

II2202 Research Methodology and Scientific Writing (II2202 Forskningsmetodik och vetenskapligt skrivande)

Examination: PRO1 7.5 credits

There were two instances of this course:

Period 1 (P1) <https://canvas.kth.se/courses/28715>
 Periods 1-2 (P1&P2) <https://canvas.kth.se/courses/28850>

P1: 99 students

Student details

0	AVBROTT	Withdrew
4	REGISTRERAD	Registered
95	AVKLARAD	Completed

Performance

14	A
34	B
27	C
18	D
2	E
2	F
<hr/>	
1	Fx
<hr/>	
98	Total

93.1% of total students completed

96.9% of students who did not drop the course completed the course

Note that the number of students withdrawing only includes students who did not do an early withdrawal.

Faculty involved with the course

Examiner: Gerald Q. Maguire Jr.

Teachers: Emil Björnson, Masoumeh Ebrahimi, Gerald Q. Maguire Jr., Jens Zander, and Anders Västberg (only for the course evaluation)

- Emil Björnson had 13 students from the TCOMM program
- Masoumeh Ebrahimi 35 students primarily from the TEBSM program
- Gerald Q. Maguire Jr. and Jens Zander each had 24 students from TCOMM and other programs

Students from other programs were mixed with the other students (trying to form groups with two students who had common subject interests for their project).

P1&P2: 112 students

Student details

0	AVBROTT	Withdrew
5	REGISTRERAD	Registered
106	AVKLARAD	Completed

Performance

12	A
52	B
27	C
10	D
5	E
2	F
<hr/>	
1	Fx
<hr/>	
108	Total

94.6% of total students completed

97.2% of students who did not drop the course completed the course

Note that the number of students withdrawing only includes students who did not do an early withdrawal.

Faculty involved with the course

Examiner: Gerald Q. Maguire Jr.

Teachers: Magnus Boman, Henrik Boström, Masoumeh Ebrahimi, Jan Ingemar Markendahl, Mihhail Matskin, and Anders Västberg (only for the course evaluation)

- Mihhail (Misha) Matskin had the students from AUSM/AUSY yr 1
- Magnus Boman had the students from DASC/DASE yr 1 and AUSM/AUSY yr 2
- Henrik Boström had the students from DASC/DASE yr 2
- Jan Ingemar Markendahl had the students from HCID/HCIN
- Masoumeh Ebrahimi had the students from INSY/INSM

Students from other programs were mixed with the other students (trying to form groups with two students who had common subject interests for their project).

Course structure and formative + summative assessments

Both courses share the same structure, with one running in P1 at half-speed and the other running over P1&P2 at one-quarter speed.

The course contains a series of assignments with formative feedback, and these are in the order suggested in the P1&P2 course):

- Power tools and how to use them (with quiz)
- Project planning (with quiz)
- Ethical Research (with quiz)
- Professionalism and Ethics for ICT students (with quiz)
- Ethical Research: Human Subjects and Computer Issues (with quiz)
- Writing and Oral Presentations (with quiz)
- Boosting your research profile: Step 1 having a unique identifier
- Avoiding Plagiarism (with quiz)
- Sustainable Development/Hållbar Utveckling (with quiz)
- Presentation of your proposed research: Ethics & Sustainability
- Quality Assurance (with quiz)
- Quantitative Methods and Tools (with quiz)
- Research plan: First draft of your research plan, presentation, and peer reviewing
- Presenting your Data (with quiz)
- Quantitative exercise
- Privacy, Discoverability, Openness, and Publicity (with quiz)
- Qualitative exercise - with peer review
- Writing the Methods, Results, and Discussion sections (with quiz)
- Writing an abstract with keywords (with quiz)
- Written and oral opposition (with quiz)
- Final report: First draft and Presentation with peer review of draft report and presentation

Note that each of the assignments marked "(with quiz)" has associated with it one or more videos with captions and transcript, lecture notes, and a quiz on the presented material.

The summative assessment for the project grade is based on: project plan, method description, scientific report, and opposition report. These are assessed in the assignments:

- Project proposal + Research plan (see above)
- Written opposition: before final seminar - with peer review
- Final Seminar -- note that this includes an oral opposition by those who wrote the written opposition for this project group
- Final report

The assignment "Presentation of your proposed research: Ethics & Sustainability" is present to ensure that the students really do think about both the ethical aspects and the sustainable development aspects of the research that they plan to do.

Summary of course evaluation

Of 211 students from both course rounds, 40 students provided an answer or 19,05%. The workload is difficult to assess as both groups studying at either 50% and 25% are included in the evaluation. There are two some what local maximums in the answers: 6-8 hours a week (28.9%) and 9-17 hours a week (39.5%) [probably the result of overlap between the two course instances] with a variation from 0-2 to 39-41 hours a week (with one student in the first group and 2 student in the latter group).

The LEQ questions have average values between 4.3 to 6, so no issue stands out. Most students are positive towards the learning environment. The lowest averages were question 4: The course was challenging in a stimulating way (c), question 10: I was able to learn from concrete examples that I could relate to (g), an question 19: I was able to learn from concrete examples that I could relate to (g). Comments indicate that some students know the material from their bachelor's education, which might be one reason for a slightly lower score. Interestingly, the LEQ average score for female students ranged from 5.1 to 5.9 while all of the scores were higher than for male students, with the exception of question 17: My background knowledge was sufficient to follow the course (f) – where the score was 0.1 lower (essentially the same). Interestingly the LEQ scores where higher for the international Master's students than for students in the years 4-5.

Students' comments are generally positive towards the course's online format although there were some students who would like to have some live lectures and more in person sessions. Generally, the students think it is interesting to work with current research topics and being able to select their own topics for their projects. In most cases, teachers provided helpful feedback.

Student's suggestions for improvement:

There are problems in interacting with other students and teachers in an online format. Some support to make this easier might be needed. More help in choosing a research topic and finding the knowledge gap is requested. Student's needing more help might also be related to the amount of feedback from different supervisors in the teacher team (one student pointed to the teacher not being knowledgeable in the specific topic area). Some students think it would be better to have pre-specified projects.

One student wanted a unified template. There is now a template for each version of the documents that lead to the final project report. One student wanted the first draft graded.

Analysis

Changes since the previous year's course

Masoumeh Ebrahimi and Jens Zander were new teachers in the course. The examiner helped these new instructors to come up to speed in this course.

A major effort was made to create wiki pages for the course material from the videos and the transcripts. These wiki pages integrate the material presented in the slides shown in the videos with a transcript for each slide. These wiki pages were **not** done for the Quality Assurance module or Jon-Erik Dahlin's videos.

Note: As noted last year, Jon-Erik Dahlin's videos on sustainable development were **not** available via the KTH Play infrastructure – so they could not be captioned by G. Q. Maguire Jr., but 2 of the 3 have automatic captions generated by YouTube. This situation remained true this year.

Some additional custom columns were added to the gradebook for teachers to keep notes regarding the oral presentations, oral oppositions, final written reports, etc. This was done with a program: `add-columns-for-II2202-final-presentation.py`. One of the new teachers for this year liked these additional custom columns and asked that they also be added to the P1-P2 instance of the course as it had proved to be so useful for the P1 version of the course.

Except for Magnus Boman's sections in the P1-P2 version of the course, peer reviews were randomized within each section. He organized his peer reviews in a different manner. The randomization of peer reviews was based upon a request by a student who wanted to have greater variety in the material that each student was to peer review. This automatic peer review assignment was implemented in `assign-random-peer-reviewer-by-section.py`* on 2021-09-16, i.e., roughly in time for the 3rd peer reviewed assignment.

Strengths and weaknesses of the course

The course seems to be very effective in helping the students when it comes to their 2nd cycle degree projects, as is evident from these students' progress in their degree project versus students who have **not** had this course. My impression is that those students who did not have not II2202, consume a large amount of supervisors' time during their degree project. To compensate for this, a number of these supervisors are doing group supervision of their students, so that the students can do peer reviews of each other's drafts. However, this would seem to be completely inappropriate for students doing their degree projects in industry – for these students, all of their drafts should be confidential until the draft goes to the opponent for the written opposition. One of the key differences is that the students who have taken II2202 actually know how to formulate a research proposal and plan their research.

As noted previously, a strength of this course, was that due to the videos and on-line material it was easy to have a 100% on-line course during Fall 2021. As a side effect, this made it possible to uncap the enrollments for the course, as we no longer have to worry about the seating capacity of our largest lecture hall in Kista (Sal A) – that previous years required splitting the P1 and P1-P2 students into different

* The programs mentioned in this report are available from <https://github.com/ggmaguirejr/Canvas-tools>

lectures as all of the students could not fit into the lecture hall. As noted previously, the use of Zoom meant that students did not have problems getting to and from the Kista campus. Additionally, the individual teachers can each schedule their advising sessions and decide whether they want to use Zoom or not. For much of Fall 2021, most of the traditional face-to-face advising of students was replaced by Zoom sessions. However, some individual teachers and their section of students did meet in smaller groups (in keeping with the public health recommendations).

As noted previously, another strength of the course is that the majority of the teachers are working with students in their section that they work with in other courses in the student's particular program; hence, they are (a) generally competent in the area, (b) they are aware of what the students are studying, (c) they are aware of the competing demands on the students' time, and (d) they can schedule their advising sessions with the students in their section to avoid conflicts with other courses the students are taking.

Having automatically graded quizzes for the 15 quizzes seems to be an effective means of providing formative feedback to students.

As noted previously, one weakness of the course concerns staffing, as it is not always possible to have teachers who are knowledgeable enough in the area to provide good guidance to the students in their section. This continued to be a problem this year for the HCID students, although Jan Ingemar Markendahl worked very hard with the students in this area - both last year and this year.

As noted previously, another weakness is that one of the teachers did not use Canvas to provide feedback to the students in their section. Thus the examiner had no easy way to handle problems or to see if the teacher is effective in guiding the students. [Note: The examiner has asked the director of studies to not assign this teacher to the course next year.]

As noted previously, an administrative weakness for the course is that splitting the students into sections based upon their program and specialization and assigning a teacher for this section – requires special permissions in Canvas. This has meant that Gerald Q. Maguire Jr. has handled this task since he introduced this approach a number of years ago.

An administrative weakness of the course is that since the projects are done in groups of two students, there are problems with:

- Students who arrive late for the course – this is primarily a problem for the EIT students as some have compulsory summer schools that ran late.
- When one student in a group withdraws from the course, there is a problem of how to handle the remaining student – sometimes it is possible to have this student join another orphaned student or join two other students to form a group of three students but sometimes the research has progressed too far to make this feasible and the student needs to complete the course by themselves.
- There are also the usual problems of group dynamics, but in general, it has been possible to address the problems that have arisen.

The following pages list and briefly describe the ~12 hours of videos available in the course.

Title	responsible person	Duration (HH:MM:SS)	Duration in seconds
Ethics			
Professionalism and Ethics for ICT students (with quiz)	Gerald Q. Maguire Jr. (GQMjr)	33:26	2006
Ethical Research (with quiz)	GQMjr	33:26	2006
Ethical Research: Human Subjects and Computer Issues (with quiz)	GQMjr	23:02	1382
ORCID			
ORCID at KTH	Niklas Olsson	4:07	247
Evaluate introduction of new technology: A case study from the development of the ORCID application at KTH	Niklas Olsson	2:50	170
Sustainable Development/Hållbar Utveckling (with quiz)			
Sustainable Development: Introduction	Jon-Erik Dahlin	15:09	909
Sustainable Development: Definitions and perspectives	Jon-Erik Dahlin	20:43	1243
Sustainable Development: Economic, Ecologic, and social sustainability	Jon-Erik Dahlin	18:43	1123
Green Networks	Markus Hidell (captions GQMjr)	17:39	1059
Avoiding Plagiarism (with quiz)	Carl-Mikael Zetterling (Bellman)	24:32	1472
Project planning (with quiz)	GQMjr	22:39	1359
Quality Assurance (with quiz)	Magnus Boman (captions GQMjr)	1:18:22	4702
Boosting your research profile: Step 1 having a unique identifier	GQMjr		

Writing and Oral Presentations (with quiz)	GQMJr	1:19:45	4785
Quantitative Methods and Tools (with quiz)			
Introduction to Quantitative Research Methods	Mark T. Smith (captions GQMJr)	1:30:13	5413
Quantitative tools with Excel and R	GQMJr	45:42	2742
Advanced Quantitative Tools using R	GQMJr	49:23	2963
Power tools and how to use them (with quiz)	GQMJr	47:43	2863
Privacy, Discoverability, Openness, and Publicity (with quiz)	GQMJr	47:08	2828
Presenting your Data (with quiz)	GQMJr	20:03	1203
Writing an abstract with keywords (with quiz)	GQMJr	12:42	762
Writing the Methods, Results, and Discussion sections (with quiz)			
Methods section	GQMJr	6:13	373
Result section	GQMJr	6:20	380
Discussion section	GQMJr	9:30	570
Written and oral opposition (with quiz)	GQMJr	20:13	1213
Total		12:09:32	43773

Summary of the teacher's views

One problem in staffing the course is that some of the teachers in particular subject areas view themselves as too heavily loaded to be a teacher in this course. Hence they do not recognize their self interest in helping these students with a research project that produces a short report, as opposed to a degree project. In some cases, these teachers do not think that the course is “that important”.

This is a very demanding course in terms of requiring the teachers to have broad competence in the area of the students that they are to guide.

Proposal regarding potential changes to the course

As the examiner, I plan to again use the 100% on-line approach for Fall 2022. The use of Zoom means that students do not have problems getting to and from the Kista campus. It will be up to the individual teachers how they wish to schedule their advising sessions and whether they want to use Zoom or not.

As noted earlier in this report, one teacher (who did not use Canvas for written feedback to students), will **not** be a teacher in the course in Fall 2022. The only written feedback that this teacher's group of students certainly got was feedback on their proposal from the examiner. Although the teacher was reminded to use Canvas for giving students written feedback, the teacher did not do so.

As noted last year, it would be useful to automate the assignment of students to the sections based upon their program. Although, the examiner has a way to get this information from LADOK, the recent changes in the procedure for logging into LADOK may make this information inaccessible to his program. Another useful feature would be to automate the addition of the group numbers to a custom column in the grade book. Currently, this is done manually by the examiner for all of the students in each instance of the course. Having this information in the Canvas gradebook enables the teacher for a given section to sort the gradebook by project group – making it easier to track the progress of their pairs of students (as the project is in group with 2 students). This remains to be automated.

The most important change to the course for Fall 2022 is to create a template for the research plan (rather than expecting that students can interpolate between the research proposal and the research report templates – using the table of the differences between these three documents that is included in the course material). The suggestion for this change was made by Jens Zander.

Another very important change to the course for Fall 2022 was the splitting of the material that was in each of the quizzes to place the non-quiz material (i.e., video, notes, transcripts, etc.) into a separate web page and integrate this with the wikipages that were created last year for each of the topics for which there was a quiz. This splitting of the material is essential for this year's P1-P2 course instance since in November 2022 -- Instructure will no longer support Canvas' classic quizzes but only support their new quiz engine. Unfortunately, this quiz engine does not correctly handle the videos; therefore, it was essential to reorganize this material. It turns out that there is a second reason why this partitioning was beneficial: KTH's E-learning group decided to automatically add an ending date to each Canvas course. Unfortunately, adding this ending date prevents students from accessing the quizzes! The examiner only learned of this problem when a student sent a note about wanting to access the videos and notes in the quizzes in conjunction with their degree project (as the student found this material useful for their degree

project). The temporary fix was to shift the ending date for the course to allow students to continue to access the material that was packaged as part of the quizzes. The re-packaging of the course material avoids this problem.

Wiki pages have now been created for the Quality Assurance module and Jon-Erik Dahlin's three videos. The transcripts were done manually by the examiner for Jon-Erik Dahlin's videos. However, as these are YouTube videos and the examiner does not have write access to them, these videos do not have captions (although captions could be derived from the transcripts). Additionally, it should be noted that as the examiner does not have the slides used by Jon-Erik Dahlin for his videos, the wiki pages do not have any of the pictures or figures that were shown in the video, but these wikipages do have the textual content of what was shown in the video.

Longer term there is a need to revise the questions, especially for the sustainability module (see the next section on I12210). One student complained about the fill-in the blank type questions (this includes question of the type short_answer_question) requiring exactly the missing word. This is a limitation of the Canvas classic quiz engine not having partial matches or regular expressions – it only can do exact matches. This revision of the questions and changes in the types of questions would seem to be a natural activity in conjunction with the transition to Canvas' new quiz engine. One of the aims would be to replace most fill in the blank questions with multiple choice questions or other forms of questions. I think that it may be possible to mine the incorrect answers from the earlier quizzes to find incorrect alternatives to create multiple choice questions. Table 1 shows a summary of the number of questions of each type. Table 2 and Table 3 show some results per quiz for the number of attempts for each quiz. We can see that for most of the quizzes that two attempts enabled the student to get a sufficient score that they did not feel a need to do this quiz again (with different questions). However, the average number of attempts for 'Sustainable Development' and 'Quality Assurance' are substantially larger than for other quizzes. The reason(s) for this need(s) to be understood. Similarly, there reason(s) for some students taking a given quiz many times needs to be understood – as the maximums for some quizzes are rather large. [Note that the two different instances of the course are taken at quarter time and half-time (respectively).] Table 4 breaks down the number of students in the P1 instance of the course who made a given number of attempts on each quiz (this corresponds to the details underlying Table 3). The underlying data for all these tables comes via a new program called `quizzes-and-answers-in-course.py`. This program should be expanded to get all of the attempts for each student for each quiz and analyze what incorrect answers were given for each question. Note that the statistics in Table 2 and Table 3 were calculated by manually added columns to calculate the sum, max, min, and average of the number of attempts for submissions of each quiz.

Note that **not** all of the repeated taking of a quiz was because of poor scores. For example, one of the students in the P1 course on the "Writing an abstract with keywords" quiz who took the quiz six times had scores of: 4.8, 5, 5, 5, 4.75, and 5 out of 5 points. This behavior of continuing to challenge themselves by taking the quiz many times is somewhat different than the results previously been reported by Khalil and Ebner [1p. 1221], where they indicated that students repeatedly took the quiz until they got the full score. The other student, who took this quiz 6 times, did not give any answers in the first 5 times that they took the quiz and then got a 5 on the 6th time. This student seems to have taken advantage of the fact that the answers are given for each attempt and after 5 times, the student had the set of all of the answers needed for the 6th attempt.

A second quiz question was analyzed in more detail* after spending several hours manually downloading a list of Canvas URLs for students' attempts for a single quiz (concerning sustainable development). There were 97 students in this course round who attempted this quiz and there were 545 total attempts to do this quiz.

Once I have this data it takes less than a minute for a program I have written to give me data about the incorrect answers to the fill in the blank(s) type questions that students gave to each particular quiz question. In each quiz attempt, each student gets a set of 5 questions randomly selected from a set of 70 questions. I'm trying to understand what are the patterns of the student errors and the patterns of their attempts. Additionally, I want to understand what are the incorrect answers that students answered. Is there an misunderstanding of the concept or is the problem due to Canvas fill in the blank questions only supporting an exact match of the string that was entered. Also, one goal is to change many of these questions to a multiple choice question for the future (to avoid the problem of spelling errors – some obvious spelling errors are highlighted in red below) and the incorrect answers give me confounding answers for the multiple choice question.

For the quiz on sustainable development the breakdown in type of questions is:

6 fill_in_multiple_blanks_question

2 matching_question

11 multiple_answers_question

8 multiple_choice_question

19 short_answer_question

24 true_false_question

In what follows, I focus on short_answer_question and fill_in_multiple_blanks_question type questions as these have a user entered string as the student's answer. The incorrect answers associated with each of the questions are:

Incorrect answers for 274196 on quiz 28330: {'progresses', 'time', 'technology development', 'sustainability', 'enviorment', 'advancement', 'performance', 'technologic changes', 'age', 'decrease', 'changes in technology', 'technological advancement', 'planning', 'use', 'replacement', 'decay', 'l', 'knocked down', 'development', 'supply', 'outdated', 'technological advancements'}

Incorrect answers for 274220 on quiz 28330: {'necessary', 'asset', 'avaliable', 'having', 'good', 'fruitful', 'repeatable', 'forced', 'possible', 'left', 'feasible', 'affective', 'required', 'expected', 'viable', 'unable'}

Incorrect answers for 274205 on quiz 28330: {'Sustainable Networks', 'green energy', 'energy-saving', 'radically'}

Incorrect answers for 274221 on quiz 28330: {'future', 'environment', 'batter', 'economic', 'nature', 'technological advances', 'everything'}

* The attempts were analyzed using a program called `augment_quizzes-and-answers-in-course.py`

Incorrect answers for 274248 on quiz 28330: {'true', 'anthropocentric', 'early', 'established', 'accurate', 'Brundtland', 'frequently quoted', 'correct', 'sustainable', 'important', 'initial', 'traditional', 'incomplete', 'ideal', 'inclusive', 'eco-centric'}

Incorrect answers for 274213 on quiz 28330: {'【】', 'sleeping modes', 'sleep models', 'sleeping modes', 'sleep modes', 'sleep mode', 'sleeping mode'}

Incorrect answers for 274240 on quiz 28330: {'green', 'ecological', 'critical', 'anthropocentric', 'e-centric', 'sustainable', 'scientific', 'Sustainable', 'ecocentric'}

Incorrect answers for 274238 on quiz 28330: {'similar', 'closely', 'concerning', 'eco-centric thinking', 'anthropocentric', 'indirectly', 'directly', 'equally', 'only', 'all', 'aquatic', 'conditionally', '1', 'anthropoid', 'not', 'highly', 'anthropocentric', 'climate', 'dangers'}

Incorrect answers for 274239 on quiz 28330: {'effective', 'anthropocentric thinking', 'indirectly', 'temperature', 'eco-centric', 'eeco-centric', 'quite', 'important', 'strongly', 'eco-centric'}

Incorrect answers for 274222 on quiz 28330: {'Basic Idea', 'nature', 'waste', 'changes', 'worth', 'sustainability', '?', 'change', 'development', 'economy', 'internet'}

Incorrect answers for 274195 on quiz 28330: {'true', 'good', 'ecological resource and services', 'Ecological Wealth', 'ecologic', 'global', 'True', 'ecology', 'earth', 'energy', 'overall', 'ecological resources', 'development', 'nature', 'ethics', 'environmental', 'eco-centric', 'environmental', 'non', 'the limit of', 'b', 'resource', 'resources', 'ecological resources', 'ecological footprint'}

Incorrect answers for 274192 on quiz 28330: {'kind', 'energy consumption', 'economic forces', 'income', 'industrialization', 'monetary', 'ecological', 'economic', 'productivity', 'quantity of goods and services', 'production', 'CO2', 'sustainability', 'economy', 'Sustainable', 'ecological footprint', 'consumption'}

Incorrect answers for 274211 on quiz 28330: {'sleep-mode', 'hardware', 'yes', 'networks', 'sleep', 'sleep mode', 'GeSI'}

Incorrect answers for 274198 on quiz 28330: {'green networks', 'designing hardware', 'Green Networks', 'design hardware', 'Internet's topology', 'routers', 'operators', 'substantial', 'networks', 'hardwork', 'hardware deisgn', 'modems', 'Design hardware', 'networking equipment', 'the internet topology', 'green network', 'd', 'internet'}

Incorrect answers for 274208 on quiz 28330: {'Global Sustainability Initiative', 'electricity', 'anthropogenic', 'IEEE', 'GSMA', '?', 'green network', 'GeSI'}

Incorrect answers for 274207 on quiz 28330: {'new', 'heavy', 'coal', 'manufacuring', 'tradional'}

Incorrect answers for 274241 on quiz 28330: {'practical', 'Marx', 'sustainability', 'critical', 'anthropological', 'sustainable', 'humanistic'}

Incorrect answers for 274247 on quiz 28330: {'7', 'several', 'many', 'two', 'sustainability', 'anthropocentric'}

Incorrect answers for 274234 on quiz 28330: {'a0': {'light greens', 'environment', 'economic', 'renew', 'economic dimension', 'sustainable', 'society', 'earth'}, 'a1': {'environment', 'ecologic', 'enviromental'}}

dimension', 'bright greens', 'social aspects', 'recycle', 'people', 'ethical'}, 'a2': {'continue', 'nature', 'social sustainability', 'Social dimension', 'dark greens', 'economics', 'economy'}}}

Incorrect answers for 274237 on quiz 28330: {'a0': {'environmental', 'anthropocentric', 'Over-provisioning', 'self', 'sustainability'}, 'a1': {'Redundancy', 'eco-', 'economic', 'eco', 'social'}}}

Invalid question id 274226 (not in the list of questions - but has incorrect answers={'a0': {'greenhouse effect', 'weather event', 'cold', 'heat', '2010'}, 'a1': {'worm', 'ice coverage', 'ice age', 'stability', 'cold', 'warm', '2020', 'hot', 'excessive heat', 'hot temperatures'}}}

Incorrect answers for 274203 on quiz 28330: {'a0': {'human', 'performance', 'energy', 'enery', 'cost', 'speed', 'power consumption', 'active nodes', 'DE', 'performance', 'life'}, 'a1': {'EE', 'links', 'power consumption', 'environment', 'power consumption', 'capacity', 'nature', 'performance', 'machine'}}}

Incorrect answers for 274256 on quiz 28330: {'a0': {'fresh water', 'environment', 'equality', 'economic', 'sustainable', 'envrionment', 'information'}, 'a1': {'electricity', 'psychosocial', 'economy', 'internet', 'life', 'food'}}}

Incorrect answers for 274216 on quiz 28330: {'a0': {'used', 'number of', 'lesser', 'power'}, 'a1': {'current', 'handle', 'data', 'reduce'}}}

From this list of incorrect answers we can see some clear cases where there were the answer was spelled incorrectly. In some cases we can see that the student did not understand the material.

I can do at most 4 downloads per minute - so it takes a couple hours to download the attempts for the one quiz analyzed in detail above. To get all of the quiz attempts for this course round would require downloading almost 4000 files. . Now I have another 13 quizzes for this course round and the other course rounds to do for the past year. Additionally, I have the other course round with a similar number of students and II2210 shares four of the quizzes – so there remains a lot to do 😊.

An open question for Fall 2022 is how much time and when I should have discussions about the lecture material, assignments, and questions that students have beyond what is handled via their specific section.

An open question is who will be the examiner and course responsible person for II2202 during Fall 2023.

Table 1: question_type_stats

Canvas question type	Number of this type of question
'multiple_answers_question'	61
'multiple_choice_question'	28
'matching_question'	14
'true_false_question'	162
'multiple_dropdowns_question'	6
'fill_in_multiple_blanks_question'	31
'short_answer_question'	69
Total	371

Table 2: Some statistics about the quiz attempts for the P1-P2 course instance

Total attempts	Max	Min	Average	Title
425	14	1	3.97	Sustainable Development/Hållbar Utveckling (with quiz)
328	9	1	3.01	Quality Assurance (with quiz)
256	11	1	2.39	Privacy, Discoverability, Openness, and Publicity (with quiz)
243	13	1	2.27	Quantitative Methods and Tools (with quiz)
232	8	1	2.23	Writing an abstract with keywords (with quiz)
228	7	1	2.21	Writing the Methods, Results, and Discussion sections (with quiz)
239	11	1	2.17	Ethical Research: Human Subjects and Computer Issues (with quiz)
229	8	1	2.12	Avoiding Plagiarism (with quiz)
202	10	1	1.92	Presenting your Data (with quiz)
211	9	1	1.92	Professionalism and Ethics for ICT students (with quiz)
209	14	1	1.90	Power tools and how to use them (with quiz)
204	8	1	1.85	Project planning (with quiz)
182	8	1	1.67	Writing and Oral Presentations (with quiz)
167	7	1	1.52	Ethical Research (with quiz)
125	4	1	1.21	Written and oral opposition (with quiz)

Table 3: Some statistics about the quiz attempts for the P1 course instance

Total attempts	Max	Min	Average	Title
545	19	1	5.62	Sustainable Development/Hållbar Utveckling (with quiz)
296	10	1	3.08	Quality Assurance (with quiz)
281	11	1	2.99	Quantitative Methods and Tools (with quiz)
252	10	1	2.60	Professionalism and Ethics for ICT students (with quiz)
247	10	1	2.55	Ethical Research: Human Subjects and Computer Issues (with quiz)
224	10	1	2.52	Privacy, Discoverability, Openness, and Publicity (with quiz)
199	9	1	2.24	Writing the Methods, Results, and Discussion sections (with quiz)
216	6	1	2.23	Avoiding Plagiarism (with quiz)
200	6	1	2.22	Writing an abstract with keywords (with quiz)
217	10	1	2.21	Project planning (with quiz)
193	9	1	2.12	Presenting your Data (with quiz)
175	9	1	1.77	Writing and Oral Presentations (with quiz)
172	14	1	1.74	Power tools and how to use them (with quiz)
164	15	1	1.69	Ethical Research (with quiz)
117	4	1	1.31	Written and oral opposition (with quiz)

Table 4: Breakdown of number of number of students in P1 course instance who made X attempts

	Number of students for X number of attempts																		
Number of attempts (X)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Sustainable Development/Hållbar Utveckling	13	12	15	7	9	10	7	5	4	2	2	3	1	1	1	3		1	1
Quality Assurance	24	19	18	18	7	4	3	1		2									
Quantitative Methods and Tools	26	29	12	6	9	3	3	3	2		1								
Professionalism and Ethics for ICT students	25	33	18	10	6	2	1	1		1									
Ethical Research: Human Subjects and Computer Issues	25	33	18	10	6	2	1	1		1									
Privacy, Discoverability, Openness, and Publicity	38	18	12	9	5	3	1	1		2									
Writing the Methods, Results, and Discussion sections	34	26	14	10	2	2			1										
Avoiding Plagiarism	30	30	25	10	1	1													
Writing an abstract with keywords	24	37	21	3	3	2													
Project planning	41	25	19	6	2	3	1			1									
Presenting your Data	39	30	10	4	4	2	1		1										
Writing and Oral Presentations	60	20	9	8			1		1										
Power tools and how to use them	59	27	9	2						1				1					
Ethical Research	63	21	7	2	3										1				
Written and oral opposition	69	14	4	2															

Related course

II2210 is a related course that uses the Ethics and Sustainable development course modules from II2202. This course provides a good means for students who have had a research methodology course elsewhere (typically double degree students) to take II2210 and then get course equivalence for II2202 - as most of the courses the students have previously taken do not have ethics or sustainable development as part of the course's material. Note that the existence of this course has greatly reduced the work load on the examiner for II2202 in processing requests for evaluation of course equivalence. In most cases the study advisers can recognize that the student has previous a research methodology course and recommend II2210 to make up for the lack of the ethics and sustainability aspects in the earlier course.

II2210 Ethics and Sustainable Development for Engineers (II2210 Etik och hållbar utveckling för ingenjörer)

Examination: PRO1 1.5 credits

There were four instances of this course during 2021 (the course is offered in each period):

On-line course (VT21-2): <https://canvas.kth.se/courses/26684> (starting 18 January 2021)

13 students, 12 completed, 1 dropped the course

On-line course (VT21-1): <https://canvas.kth.se/courses/26685> (starting 22 March 2021)

36 students, 32 completed, 4 dropped the course

On-line course (HT21-1): <https://canvas.kth.se/courses/30567> (starting 30 August 2021)

44 students. 39 completed in this term and one completed in the next term, 4 dropped the course

On-line course (HT21-2): <https://canvas.kth.se/courses/30564> (starting 1 November 2021)

41 students, 37 completed, one completed 75% of the course and one completed only 25% of the course, 1 dropped (another student was the student from the previous term who completed the course in this term)

Over the course of the year 2021, 120 students completed this course.

One development for this course was the addition of a program to compute which students have completed all 4 of the modules with passing grades and make a note in a custom column of this along with the date when the last module was completed. This makes it easier to report the grades in LADOK, since the "Export to LADOK" function from Canvas does not include the information about the date when the course was completed. The program is `II2210-grades_to_report.py`. A second version `II2210-grades_to_reportv2.py` of the program makes the column automatically visible to the examiner in the gradebook. The examiner generally runs this program every Monday and if there are grades to report, exports them to LADOK and then completes the grading information (adding the date) and certification in LADOK. After adding the material to LADOK the note is changed to simply say "P". [Viggo Kann has written a version of this program to support the "prosam" course (he is responsible for).]

As of Fall 2022, the course responsible person for II2210 will be Markus Hidell. During Fall, the current examiner will help him transition to being the examiner for the course in Spring 2023.

The repackaging of the videos and other material into a wikipage for each quiz has been done for one instance of this course for Fall 2022 (<https://canvas.kth.se/courses/35177>). Additionally, all of the wikipages for the four modules have been added to this course instance (from the latest P1-P2 course instance).

Table 5 shows the break down by type of questions for the quizzes in II2210. Table 6 some results per quiz for the number of attempts for each quiz. Table 7 breaks down the number of students in the P2 instance of the II2210 course who made a given number of attempts on each quiz (this corresponds to the details underlying Table 6).

Table 5: question_type_stats

Canvas question type	Number of this type of question
'matching_question'	4
'multiple_answers_question'	15
'short_answer_question'	36
'true_false_question'	77
'multiple_choice_question'	15
'fill_in_multiple_blanks_question'	16
'multiple_dropdowns_question'	1
Total	164

Table 6: Some statistics about the quiz attempts for the P2 course instance (HT21-2) – with 41 students

Total attempts	Max	Min	Average	Title
163	12	1	4.18	Sustainable Development/Hållbar Utveckling
93	6	1	2.51	Professionalism and Ethics for ICT students
91	6	1	2.39	Ethical Research: Human Subjects and Computer Issues
59	5	1	1.55	Ethical Research

Table 7: Breakdown of number of number of students in the P2 course instance (HT21-2) who made X attempts

Number of students for X number of attempts												
Number of attempts (X)	1	2	3	4	5	6	7	8	9	10	11	12
Sustainable Development/Hållbar Utveckling	5	9	7	4	2	4	3	1	2	1		1
Professionalism and Ethics for ICT students	10	13	6	4	1	3						
Ethical Research: Human Subjects and Computer Issues	15	7	7	5	3	1						
Ethical Research	25	8	3	1	1							

The current examiner has discussed with Markus Hidell the need to revise the questions, especially for the sustainability module. This would seem to be a natural activity in conjunction with the transition to Canvas' new quiz engine. One of the aims would be to replace most of the fill in the blank(s) questions with multiple choice or another form of question. These changes could be back ported to the corresponding modules in II2202.

References

- [1] Mohammad Khalil and Martin Ebner, 'A STEM MOOC for school children — What does learning analytics tell us?', in *2015 International Conference on Interactive Collaborative Learning (ICL)*, 2015, pp. 1217–1221. DOI: 10.1109/ICL.2015.7318212