Report - SF2822 - 2017-06-26

Respondents: 1
Answer Count: 1
Answer Frequency: 100.00 %

Please note that there is only one respondent to this form: the person that performs the course analysis.

Course analysis carried out by (name, e-mail):

Anders Forsgren, andersf@kth.se

COURSE DESIGN

Briefly describe the course design (learning activities, examinations) and any changes that have been implemented since the last course offering.

The course is designed around two projects and lectures/exercise sessions. The projects are carried out in groups, and the students use a high-level optimization modeling language, GAMS. Modeling is examined throught the projects, theory and method knowledge is examined through the final exam. Method knowledge is optionally examined through the second project. This is the same setup as last year.

THE STUDENT'S WORKLOAD

Does the students' workload correspond to the expected level (40 hours/1.5 credits)? If there is a significant deviation from the expected, what can be the reason?

The expected workload would be 20 hours per week. The questionnaire shows a lower load. I think it differs depending on the students' background. Also, I think it is difficult for them to estimate how much time they spend on the projects.

THE STUDENTS' RESULTS

How well have the students succeeded on the course? If there are significant differences compared to previous course offerings, what can be the reason?

In the projects, the students did well. The overall result was slightly higher than earlier years. In particular, a large number of students did very well in the projects and in the final exam, thereby getting a grade A.

OVERALL IMPRESSION OF THE LEARNING ENVIRONMENT

What is your overall impression of the learning environment in the polar diagrams, for example in terms of the students' experience of meaningfulness, comprehensibility and manageability? If there are significant differences between different groups of students, what can be the reason?

The overall impression based on the polar diagrams is that this is a well functioning learning environment.

ANALYSIS OF THE LEARNING ENVIRONMENT

Can you identify some stronger or weaker areas of the learning environment in the polar diagram - or in the response to each statement - respectively? Do they have an explanation?

Stronger aspects concern support, stimulating tasks, clear goals and organization, constructive alignment, feedback and security. Weaker aspects concern choices and exploration and own experience.
I think the main strengths of the course are based on the projects, the students are well motivated and work hard. As for the weaknesses, I assign the groups and also assign the tasks to each group. This is a choice on my part. Assigning groups is important. Letting the groups choose projects might be difficult to handle. There is a choice between modeling and method assignment in project two.
There is a lower mark on receiving feedback without being graded. We tend to encourage students to discuss project with us prior to handing in. This is not graded. Normally I state this clearly and explicitly. I may not have been sufficiently clear on that point this year.

ANSWERS TO OPEN QUESTIONS

What emerges in the students' answers to the open questions? Is there any good advice to future course participants that you want to pass on?

The students are in general quite happy with the course. In particular, they appreciate the work with the projects.

PRIORITY COURSE DEVELOPMENT

What aspects of the course should primarily be developed? How could these aspects be developed in the short or long term?

The course has a functioning setup and I do not plan any major changes right now.
Minor changes would be to announce in advance which exercises to be handled at the exercise session, and also to develop new projects. We had one new project this year. Another point would be to change the way the students assess their own workload in the projects. This year we asked to send the self assessment forms individually rather than adding them to the report, as some students did not like the previous way.

OTHER INFORMATION

Is there anything else you would like to add?

The results from the course evaluation are very much in line with my own view of the course. Axel Ringh did a very good job as teaching assistant.

Course data 2017-06-26

SF2822 - Applied Nonlinear Optimization, VT 2017

Course facts

Course start:	2017 w.12
Course end:	2017 w.23
Credits:	7,5
Examination:	PRO1 - Project, 1.5, Grading scale: A, B, C, D, E, FX, F PRO2 - Project, 1.5, Grading scale: A, B, C, D, E, FX, F TEN1 - Examination, 4.5, Grading scale: A, B, C, D, E, FX, F
Grading scale:	A, B, C, D, E, FX, F

Staff

Examiner:	Anders Forsgren <andersf@kth.se>
Course responsible teacher:	Anders Forsgren <andersf@kth.se>
Teachers:	Anders Forsgren <andersf@kth.se>
Assistants:	Axel Ringh <aringh@kth.se>

Number of students on the course offering

First-time registered:	38
Total number of registered:	42

Achievements (only first-time registered students)

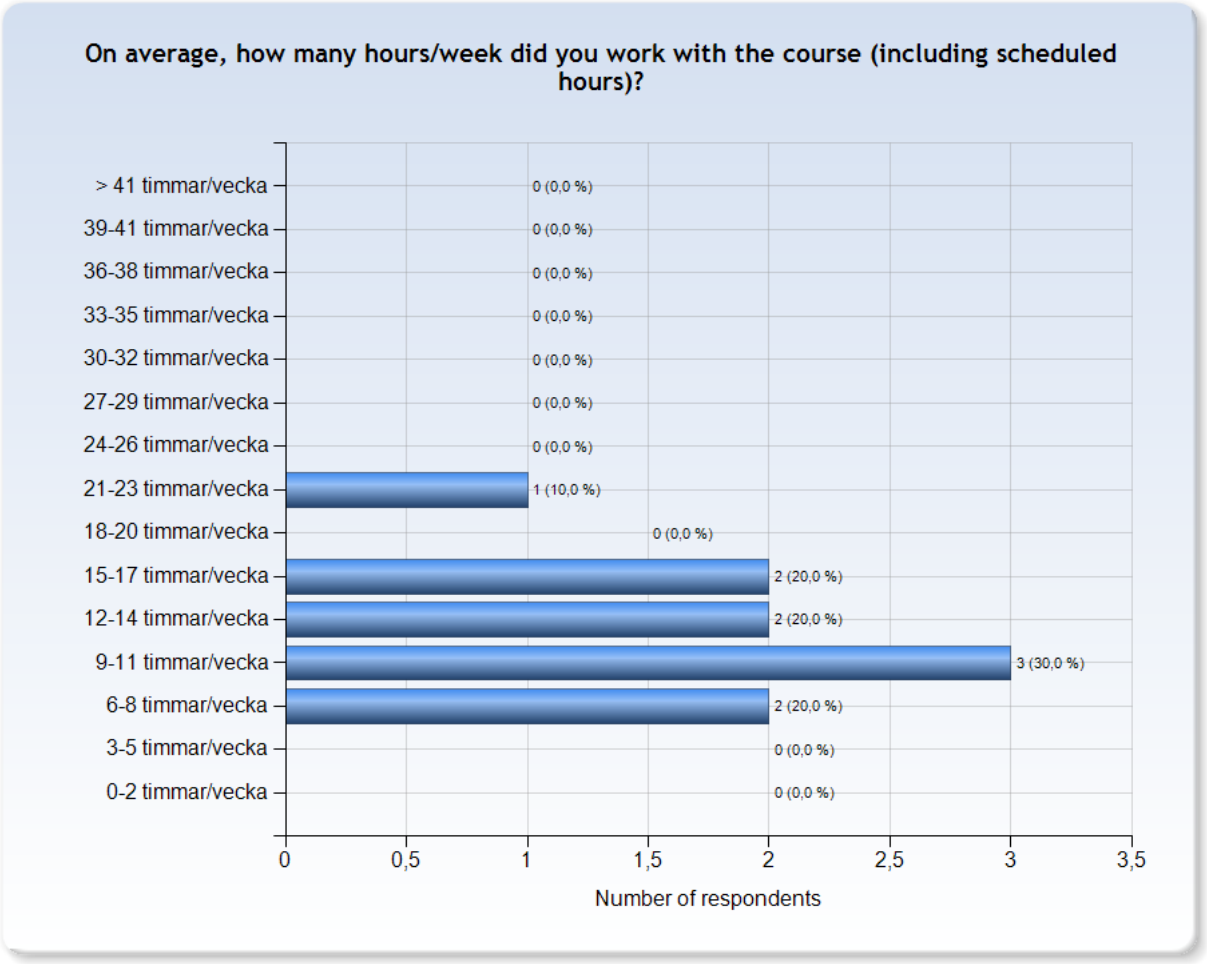
Pass rate[1] [%]	65.80%
Performance rate[2] [%]	76.80%
Grade distribution[3] [%, number]	A 52% (13) B 28% (7) C 16% (4) D 4% (1)

1 Percentage approved students
2 Percentage achieved credits
3 Distribution of grades among the approved students

SF2822 - 2017-06-01

Antal respondenter: 38
Antal svar: 10
Svarsfrekvens: 26,32 %

ESTIMATED WORKLOAD



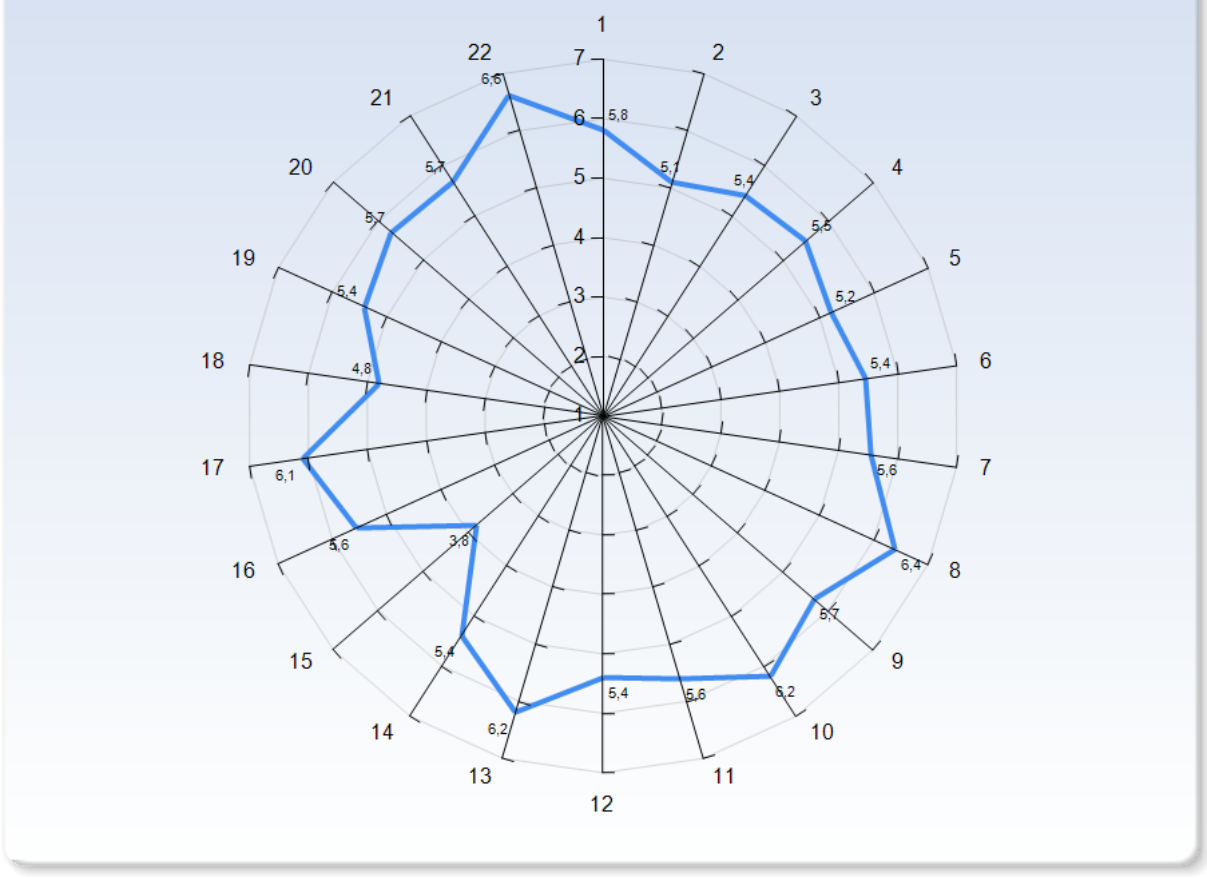
Comments

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
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
7
6
5
4
3
2
1
5,8
5,1
5,4
5,5
5,2
5,4
5,6
6,4
5,7
5,2
5,6
5,4
6,2
5,4
3,8
5,6
6,1
4,8
5,4
5,7
5,7
6,5

KTH Learning Experience Questionnaire v3.1.3

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. I understood how the course was organized and what I was expected to do (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 choices

19. I was able to learn in a way that suited me (m)
20. I had opportunities to choose what to do (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, intriguing or important

b) We can speculate, try out 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 yet supportive environment

d) We feel that we are part of a community and believe that other people have faith 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 sufficient background knowledge to manage the present learning situation

g) We can learn inductively by moving from specific examples and experiences to general principles, rather than the other way around

h) We are challenged to develop a proper understanding of key concepts and successively create a coherent whole of the content

i) We believe that the work we are expected to do will help us to reach the intended learning outcomes

j) We can try, fail, and receive feedback in advance of and separate from any summative judgment of our efforts

k) We believe that our work will be considered fairly and honestly

l) We have sufficient time to learn and devote the time necessary to do so

m) We believe that we are in control of our own learning, not manipulated

n) We can work collaboratively 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.

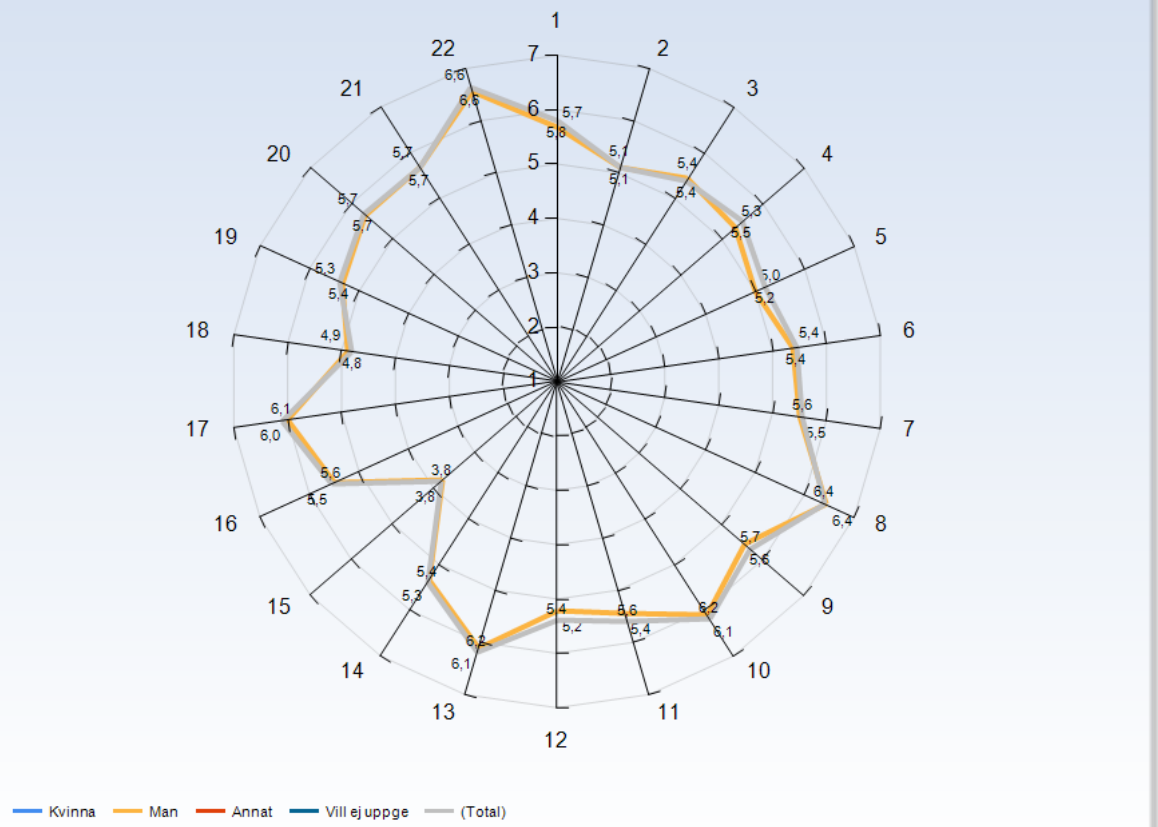
Biggs J. & Tang, C. (2011). *Teaching for Quality Learning at University*, Chapter 6, pp. 95-110. Maidenhead: McGraw Hill.

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.

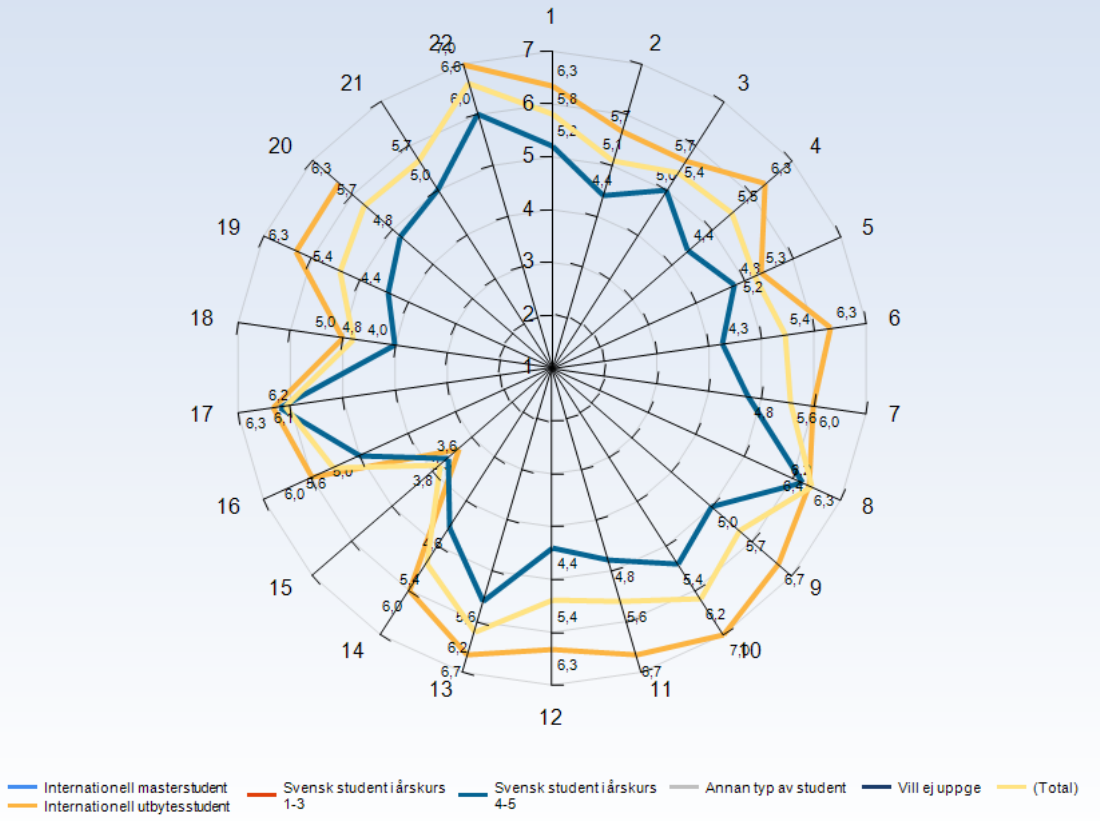
Ramsden, P. (2003). *Learning to Teach in Higher Education*, Chapter 6, pp. 84-105. New York: RoutledgeFalmer.

Average response to LEQ statements - per gender



Comments

Average response to LEQ statements - per type of student



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)
Projects were really interesting

What was the best aspect of the course? (I worked: 9-11 timmar/vecka)
Strukturen
Anders and Axel will always make time for your questions. Excellent supervision.

What was the best aspect of the course? (I worked: 12-14 timmar/vecka)
The content. It was a fucking amazing subject to learn.
The exercise sessions: absolutely necessary to better understand what the course was about.

What was the best aspect of the course? (I worked: 15-17 timmar/vecka)
"Realistic" projects
Implementation of own solvers. Interesting IQP methods.

What would you suggest to improve?

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

What would you suggest to improve? (I worked: 9-11 timmar/vecka)
Picking a project partner at random can lead to many people relying on others to do their work. Especially very motivated people tend to get forced into doing all the work on their own. This is incredibly frustrating, demotivating and can lead to unwanted results. I feel that this system rewards people with low work attitude and punishes those who are committed. I would prefer free group choice. If this is too complicated a system were grade targets are set might be useful. i understand that this system is meant to help people who have trouble with the course material but it does not have this effect.

What would you suggest to improve? (I worked: 12-14 timmar/vecka)
Perhaps the form of the lectures: making them more illustrative, with more concrete examples would be better than several slides I guess.

What would you suggest to improve? (I worked: 15-17 timmar/vecka)
Skip fewer slides during lectures (decrease amount of slides to match the actual content, or clearly label slides as "extras").

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)
Enjoy.
Go to the exercise sessions which are very very important, work hard on the projects (give good insights into the course too) and prepare the theory questions well in advance to really understand them when it is time for the exam.

What advice would you like to give to future participants? (I worked: 15-17 timmar/vecka)
Prepare answers to theory questions as they come up (instead of before final exam)
Work hard.

Is there anything else you would like to add?

Is there anything else you would like to add? (I worked: 12-14 timmar/vecka)
No tnx
Nothing

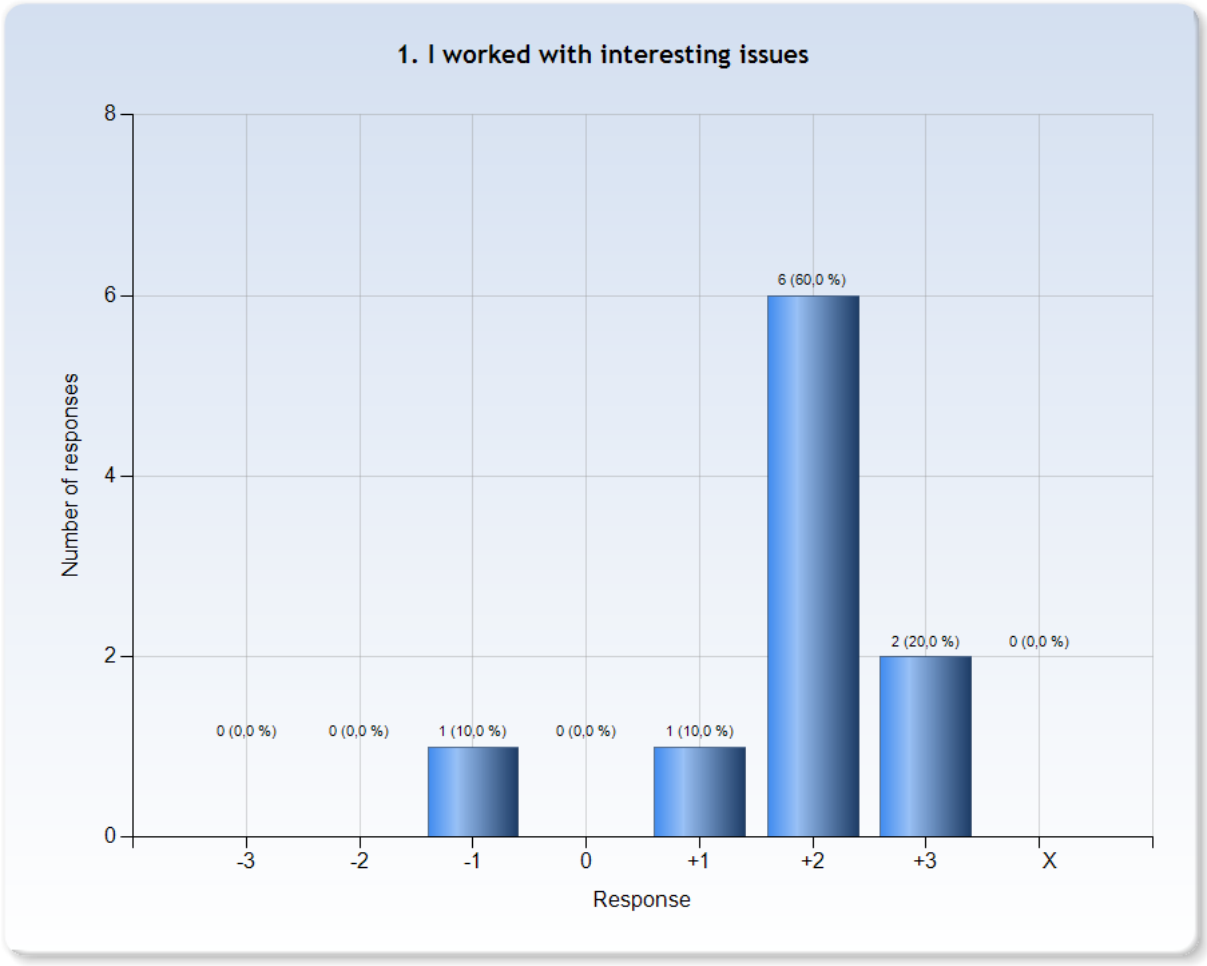
SPECIFIC QUESTIONS

RESPONSE DATA

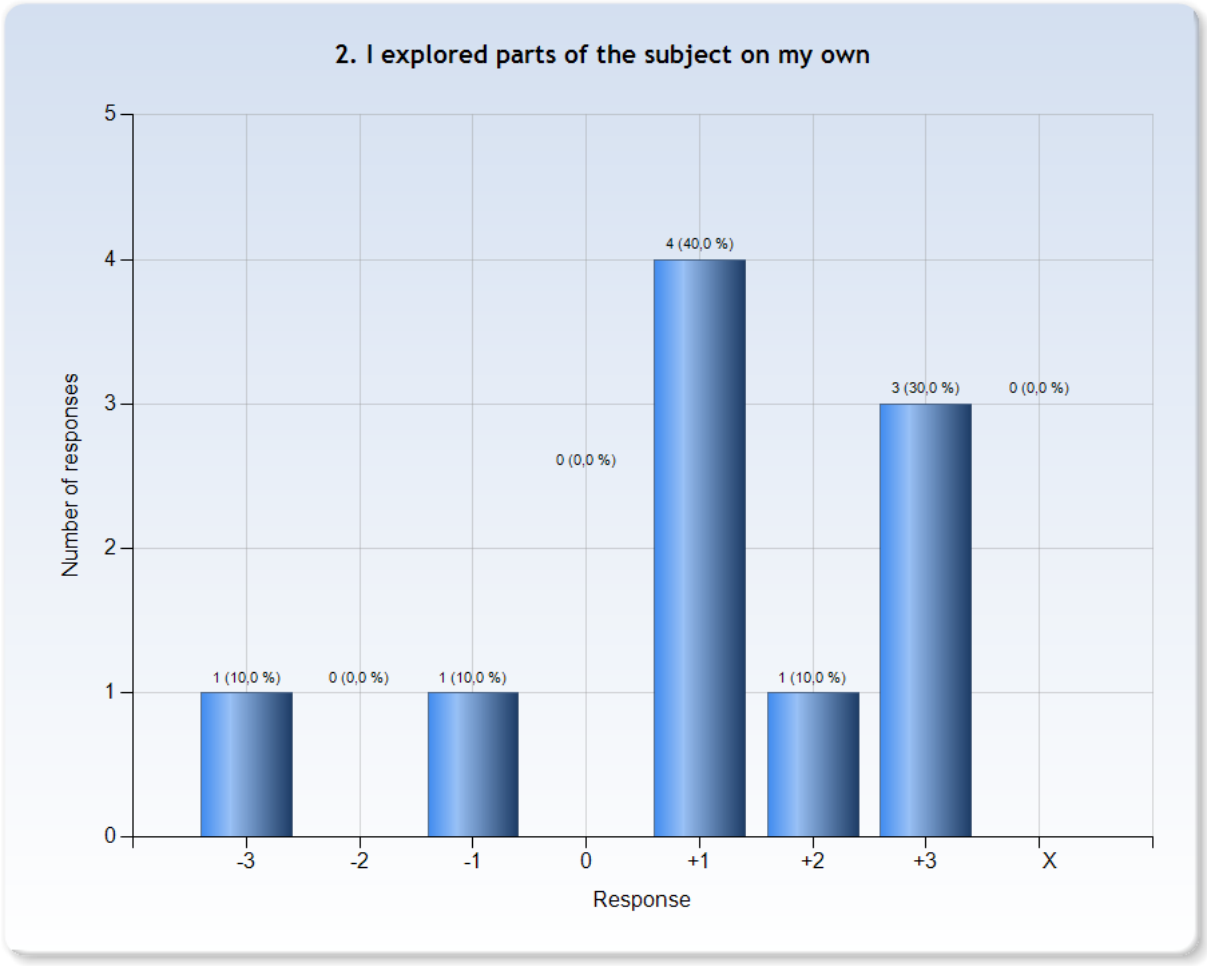
The diagrams below show the detailed response to the LEQ statements. The response scale is defined by:

-3 = No, I strongly disagree with the statement
0 = I am neutral to the statement
+3 = Yes, I strongly agree with the statement

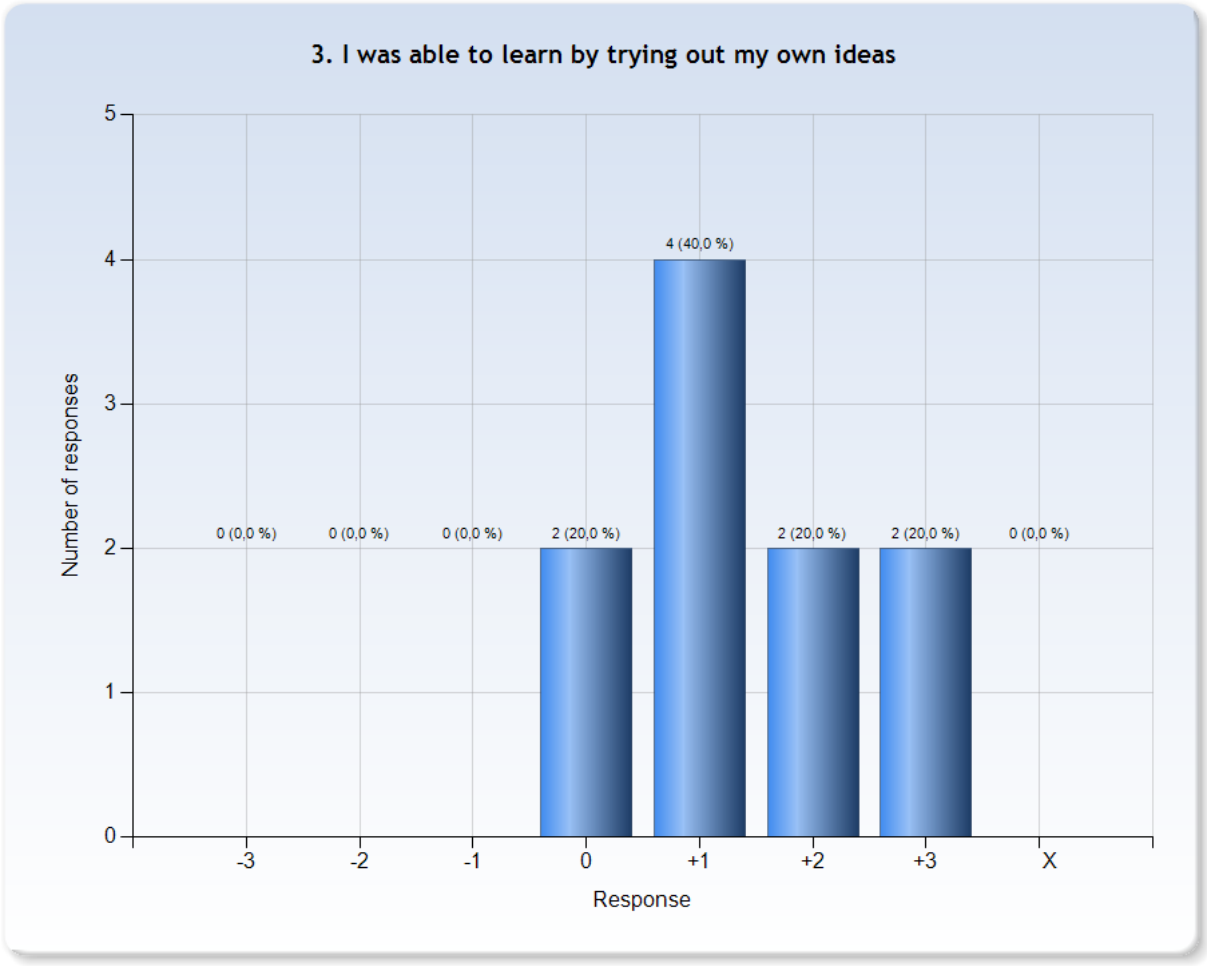
X = I decline to take a position on the statement


1. I worked with interesting issues
Number of responses
Response
0
2
4
6
8
-3
-2
-1
0
+1
+2
+3
X
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
0 (0,0 %)
1 (10,0 %)
6 (60,0 %)
2 (20,0 %)
0 (0,0 %)

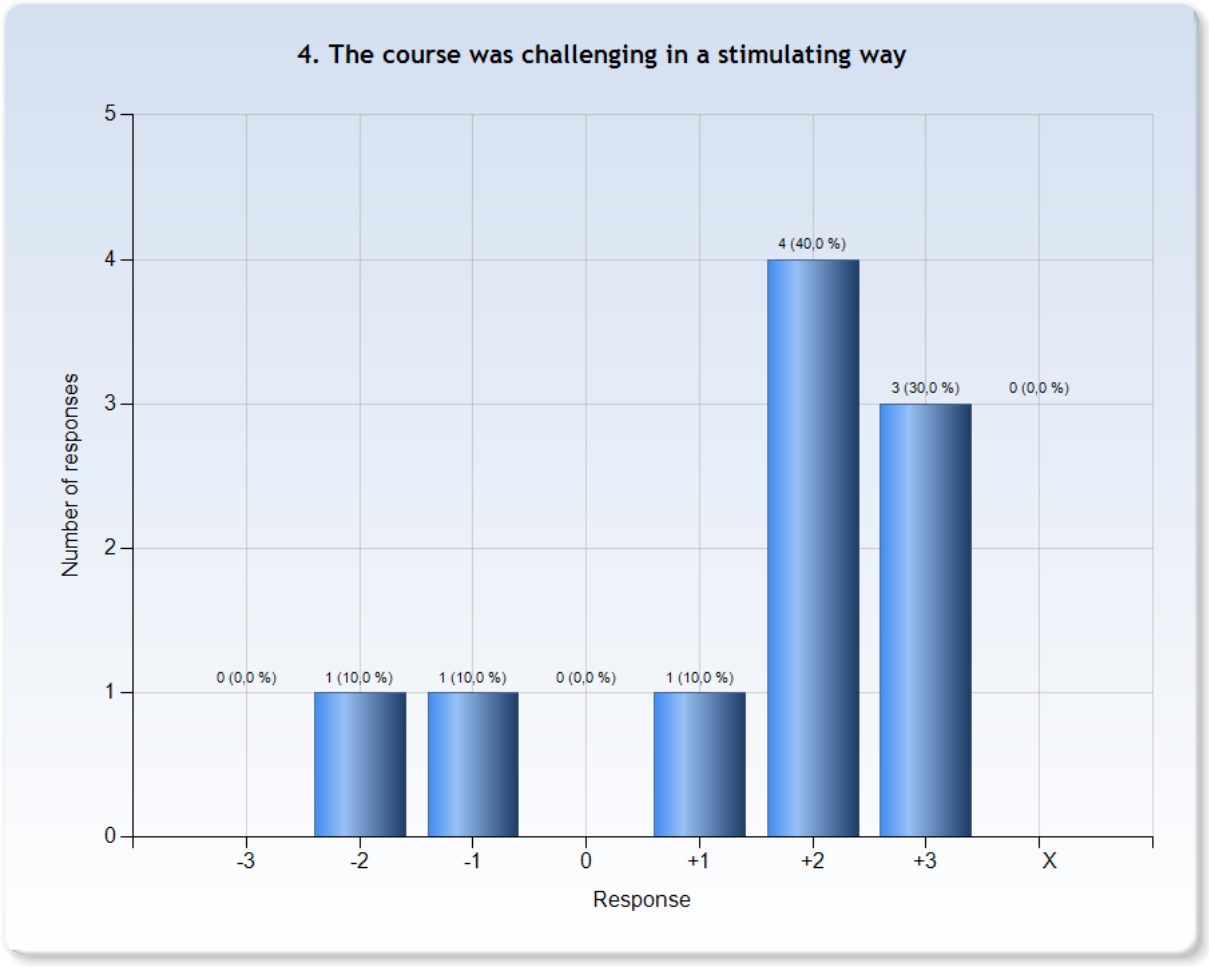
Comments


2. I explored parts of the subject on my own
Number of responses
Response
0
1
2
3
4
5
-3
-2
-1
0
+1
+2
+3
X
1 (10,0 %)
0 (0,0 %)
1 (10,0 %)
0 (0,0 %)
4 (40,0 %)
1 (10,0 %)
3 (30,0 %)
0 (0,0 %)

Comments

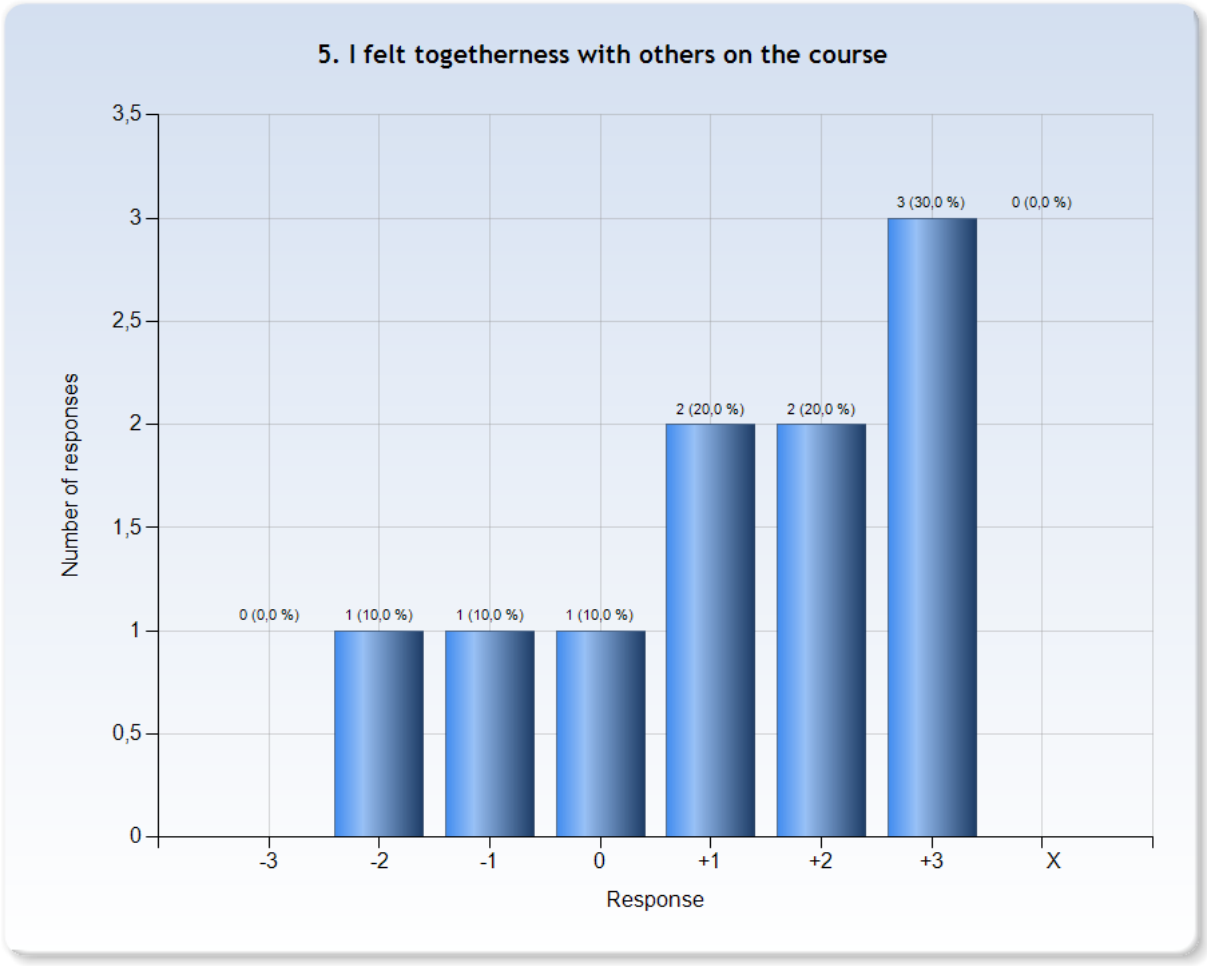

3. I was able to learn by trying out my own ideas
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
2 (20,0 %)
4 (40,0 %)
2 (20,0 %)
2 (20,0 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X

Comments

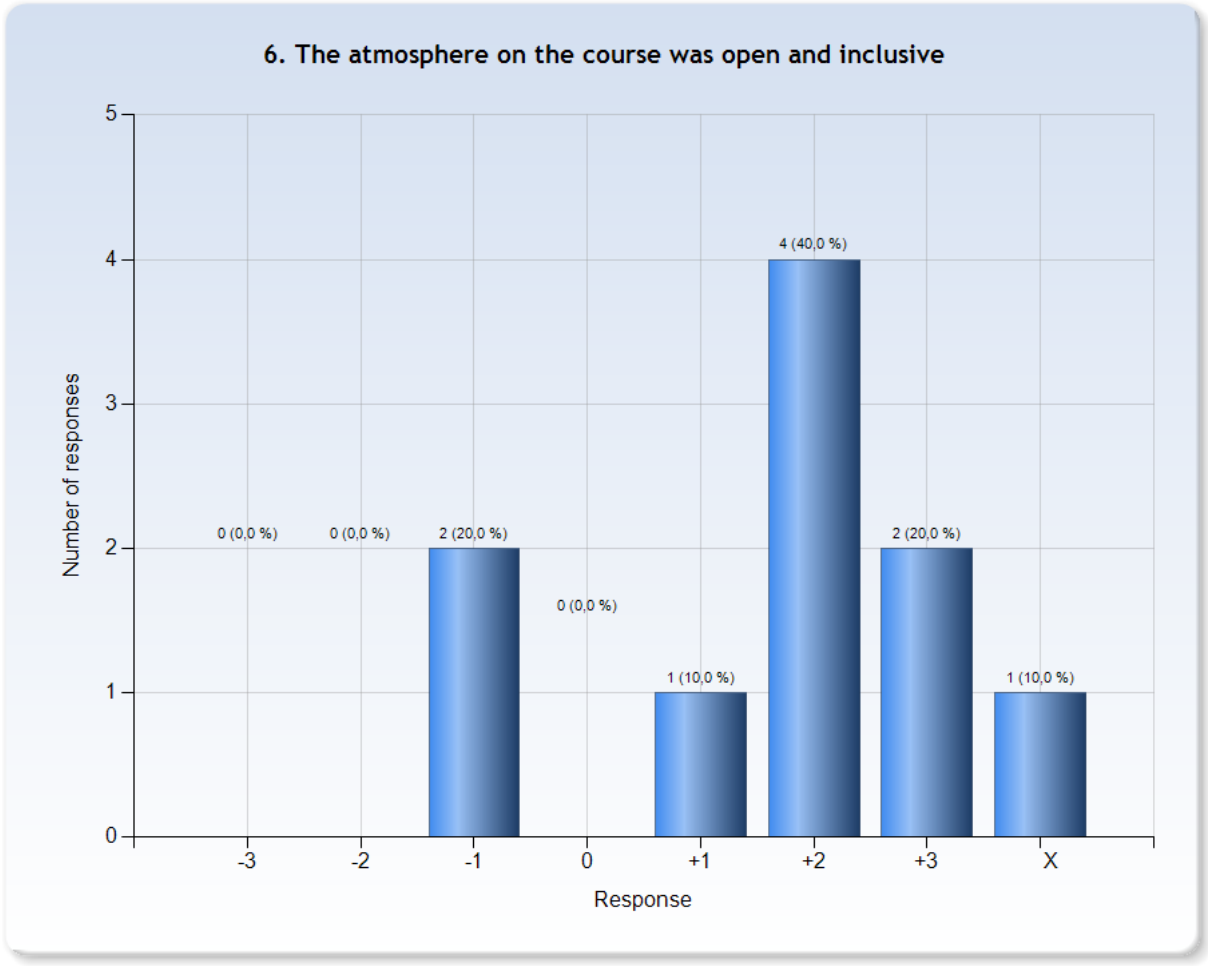


Comments

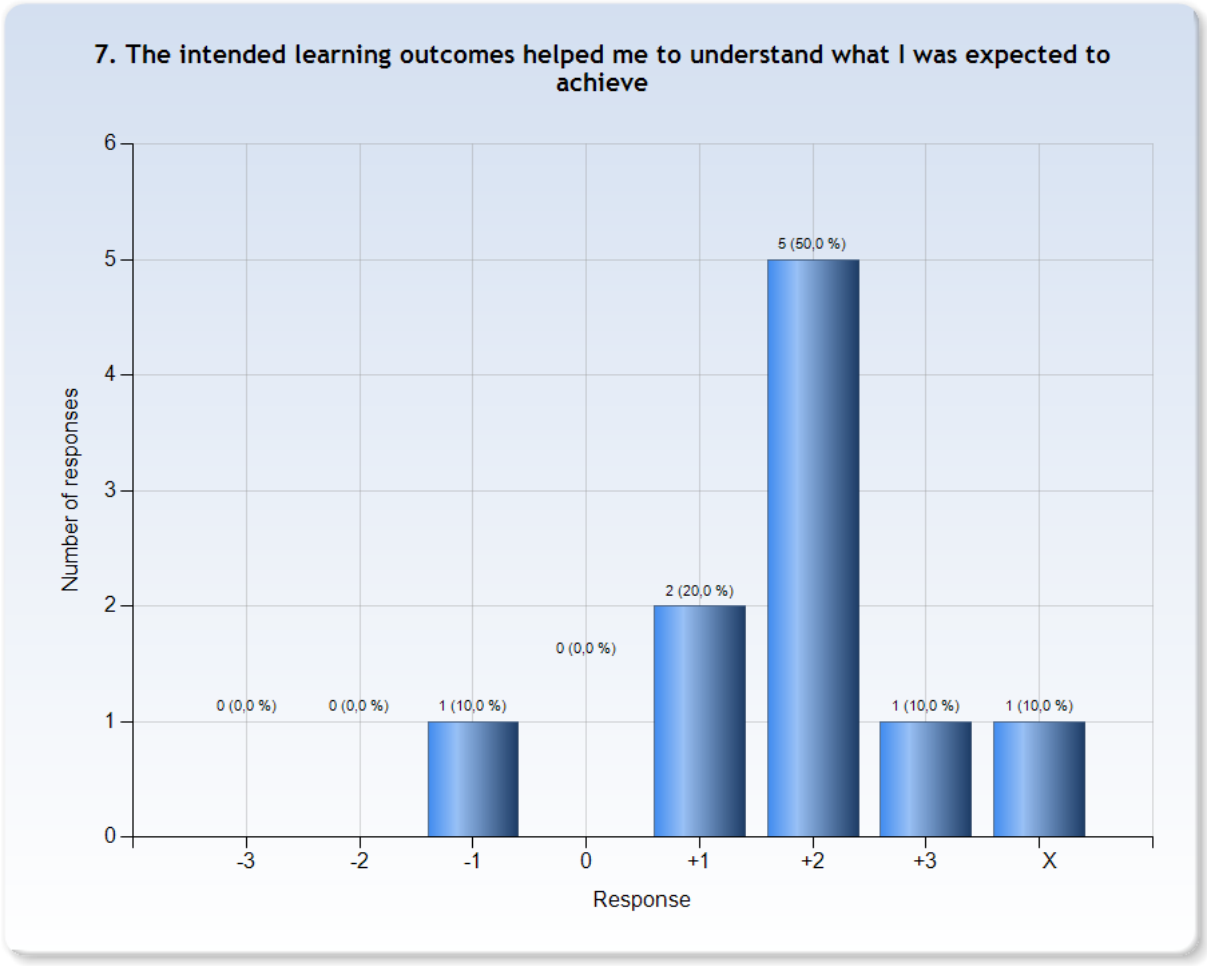
Comments (My response was: +3)
Projects


5. I felt togetherness with others on the course
Number of responses
3,5
3
2,5
2
1,5
1
0,5
0
0 (0,0 %)
1 (10,0 %)
1 (10,0 %)
1 (10,0 %)
2 (20,0 %)
2 (20,0 %)
3 (30,0 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X
Response

Comments

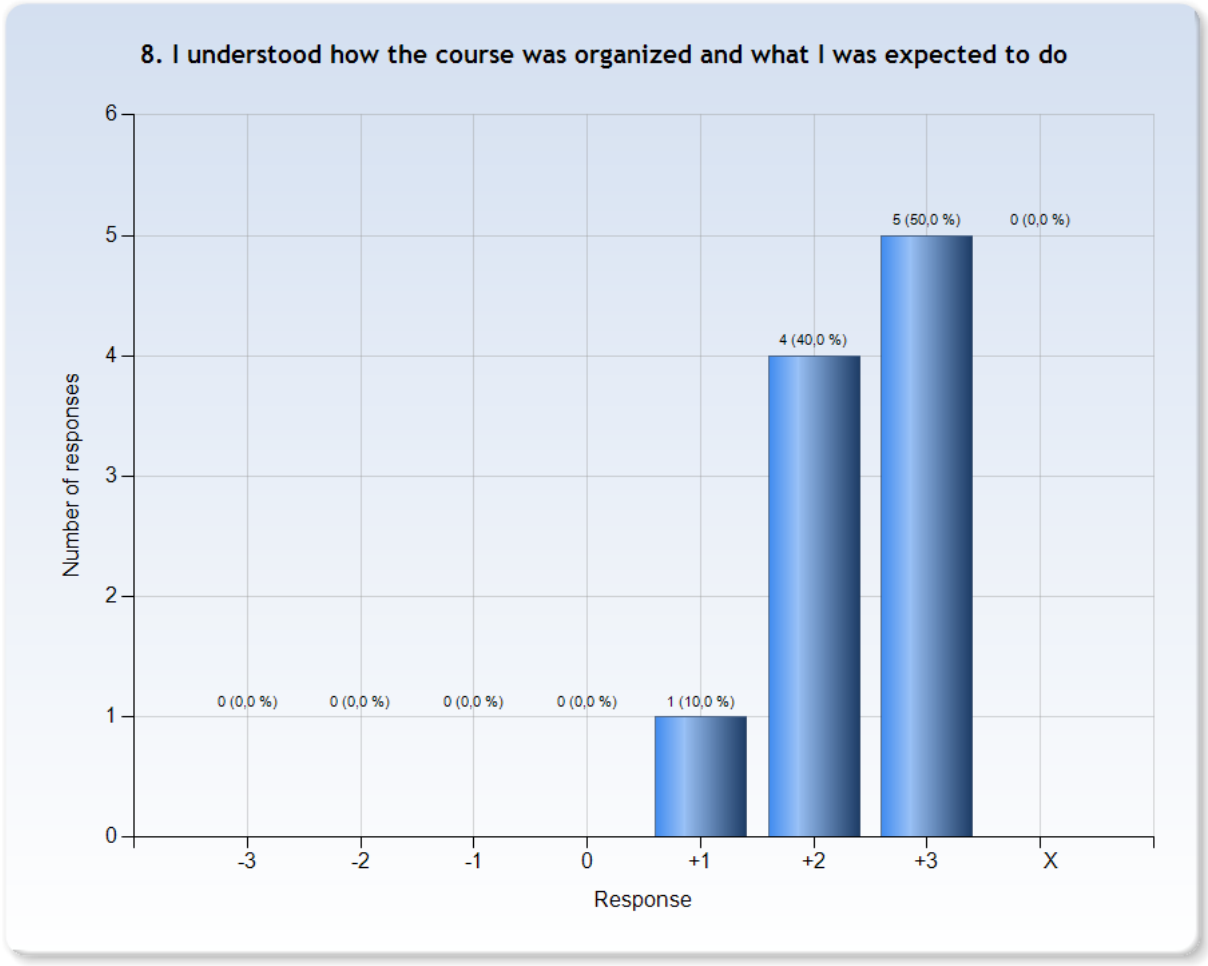

6. The atmosphere on the course was open and inclusive
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
2 (20,0 %)
0 (0,0 %)
1 (10,0 %)
4 (40,0 %)
2 (20,0 %)
1 (10,0 %)
-3
-2
-1
0
+1
+2
+3
X

Comments



Comments

Comments (My response was: X)
läste inte lärandemålen förräns nyss


8. I understood how the course was organized and what I was expected to do
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
4 (40,0 %)
5 (50,0 %)
0 (0,0 %)
-3
-2
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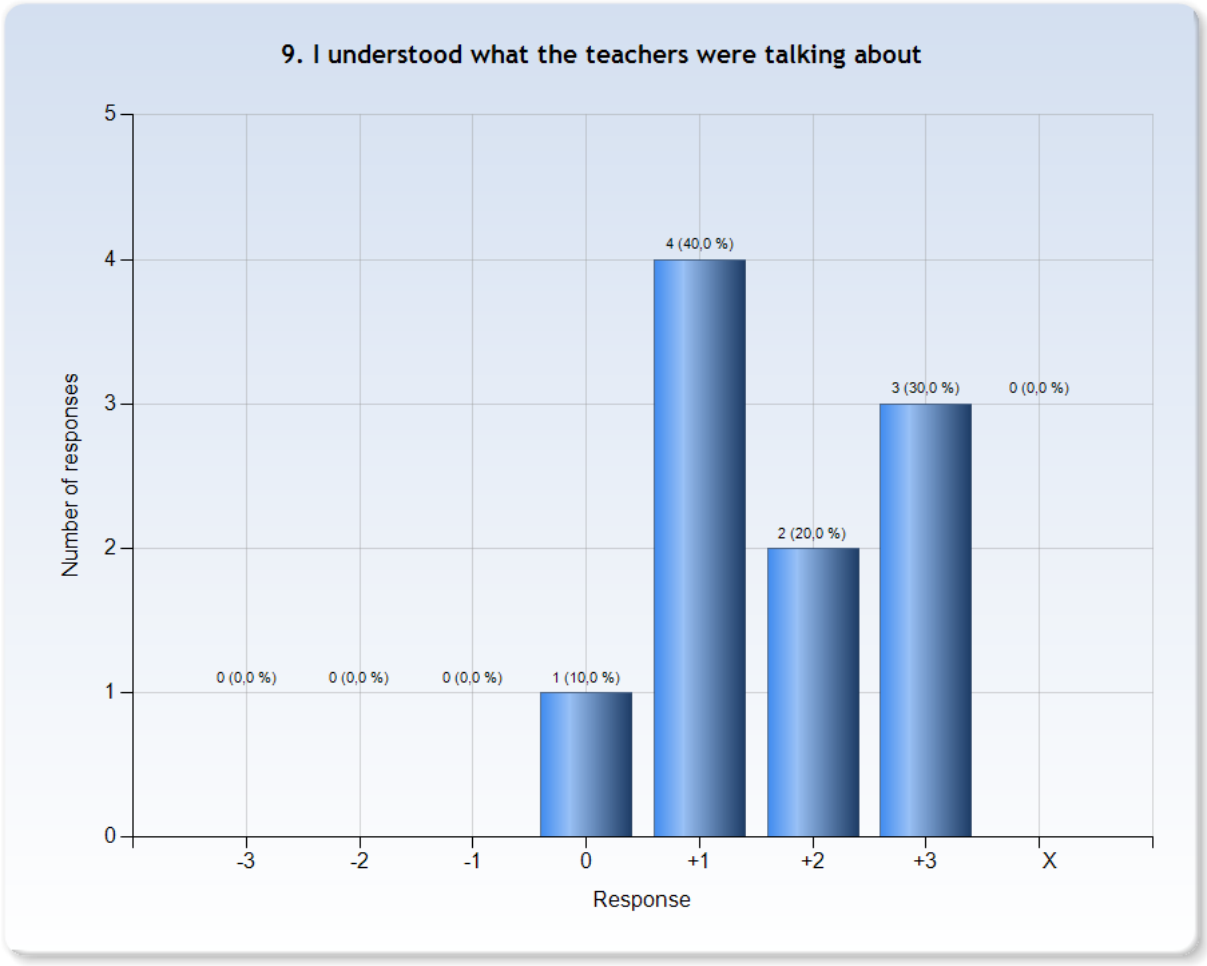
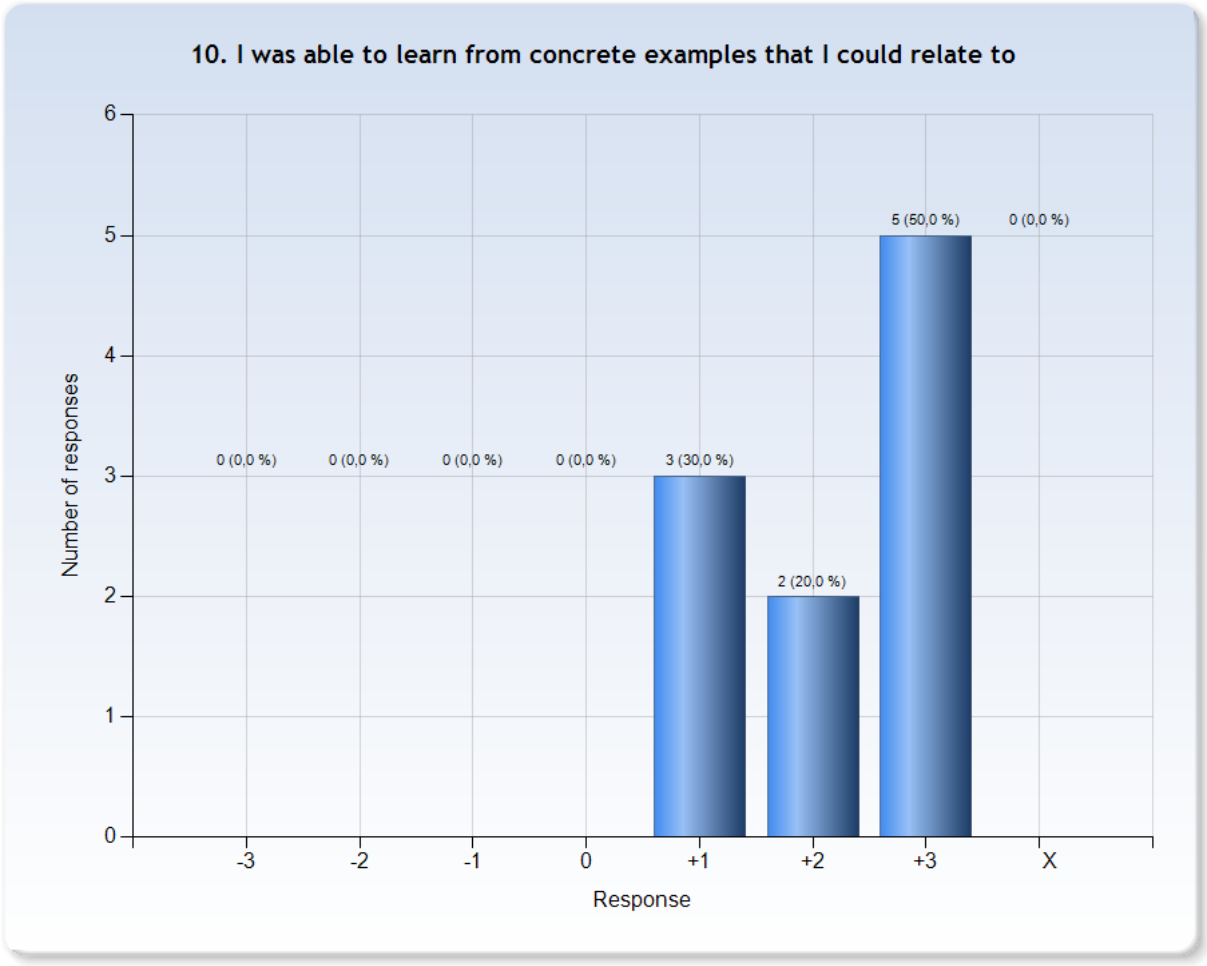
0
+1
+2
+3
X

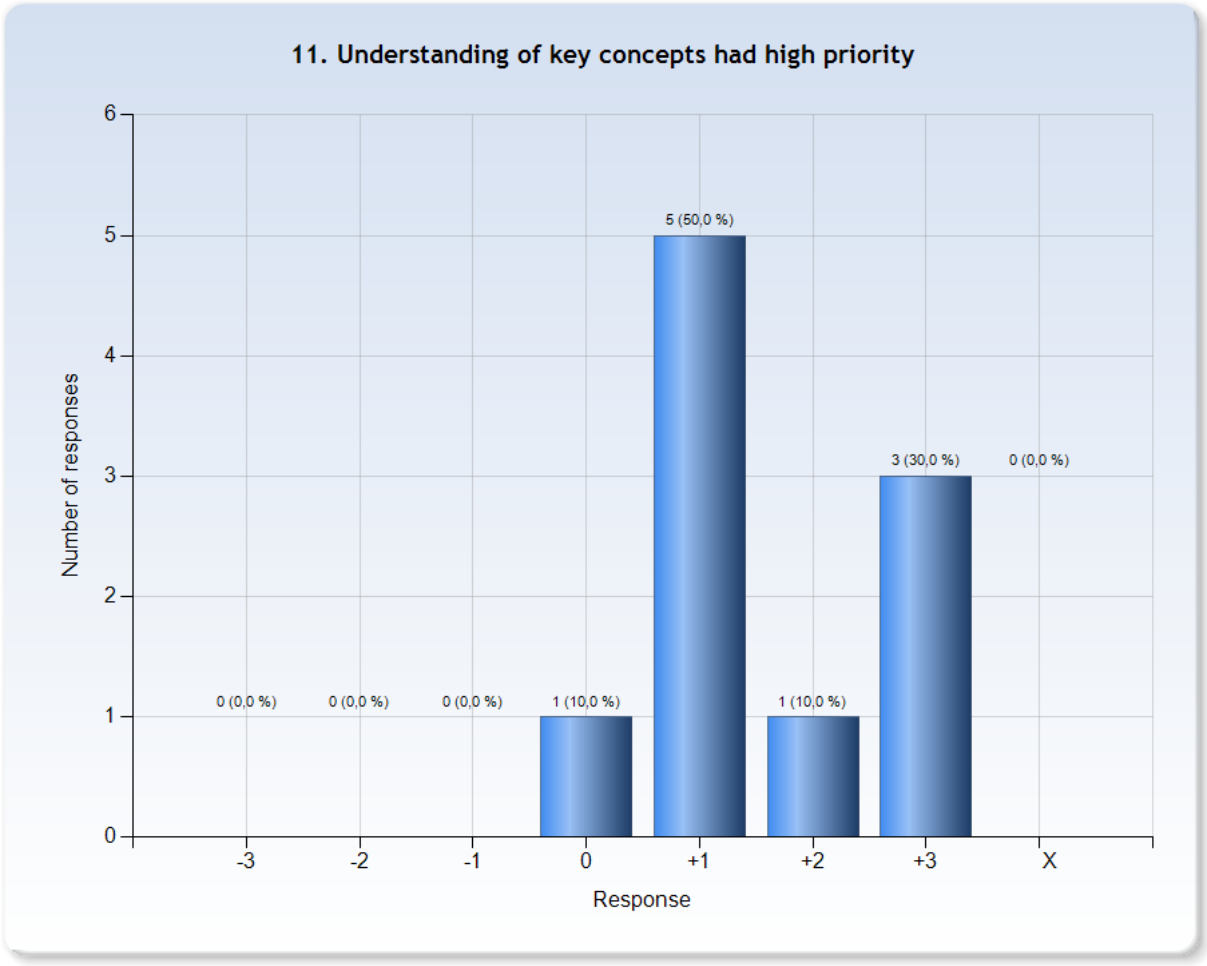
Comments


9. I understood what the teachers were talking about
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
4 (40,0 %)
2 (20,0 %)
3 (30,0 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X

Comments

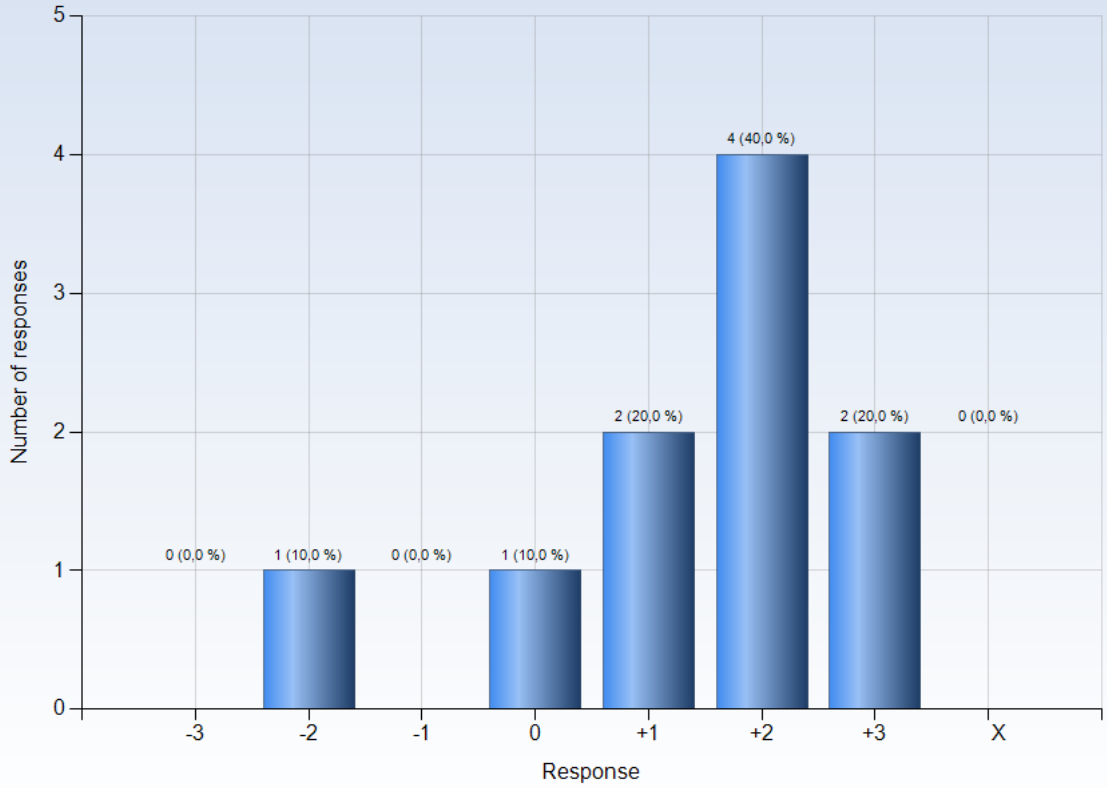

10. I was able to learn from concrete examples that I could relate to
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
3 (30,0 %)
2 (20,0 %)
5 (50,0 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X

Comments

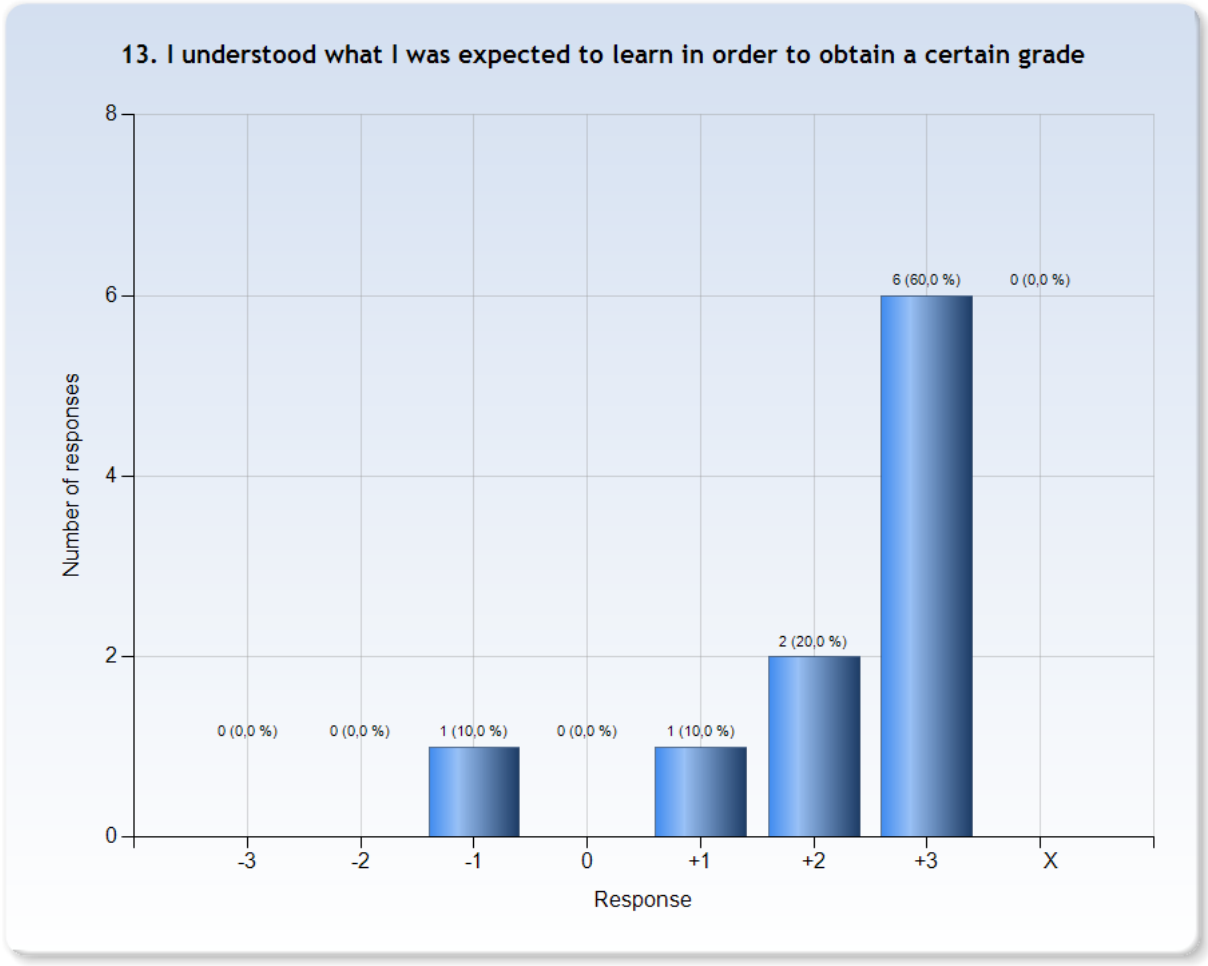

11. Understanding of key concepts had high priority
Number of responses
Response
0
1
2
3
4
5
6
-3
-2
-1
0
+1
+2
+3
X
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
5 (50,0 %)
1 (10,0 %)
3 (30,0 %)
0 (0,0 %)

Comments

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



Comments


13. I understood what I was expected to learn in order to obtain a certain grade
Number of responses
8
6
4
2
0
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
0 (0,0 %)
1 (10,0 %)
2 (20,0 %)
6 (60,0 %)
0 (0,0 %)
-3
-2
-1
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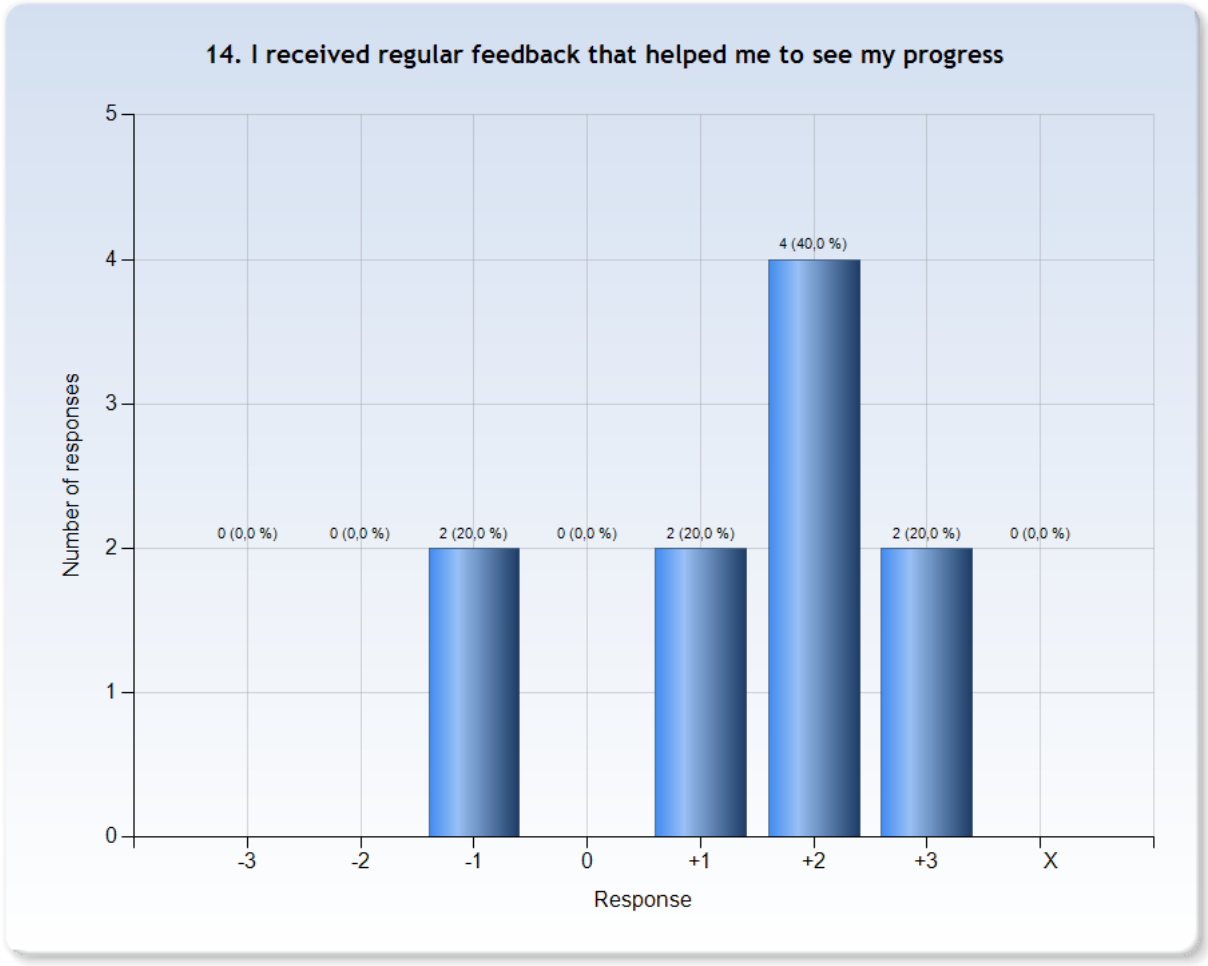
+2
+3
X
Response

Comments


14. I received regular feedback that helped me to see my progress
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
2 (20,0 %)
0 (0,0 %)
2 (20,0 %)
4 (40,0 %)
2 (20,0 %)
0 (0,0 %)
-3
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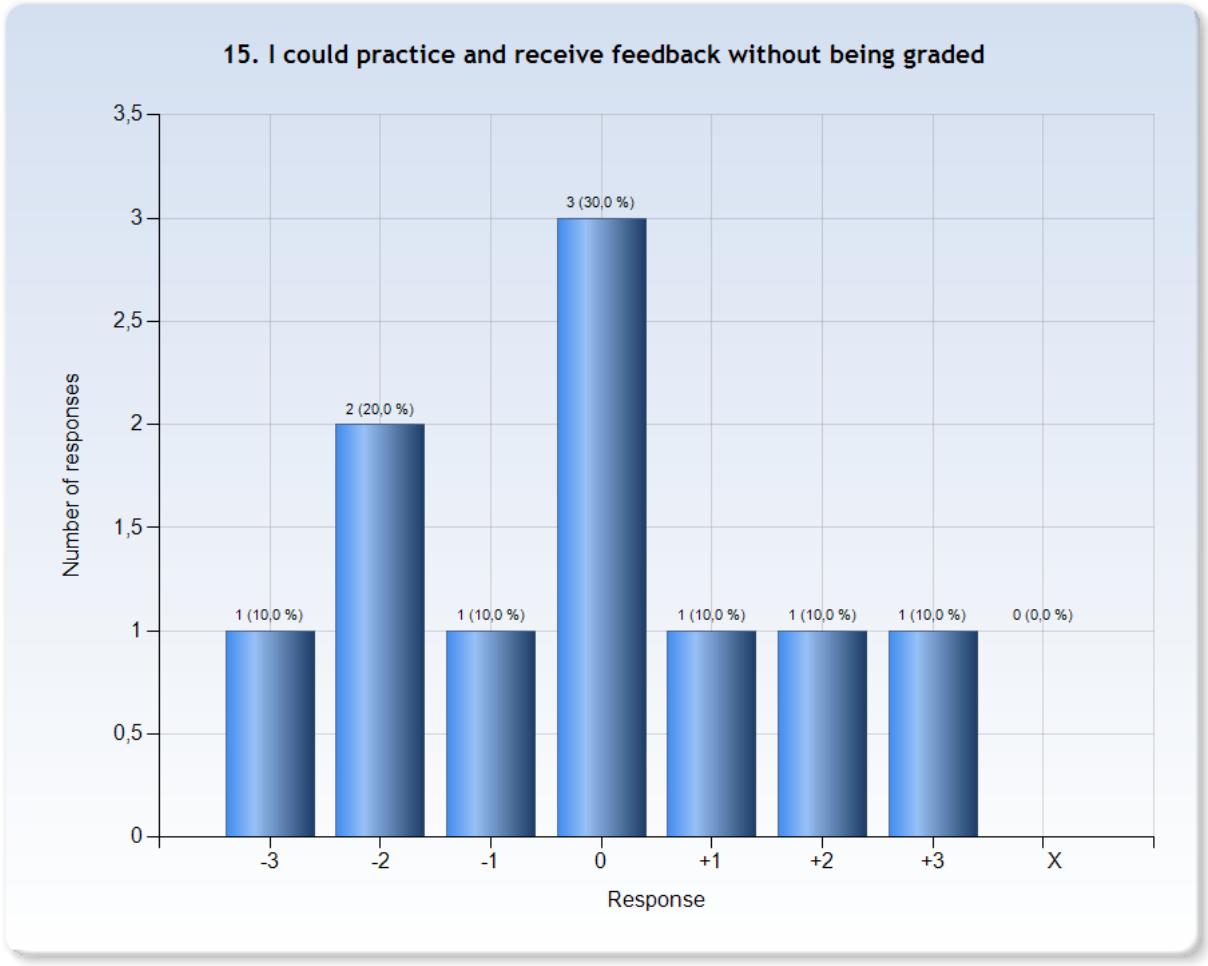
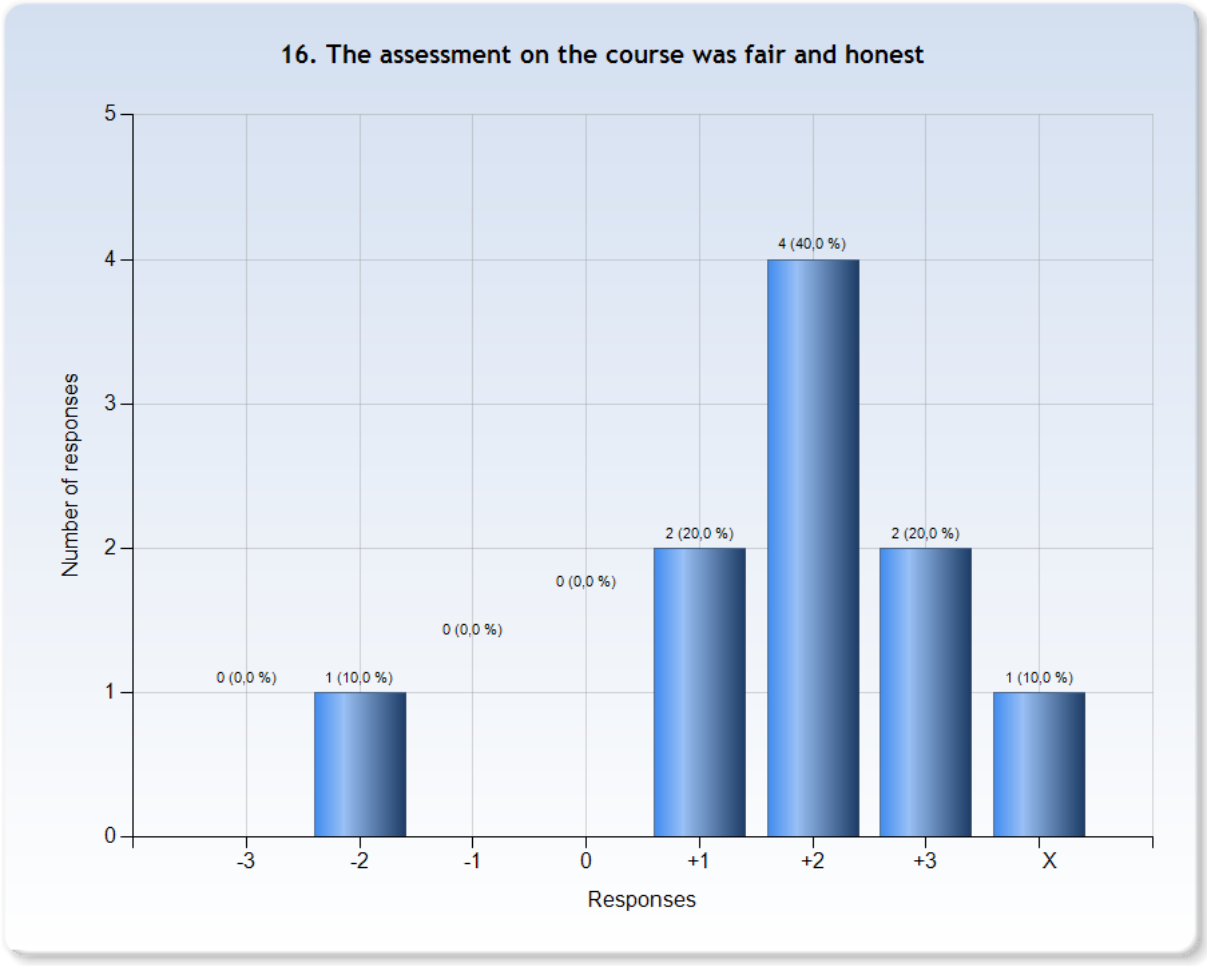
-1
0
+1
+2
+3
X

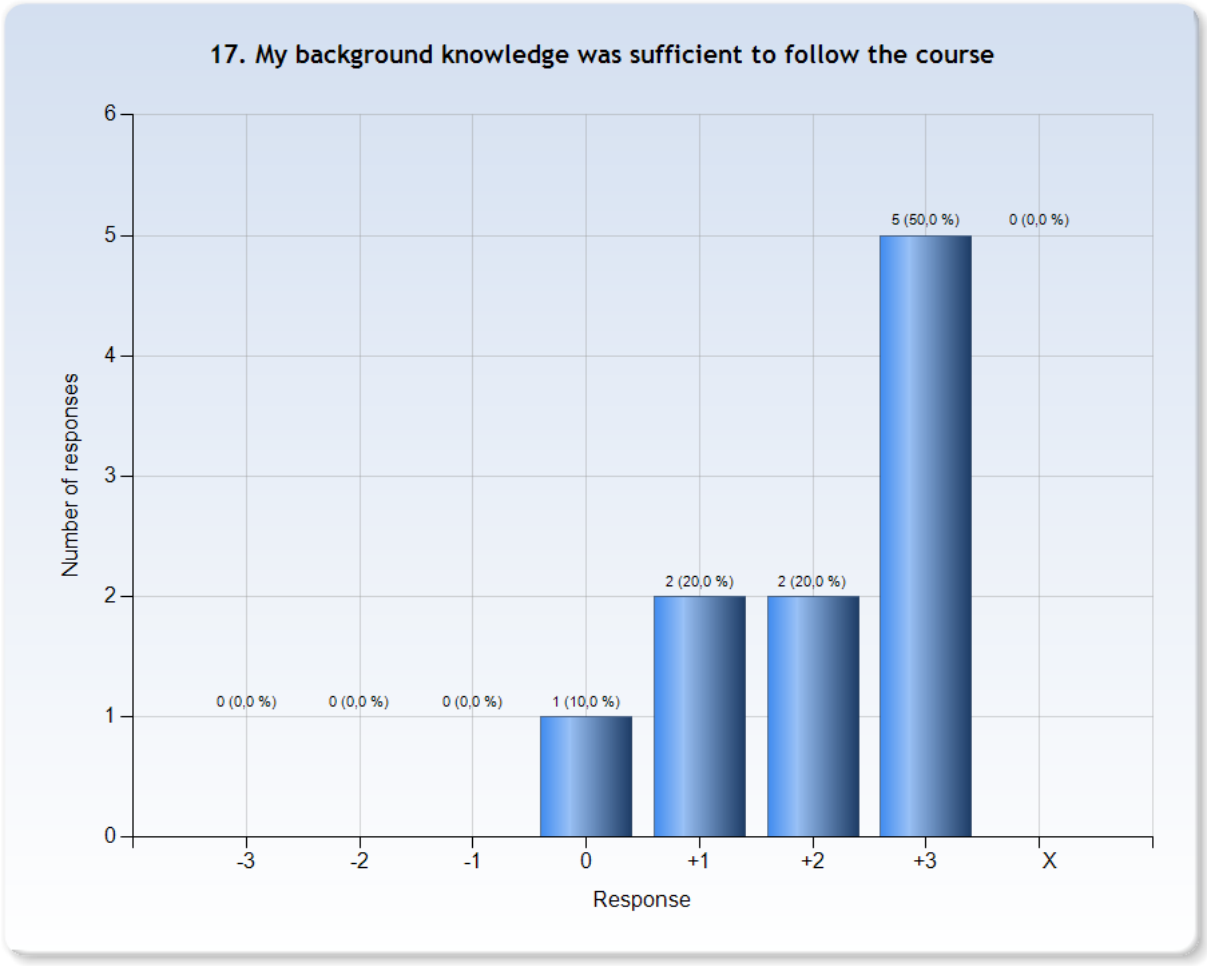
Comments


15. I could practice and receive feedback without being graded
Number of responses
3,5
3
2,5
2
1,5
1
0,5
0
3 (30,0 %)
2 (20,0 %)
1 (10,0 %)
1 (10,0 %)
1 (10,0 %)
1 (10,0 %)
1 (10,0 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X
Response

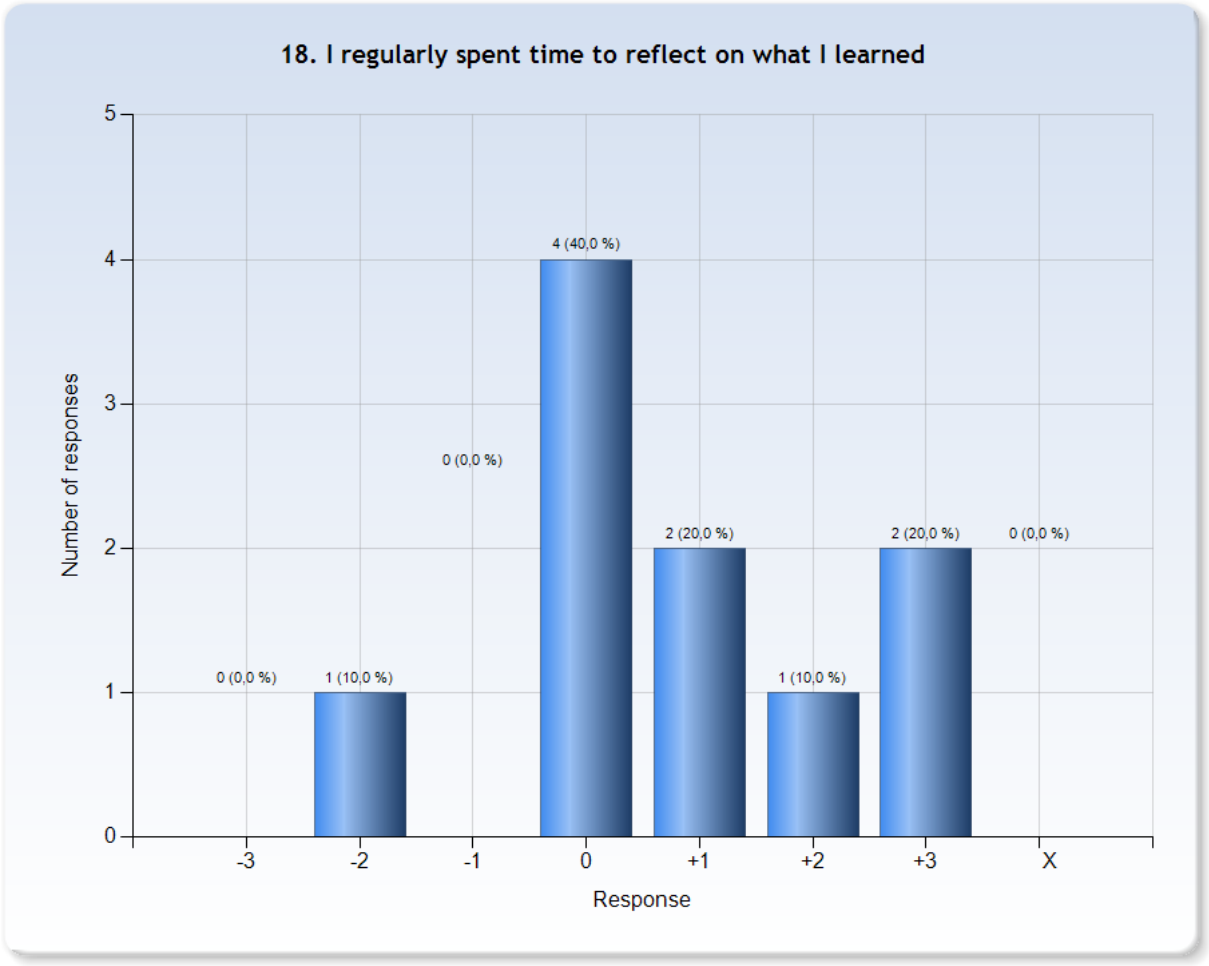
Comments


16. The assessment on the course was fair and honest
Number of responses
Responses
0
1
2
3
4
5
-3
-2
-1
0
+1
+2
+3
X
0 (0,0 %)
1 (10,0 %)
0 (0,0 %)
0 (0,0 %)
2 (20,0 %)
4 (40,0 %)
2 (20,0 %)
1 (10,0 %)

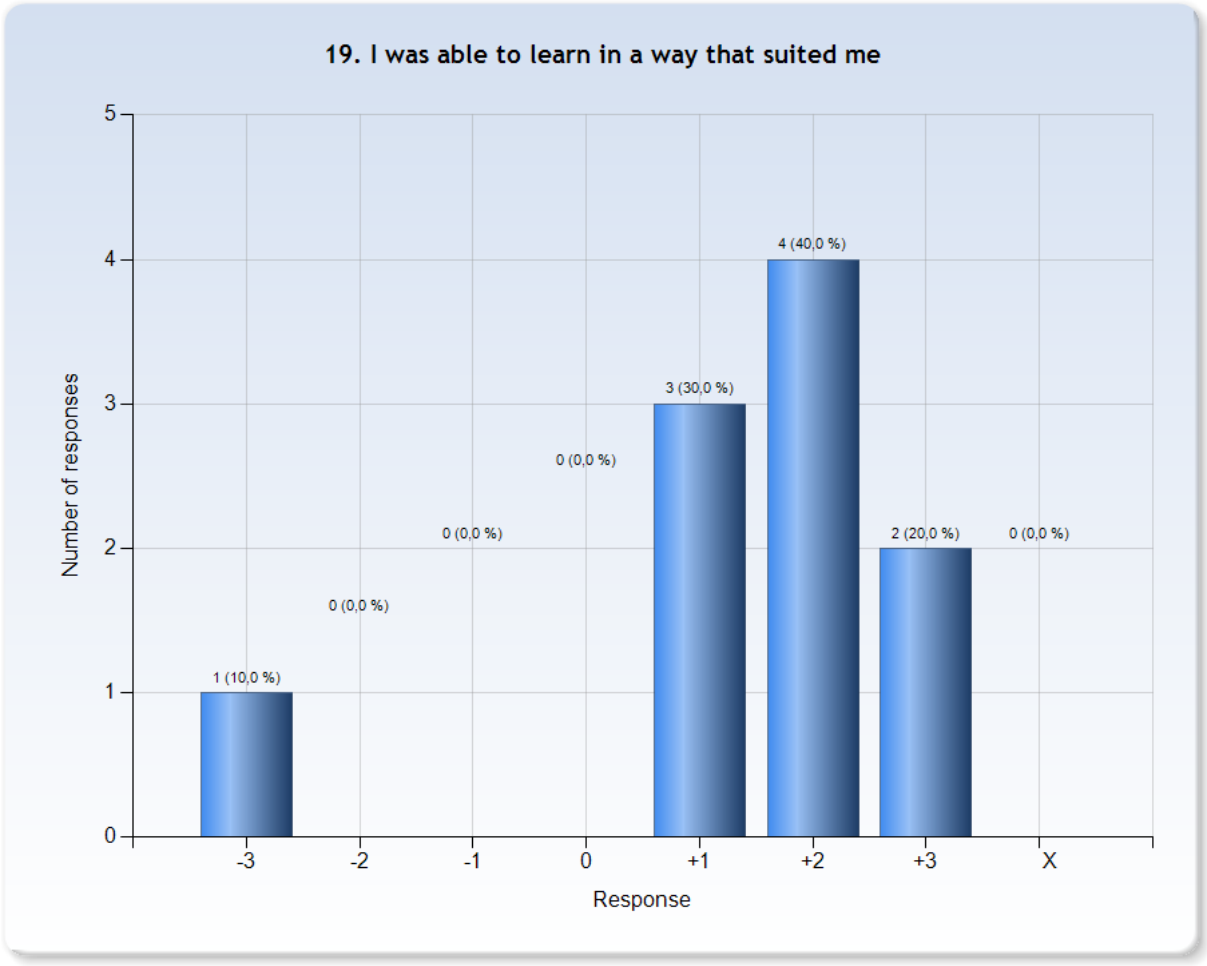
Comments


17. My background knowledge was sufficient to follow the course
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
2 (20,0 %)
2 (20,0 %)
5 (50,0 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X

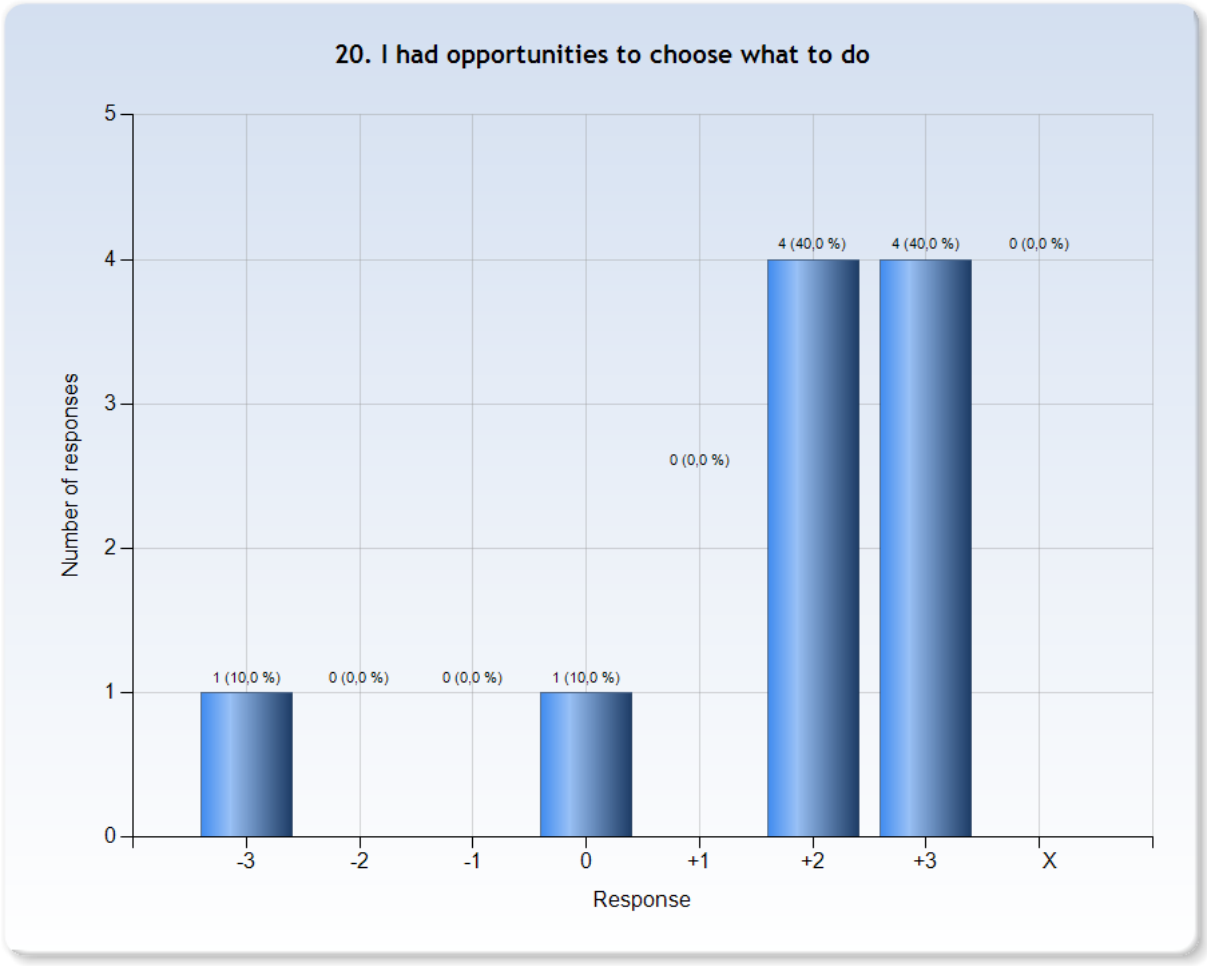
Comments


18. I regularly spent time to reflect on what I learned
Number of responses
Response
0
1
2
3
4
5
-3
-2
-1
0
+1
+2
+3
X
0 (0,0 %)
1 (10,0 %)
0 (0,0 %)
4 (40,0 %)
2 (20,0 %)
1 (10,0 %)
2 (20,0 %)
0 (0,0 %)

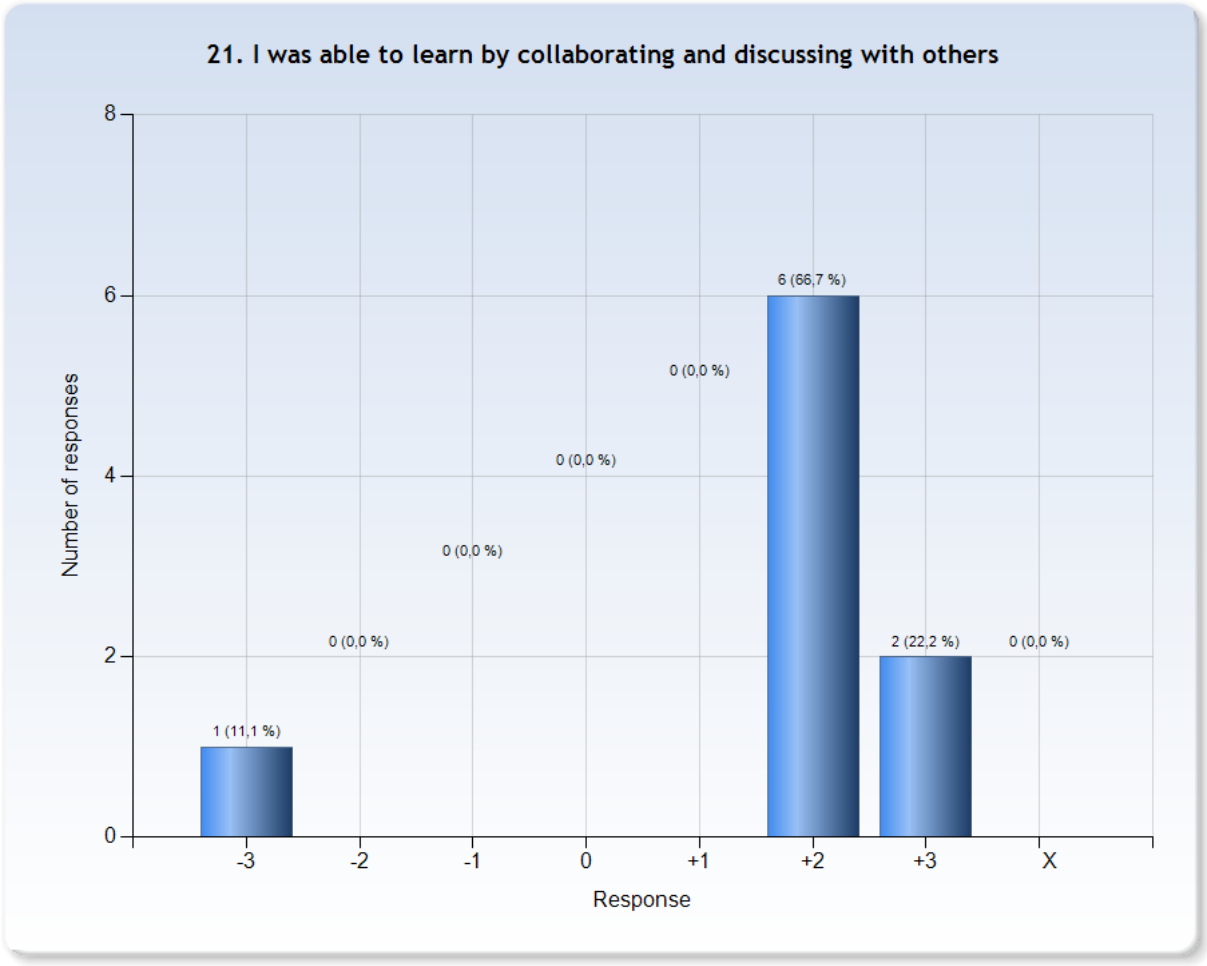
Comments


19. I was able to learn in a way that suited me
Number of responses
Response
0
1
2
3
4
5
-3
-2
-1
0
+1
+2
+3
X
1 (10,0 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
3 (30,0 %)
4 (40,0 %)
2 (20,0 %)
0 (0,0 %)

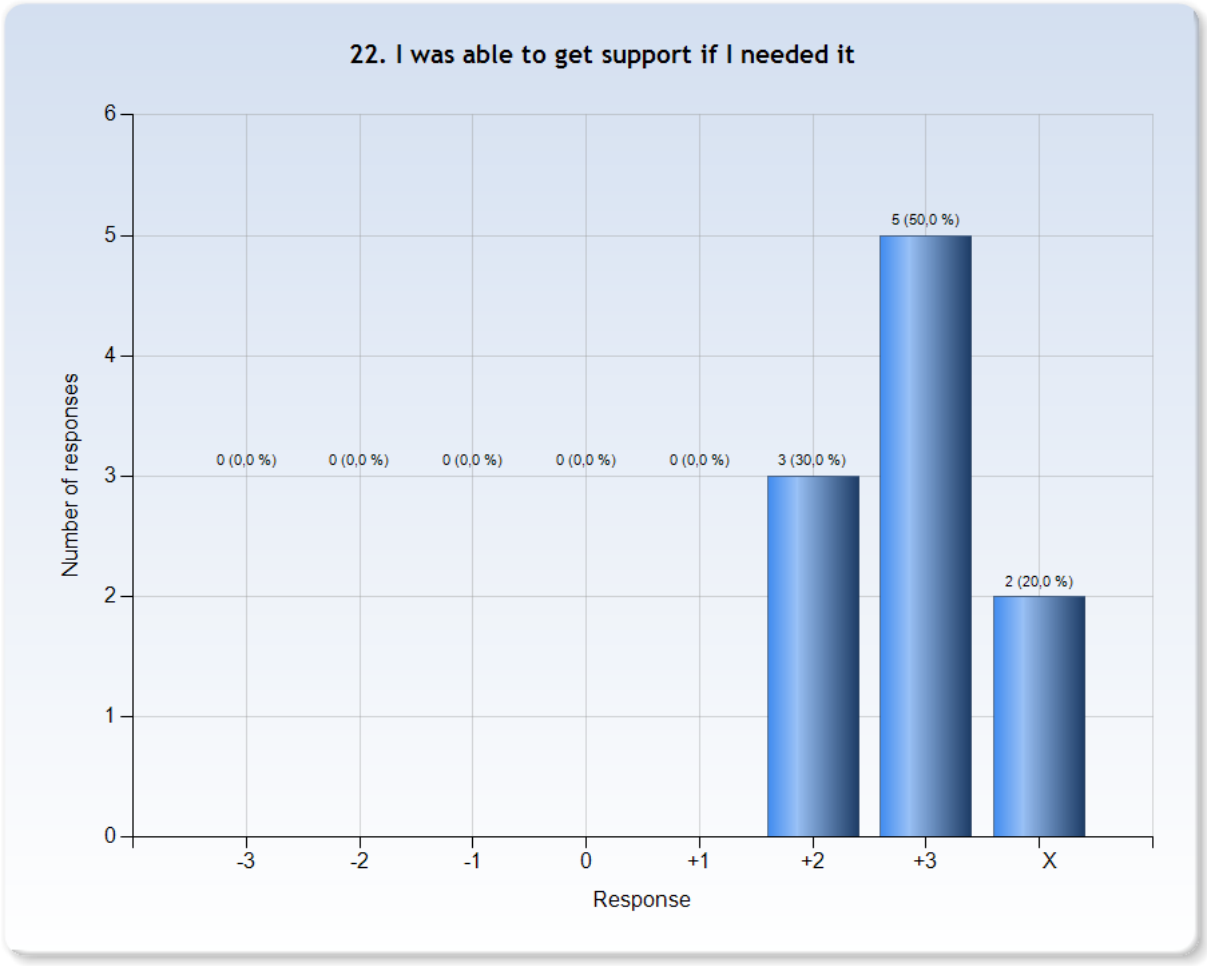
Comments


20. I had opportunities to choose what to do
Number of responses
Response
0
1
2
3
4
5
-3
-2
-1
0
+1
+2
+3
X
1 (10,0 %)
0 (0,0 %)
0 (0,0 %)
1 (10,0 %)
0 (0,0 %)
4 (40,0 %)
4 (40,0 %)
0 (0,0 %)

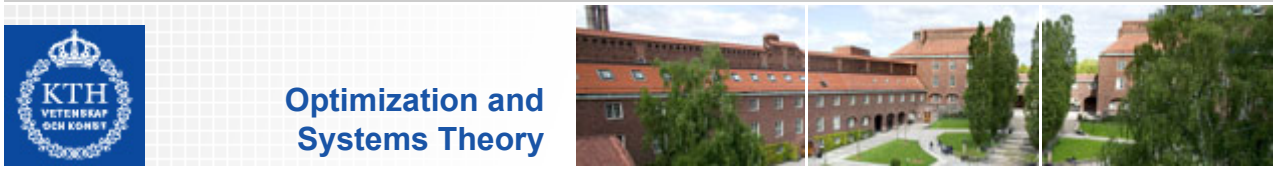
Comments


21. I was able to learn by collaborating and discussing with others
Number of responses
8
6
4
2
0
1 (11,1 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
6 (66,7 %)
2 (22,2 %)
0 (0,0 %)
-3
-2
-1
0
+1
+2
+3
X
Response

Comments


22. I was able to get support if I needed it
Number of responses
Response
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
0 (0,0 %)
3 (30,0 %)
5 (50,0 %)
2 (20,0 %)
-3
-2
-1
0
+1
+2
+3
X

Comments



Optimization and Systems Theory

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SF2822 Applied Nonlinear Optimization, 7.5hp

The course is given in period 4, spring 2017.

- Official course information

Examiner and instructor: Anders Forsgren
Exercise leader and project leader: Axel Ringh

- Course information
- KTH course web page
- Information on how to register for the exam can be found here.
- Information on exam placement can be found here.
- GAMS at the KTH linux computers.
  - Type "module add gams" or add it to a suitable login file.
  - Use an editor, for example emacs, to create/modify model files (".gms") and reading output files (".lst").
  - Put the model files in your home catalog. Run GAMS from that catalog, e.g. "gams trans1".
  - Please note that there is a whole library of example files at GAMS subdirectory "modlib".
- GAMS on your own computer.
  - The demo version of GAMS (which we use) can be downloaded from the GAMS website.
- GAMS resources
  - GAMS documentation
  - GAMS user's guide
- To solve larger problems than what the demo version of GAMS can handle.
  - There is an option to solve optimization problems over the internet by NEOS (http://www.neos-server.org/). Here you can send for example GAMS files and obtain access to various solvers without the size limitations of the demo version. This is a very useful tool. We recommend using the solvers SNOPT or KNITRO for solving NLP models.
  - NEOS is usually reliable, but please note that you will not be allowed to hand in late because of possibly waiting for answer from NEOS. Please do not wait to the last moment with submitting jobs.
- Exams
  - Final exam June 1 2017 (pdf)
    Solutions to final exam June 1 2017 (pdf)
  - Final exam August 18 2016 (pdf)
    Solutions to final exam August 18 2016 (pdf)
  - Final exam June 3 2016 (pdf)
    Solutions to final exam June 3 2016 (pdf)
  - Final exam August 20 2015 (pdf)
    Solutions to final exam August 20 2015 (pdf)

- Final exam June 3 2015 (pdf)
  Solutions to final exam June 3 2015 (pdf)
- Final exam August 21 2014 (pdf)
  Solutions to final exam August 21 2014 (pdf)
- Final exam June 3 2014 (pdf)
  Solutions to final exam June 3 2014 (pdf)
- Final exam August 23 2013 (pdf)
  Solutions to final exam August 23 2013 (pdf)
- Final exam May 20 2013 (pdf)
  Solutions to final exam May 20 2013 (pdf)
- Final exam August 17 2012 (pdf)
  Solutions to final exam August 17 2012 (pdf)
- Final exam June 2 2012 (pdf)
  Solutions to final exam June 2 2012 (pdf)
- Final exam August 23 2011 (pdf)
  Solutions to final exam August 23 2011 (pdf)
- Final exam May 28 2011 (pdf)
  Solutions to final exam May 28 2011 (pdf)
- Final exam June 9 2010 (pdf)
  Solutions to final exam June 9 2010 (pdf)
- Final exam December 17 2009 (pdf)
  Solutions to final exam December 17 2009 (pdf)
- Final exam June 10 2009 (pdf)
  Solutions to final exam June 10 2009 (pdf)
- Final exam December 20 2008 (pdf)
  Solutions to final exam December 20 2008 (pdf)
- Final exam June 5 2008 (pdf)
  Solutions to final exam June 5 2008 (pdf)
- Final exam December 15 2007 (pdf)
  Solutions to final exam December 15 2007 (pdf)

- Course analysis after the course given in the spring of 2016

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Anders Forsgren, andersf@kth.se
Last updated: 2017-06-01

Optimization and Systems Theory

SF2822 Applied Nonlinear Optimization, 7.5hp, 2016/2017

Instructor and examiner

Anders Forsgren (andersf@kth.se), room 3533, Lindstedtsv. 25, tel 790 71 27.
Office hours: Monday 11-12. (Or by agreement.)

Exercise leader and project leader

Axel Ringh (aringh@kth.se), room 3734, Lindstedtsv. 25, tel. 790 66 59.
Office hours: By agreement.

Course material

- ***Linear and Nonlinear Optimization***, second edition, by I. Griva, S. G. Nash och A. Sofer, SIAM, 2009.
  (The book can be ordered from several places. Please note that you can become a SIAM member for free and obtain a discount at the SIAM bookstore.)
- ***Exercises in applied nonlinear optimization, 2016/2017***. Available via Canvas.
- ***Supplementary course material in applied nonlinear optimization, 2016/2017***. Available via Canvas.
- ***Lecture notes in applied nonlinear optimization, 2016/2017***. Can be downloaded from this web page, see the schedule below. Also available via Canvas.
- ***GAMS, A user's guide***. May be downloaded from the GAMS web site.
- ***GAMS***. GAMS is installed in the KTH linux computer rooms. It may also be downloaded from the GAMS web site for use on a personal computer.
- Two project assignments that are handed out during the course, March 30 and April 27 respectively.

Additional notes that may be handed out during the course are also included.

Course goals

After completed course, the student should be able to:

- explain fundamental concepts of nonlinear programming;
- explain how fundamental methods for nonlinear programming work;
- illustrate how these methods work by solving small problems by hand calculations;
- starting from a suitably modified real problem, formulate a nonlinear program; make a model in a modeling language and solve the problem;
- analyze the solutions of the optimization problem solved, and present the analysis in writing as well as orally;
- interact with other students when modeling and analyzing the optimization problems.

Examination

The examination is in two parts, projects and final exam. To pass the course, the following is required:

- Pass project assignment 1, with presence at compulsory presentation lecture on Thursday April 27, and presence at the following dicussion session.
- Pass project assignment 2, with presence at compulsory presentation lecture on Wednesday May 17, and presence at the following dicussion session.
- Pass final exam.

Course registration

Due to the project based nature of this course, students must register no later than March 28. Registration is made by the students online following KTH standard procedures. PhD students are not able to register online but register via e-mail to Anders Forsgren.

Project assignments

The project assignments are performed in groups, where the instructor determines the division of groups. This division is changed between the two assignments. Assignment 1 is carried out using the modeling language GAMS. For project 2, there is a choice between a modeling assignment, to be carried out using GAMS, or a method assignment, to be carried out using Matlab. The project assignments ***must*** be carried out during the duration of the course and completed by the above mentioned presentation lectures. Presence at the presentation lectures is compulsory. For passing the projects, the following requirements must be fulfilled:

- No later than the night before the presentation lecture, each group must hand in a well-written report which describes the exercise and the group's suggestion for solving the exercise. Suitable word processor should be used. The report should be on a level suitable for another participant in the course who is not familiar with the group's specific problem.
- When handing in the report, each student should append an individual sheet with a brief self-assessment of his/her contribution to the project work, quantitatively as well as qualitatively.
- At the presentation lecture, all assignments will be presented and discussed. Each student is expected to be able to present the assignment of his/her group. In particular, each student is expected to take part in the discussion. The presentation and discussion should be on a level such that students having had the same assignment can discuss, and students not having had the same assignment can understand the issues that have arisen and how they have been solved.
- Each group should make an appointment for a discussion session with the course leaders. There is no presentation at this session, but these sessions are in the form of a 20 minutes question session, one group at a time. There will be times available the days after the presentation session. One week prior to the presentation lecture, a list of available times for discussion sessions will be made available at Doodle, reachable from the course home page. Each group should sign up for a discussion session prior to the presentation lecture.
- Each participant in the course must contribute to the work of the group. Each group must solve their task independently. Discussion between the groups is encouraged, but each group must individually solve the assignments. It is ***not*** allowed to use solutions made by others in any form. If these rules are violated, disciplinary actions in accordance with the KTH regulations will be taken.

Each project assignment is awarded a grade which is either fail or pass with grading E, D, C, B and A. Here, the mathematical treatment of the problem as well as the report and the oral presentation or discussion is taken into account. Normally, the same grade is given to all members of a group.

Final exam

The final exam consists of five exercises and gives a maximum of 50 points. At the exam, the grades F, Fx, E, D, C, B and A are awarded. For a passing grade, normally at least 22 points are required. At the exam, in addidion to writing material, no other material is allowed at the exam. Normally, the grade limits are given by E (22-24), D (25-30), C (31-36), B (37-42) and A (43-50).

The grade Fx is normally given for 20 or 21 points on the final exam. An Fx grade may be

converted to an E grade by a successful completion of two supplementary exercises, that the student must complete independently. One exercise among the theory exercises handed out during the course, and one exercise which is similar to one exercise of the exam. These exercises are selected by the instructor, individually for each student. Solutions have to be handed in to the instructor and also explained orally within three weeks of the date of notification of grades.

The final exam is given Thursday June 1, 8.00-13.00.

Final grade

By identitying A=7, B=6, C=5, D=4, E=3, the final grade is given as

round((grade on proj 1) + (grade on proj 2) + 2 * (grade on final exam)) / 4),

where the rounding is made to nearest larger integer in case of a tie.

Preliminary schedule

(Lecture notes are not yet available.)

"L" means lecture, "E" means exercise session, "P" means project sesstion.

Type	Day	Date	Time	Room	Subject
L1.	Wed	Mar 22	8-10	E51	Introduction. Nonlinear programming models. (pdf)
L2.	Thu	Mar 23	10-12	Q21	Optimality conditions for linearly constrained problems. (pdf)
L3.	Fri	Mar 24	13-15	L52	Optimality conditions for nonlinearly constrained problems. (pdf)
P1.	Wed	Mar 29	8-10	E31	Introduction to GAMS.
P2.	Thu	Mar 30	10-12		GAMS excercise session.
E1.	Fri	Mar 31	13-15	D34	Optimality conditions.
L4.	Wed	Apr 5	8-10	D34	Unconstrained optimization. (pdf)
L5.	Thu	Apr 6	10-12	Q21	Unconstrained optimization, cont. (pdf)
L6.	Fri	Apr 7	13-15	E51	Equality-constrained quadratic programming. (pdf)
E2.	Wed	Apr 19	8-10	D34	Unconstrained optimization.
E3.	Thu	Apr 20	10-12	E31	Equality-constrained quadratic programming.
L7.	Fri	Apr 21	13-15	E51	Inequality-constrained quadratic programming. (pdf)
L8.	Wed	Apr 26	8-10	E31	Inequality-constrained quadratic programming, cont. (pdf)
P3.	Thu	Apr 27	10-12	D34	Presentation of project assignment 1.
E4.	Fri	Apr 28	13-15	D34	Inequality-constrained quadratic programming.
L9.	Wed	May 3	8-10	E51	Sequential quadratic programming. (pdf)
E5.	Thu	May 4	10-12	D34	Sequential quadratic programming.
L10.	Fri	May 5	13-15	E31	Interior methods for nonlinear programming. (pdf)
E6.	Wed	May 10	8-10	D34	Interior methods for nonlinear programming.
L11.	Thu	May 11	10-12	E31	Interior methods for nonlinear programming, cont. Semidefinite programming. (pdf)
L12.	Fri	May 12	13-15	E31	Semidefinite programming, cont.

P4.	Wed	May 17	8-10	E31	Presentation of project assignment 2.
E7.	Thu	May 18	10-12	E51	Semidefinite programming.
E8.	Fri	May 19	13-15	D34	Selected topics.

Overview of course contents

- **Unconstrained optimization**
  Fundamental theory, in particular optimality conditions.
  Linesearch algorithms, steepest descent, Newton's method.
  Conjugate directions and the conjugate gradient method.
  Quasi-Newton methods.
  (Chapters 11, 12.1-12.3 and 13.1-13.2 in Griva, Nash and Sofer.)
- **Constrained nonlinear optimization**
  Fundamental theory, optimality conditions, Lagrange multipliers and sensitivity analysis.
  Quadratic programming.
  Primal methods, in particular active-set methods.
  Penalty and barrier methods, in particular primal-dual interior methods.
  Dulal methods, local duality, separable problems.
  Lagrange methods, in particular sequential quadratic programming.
  (Chapters 3, 14.1-14.7, 14.8.1, 15.1-15.5, 16.1-16.3 and 16.7 in Griva, Nash and Sofer.)
- **Semidefinite programming**
  Fundamental theory.
  (Chapter 16.8 in Griva, Nash and Sofer. Separate article in the supplementary course material. Fundamental concepts only.)

Welcome to the course!

Course web page: http://www.math.kth.se/optsyst/grundutbildning/kurser/SF2822/.

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