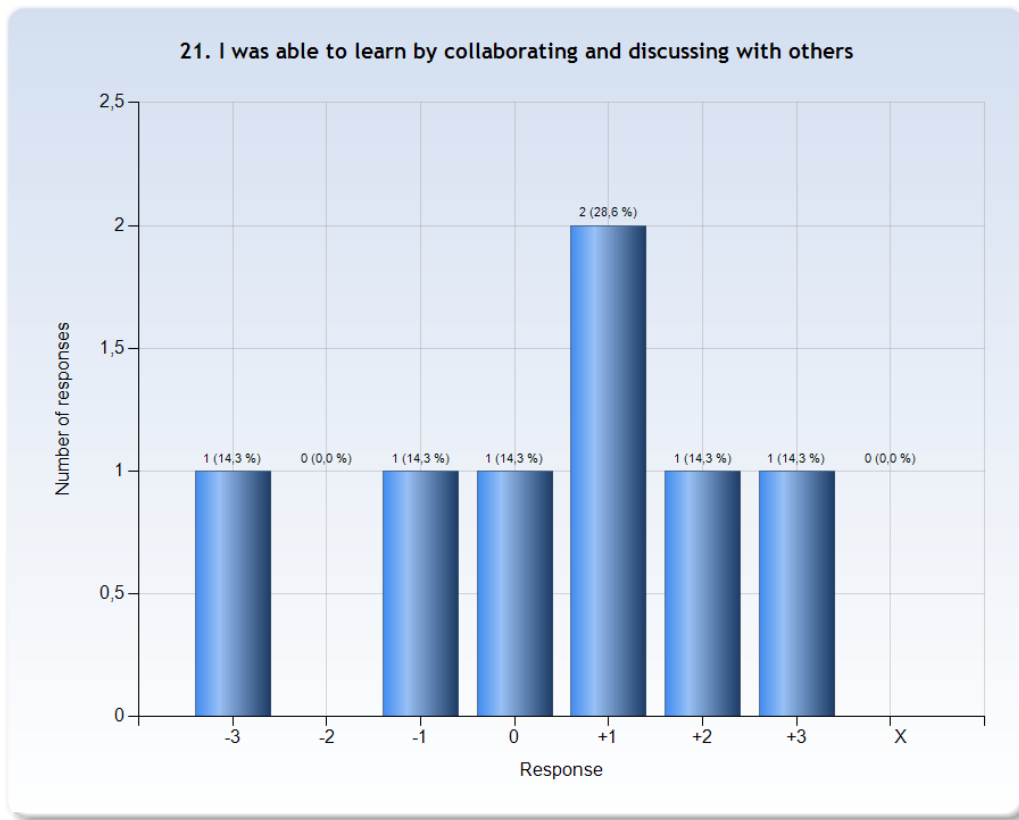
Comments



Comments



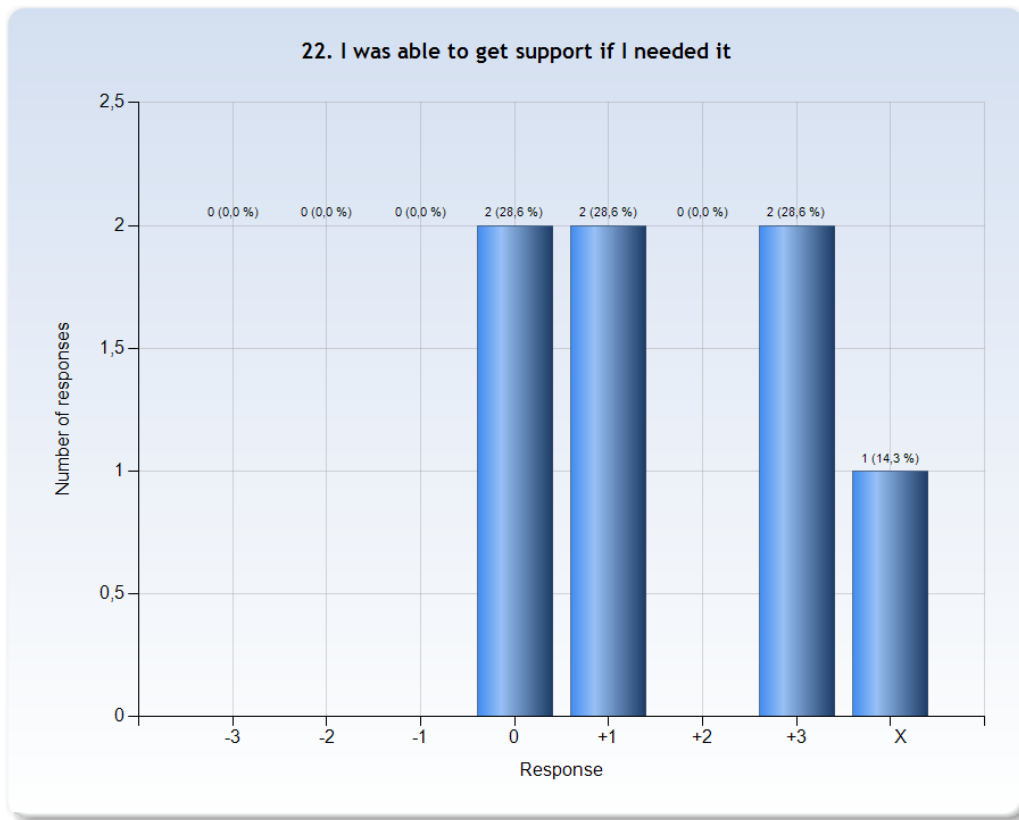
Comments



Comments

Comments (My response was: +1)

It was hard to do that with other students considering covid-19



Comments

Comments (My response was: +1)

Teacher was really helpful and assistants as well. Maybe it would be better if the discussion section is checked regularly rather than always sending an e-mail to assistants or teacher.