Student experience on engagement through online learning resources

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2023 Laurea

Laurea-ammattikorkeakoulu

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Tietojenkäsittelyn koulutus

Opinnäytetyö

Marraskuu, 2023

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Opiskelijakokemus verkko-oppimisen resurssien mielekkyydestä oppimisen tukena

Vuosi	2023	Sivumäärä	46

Tämän tutkimuksen tavoitteena oli kartoittaa opiskelijoiden kokemusta ja mielipiteitä verkko-oppimisen resursseista sisältöjen omaksumisessa ja oppimisen apuvälineenä. Tutkimus toteutettiin rakentamalla prototyyppinä verkko-oppimisen alusta Laureassa lehtorina toimivalle tilaajalle viiden opintopisteen laajuiselle kurssille Data Networks and Information Security. Vastaajien mielipiteet kerättiin kurssin aikana sille rekisteröityneiltä opiskelijoilta kahdella kyselyllä. Tietopohjana käytettiin aikaisempaa tutkimusta verkko-oppimisen mielekkyydestä ja erilaisista oppimiseen vaikuttavista tekijöistä.

Kyselyllä kerätystä tiedosta tehtiin kuvallinen analyysi laadullisin menetelmin. Analyysillä saatiin suuntaa antavia vastauksia opiskelijoiden mielipiteistä verkko-oppimisalustoilla käytettävistä oppimista tukevista resursseista. Oppimista eniten tukevina resursseina opiskelijat kokivat verkkoluennot, niiden nauhoitteet ja videotutoriaalit. Käytännölliset tehtävänannot olivat hyviä oppimisen välineitä ja kokeita pidettiin hyödyllisinä oppimisen kannalta. Interaktiiviset itsearvioituvat verkkotehtävät olivat joillekin hyvä lisä oppimiseen, mutta eivät välttämättömiä. Yhteistoiminnalliset oppimisresurssit, joita prototyyppikurssilla ei ollut lainkaan, koettiin hyviksi oppimisen välineiksi, mutta lukeminen ja kirjoittaminen eivät olleet opiskelijoiden mielipiteiden mukaan hyödyllisiä. Kaikki tiedosta nousseet tulokset ovat moniselitteisiä, koska vastausten hajonta oli suuri.

The objective of this study was to survey student opinion on engagement created through learning resources in online learning. The objective was reached by first developing an online learning environment prototype commissioned by a senior lecturer in Laurea University on Applied Sciences for a five credit course Data Networks and Information Security, and then surveying student experience from the students registered on the course by embedding two questionnaires amongst the course modules on the platform.

The collected data was qualitatively interpreted by using graphic analysis as a method and through the analysis, approximate trends in student opinion were found. The most engaging resources were found to be the ones where an instructor explains the content in their own words, presented as an online lecture and its recording, or a video tutorial. Practical work was also found to be helpful, and tests were seen as a learning tool. Interactive, automatically evaluated resources that would make the instructors work easier, were an additional tool for some, but not seen as necessary. Collaborative elements, that were not present on the course platform would have been appreciated by some, but reading and writing was not seen as an appealing. All the results are ambiguous in the sense that deviation in responses was large.

Content

1   Introduction

This thesis work arises from my personal interest and experience in different digital learning platforms, and a commission from a Senior Lecturer Arvind Sharma in Laurea University of Applied Sciences. He indicated to me during November 2021, that he would like to commission a learning platform on the Canvas Learning Management System for his students as a thesis project, and as he knew my background with experience in using several different Learning Management Systems, I would perhaps be the right person to build this platform. As a client, he expressed interest in having this done as a two-person project with two separate learning platforms in two separate subjects and inquired about my peer students' possible interest in joining the development. I had a person in mind and the project started in co-operation with fellow student Irina Salonen.

Irina and I both were to be responsible for one of the courses taught by Arvind Sharma during the spring term of 2022, but our projects on them would veer into becoming two separate theses, as the scheduling and the content of the courses were vastly different. My project was to concentrate on a course on the topic of Data Networks and Information Security which was scheduled to start during the January of 2022, and as the webpage course was to begin much later during the spring term, it was a good idea to develop two separate projects.

Data Networks and Information Security is a course that the client had not taught before, so my starting point for the development work would be the source material he indicated to me, CCNA 200-301 Official Cert Guide Library Volume 1, by Wendell Odom, published by Cisco Press, and his original ideas on what a course could and should contain. Arvind Sharma wished the platform to be useful in digital, blended, and classroom studies. Beside these considerations, what he expected for himself was convenience, easy usability, and a way to evaluate student progress without extensive amount of reading. Such a goal could be reached by automation. I am a student, though, which meant that the most important point of view of this is study would be the user experience, meaning the students.

I have attended a version of this course during my first year of studies in Laurea, and I found it to be one of the better courses of that term. It was taught by different lecturers, though, and the client wanted to approach the topic in a very different manner. One of the biggest challenges during the design part of this project was imagining something that I personally found to work very well to something completely different that would hopefully be equally as engaging for the students. The fact that I have a long background in teaching was something of a hindrance as well, as like I mentioned earlier, the main focus of development project and the connected study was to be the students' experience instead of the teacher's.

The objective of this thesis is to map out the student experience and engagement through various learning resources and tasks in a digital learning environment. This objective will be reached through the development of the commissioned course platform prototype and two survey questionnaires for the students on the course.

2 Knowledge base

According to Grey and DiLoreto (2016, 2) the fact that students feel disconnected from their instructors and other students is one of the challenges of online learning. Covid 19 pandemic and its aftermath have brought the academic world to a crossroads where the sudden forced move from classrooms and lecture halls to digital learning environments changed the currency and the future of studying towards increased online learning. The trend towards this has remained even though the crisis stage of the pandemic and school shutdowns are in the past.

Physical presence in a shared space is not a requirement for highly successful learning experience (Veletsianos 2020, 32). Online courses can be designed to build student engagement. It is pivotal to consider both the instructor and the student to build an engaging digital learning platform. Child, Frank, Law and Sarakatsannis (2023) state that the main draws of online learning are convenience and flexibility. They have surveyed students and recognized the top three features that online learning should contain: these three are recordings of online classes which are easy to watch at any time, easily accessible digital resources, and flexibility in schedule.

Student engagement in online learning has a distinction between behavioral engagement of clicking and browsing through a Learning Management System environment, and cognitive engagement of thinking through the subject matter and deeper learning (Kennedy, 2020). The course design and activities should be built in a way that moves past access and download and presents the students with content and assignments that require the use of cognitive processes to facilitate understanding and learning.

Research findings by Mucundanyi indicate that to reach this through an online environment the priorities should be in student-instructor interactions, student-student, student-student interactions, and finally student-content interactions. (2019, 86). All three can be broken into smaller slivers of interaction, but then combined on an online course through the forming community, and cognitive engagement that builds through structure and course design. This way the isolation that may be seen as a negative side of online studies, may lessen, and the possibility of academic success increases.

3   Development work

The actual development of the digital material for the course Data Networks and Internet Security started in December 2021 with a discussion on the preferred content the Senior Lecturer who ordered the platform would want. His wishes are listed here as he presented them to me.

1. The course material was to be built around CCNA 200-301 Official Cert Guide Library Volume 1, by Wendell Odom, published by Cisco Press. As the course would contain online lectures, the lecturer would script them himself, but I was to develop the actual learning materials around those contents. The lab work connected to the course would come from the teacher as well.
2. The students should be able to advance during the course without limitations. They should have the freedom to move forward as fast as they preferred.
3. The course was to be as automated as possible to ease the evaluation work of the lecturer. This would mean no writing assignments, but a lot of small tests, quizzes, and interactive assignments.
4. The lecturer would be allowed to make changes to the course schedule and content if needed.

With these four things in mind, I had to research the Canvas LMS, and its possibilities quite quickly and set myself some very definite deadlines as the course would start in the beginning of January 2022 and the schedule would have to be followed. Besides these abovementioned decisions, it became clear quite quickly, that this project would only be a first iteration of a development process, after which the course should be developed further depending on the feedback and needs arising from the first run.

3.1   Planning Stage

The course would be starting during the second week of January 2022 and finish by the end of March. The schedule for developing the course material was going to be extremely tight which would limit the original wish to give the students freedom to advance in their own pace. The reason for this is the fact that the course would have a linear structure with an orientation module, seven modules developed by me, and two with additional materials from the teacher. Each module would have an online lecture and the assignments and materials should be delivered before the lesson. The course timetable meant that the project was going to be delivered one module at a time, in small increments with shorter deadlines. This stage of the project was going to be done in co-operation with the lecturer who commissioned the platform.

3.2   Modules

Canvas is a LMS with a linear structure where a student will move ahead by going through modules in order. Originally, the plan was for 9 modules with set content that would be created by me, but later during the course, the course lecturer decided to decrease the module count to seven. Modules eight and nine would consist of content brough in by guest lecturers and lab work which weren't a part of the course that I would be implementing on the platform.

It was decided that each module should contain a consistent set of resources and tasks that would repeat through the whole course. This way the students would have a clear outline of the course and the expected workload. All the modules would be numbered, and all the content would have a sub-header numbering to make the structure of the module and the whole course easy to follow.

3.3   Tasks and resources

Each module would have a similar structure with each other and similar tasks and resources. All of them would start with a study guide outlining the module resources, tasks, and required reading for reaching the learning goals of the module.
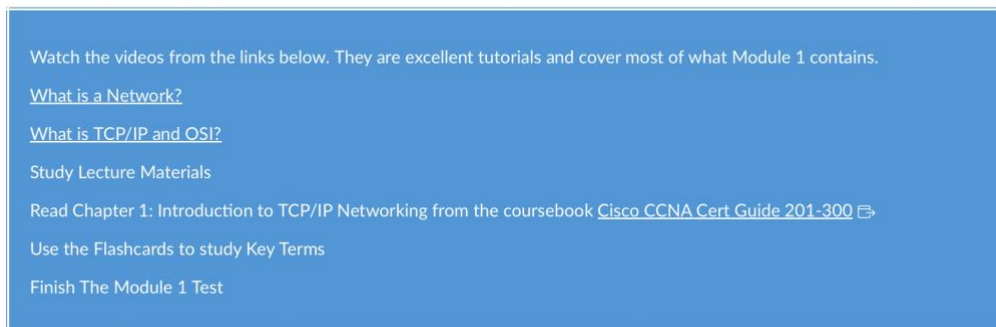
Module 1 Study Guide

Watch the videos from the links below. They are excellent tutorials and cover most of what Module 1 contains.

What is a Network?

What is TCP/IP and OSI?

Study Lecture Materials

Read Chapter 1: Introduction to TCP/IP Networking from the coursebook Cisco CCNA Cert Guide 201-300

Use the Flashcards to study Key Terms

Finish The Module 1 Test

Figure 1: Study guide

3.3.1   Lecture recordings

The course was going to contain online lectures and the script for these came from the lecturer. These lectures were recorded, and the recordings were added to the modules after the actual live lecture had been presented.

3.3.2   Lecture outlines

Each module contains a lecture and a subject outline. Some of this material came from the lecturer, some was formed and added to the platform by me. These outlines also contain links to carefully chosen video tutorials that would help in understanding the subject, but these were not embedded to the course platform for copyright reasons.

Foundations and History

Watch the videos from the links below. They are excellent tutorials and cover most of what Module 1 contains.

What is a Network? 🗗

What is TCP/IP and OSI? 🗗

Networking Model

- Network's job is to move data from one device to another and networks function when devices and software follows rules.
- These rules are standards and protocols, which are agreements on how a network should work.
- The large number of standards and protocols have made things difficult and in time they have formed several different networking models.
- *Networking model* for a network can be compared to an architectural model of a house. During building different people work on different parts, but all of them use the model as their blueprint.
  - Networking model is sometimes also called a *networking architecture* or a *networking blueprint*.
  - Refers to a comprehensive set of documents
  - Individual document in a model describes one small function of a network, together they define how a network should work
  - e.g. some documents could describe protocols and others physical requirements
- Currently, TCP/IP rules are the most prevalent networking model used in networks

Figure 2: Lecture outline

3.3.3   Interactive h5p assignments

In the development stage of each module, I built and embedded to the platform one or several interactive h5p activities based on the course material CCNA 200-301 Official Cert Guide Library Volume 1. These are all self-evaluating resources that will automatically count the collected points to the overall course score to ease the final evaluation.

10BASE-T and100BASE-T Pin Pairs Used

Instruction: Drag each option to the correct space.

Edit | Reports

Pins

Transmits on Pins 1, 2	Transmits on Pins 3, 6	
		Wireless acces point (Ethernet Interface)
		Switches
		Hubs
		Routers
		PC NICs

Submit

H·P   Reuse   I am confused

Figure 3: Example h5p assignment

3.3.4   Key Term Flashcards with game and quiz functionalities

The course material contains a great deal of new and difficult terms in English which is a second language to most of the students participating. I embedded interactive flashcards with game and quiz functionalities to make the acquirement of this terminology easier to speakers of English as a second language. I used Quizlet to make the flashcards and embedded them to the Canvas Learning Management System.

Figure 4: Flashcard quiz

3.3.5   Question banks

I built a question bank for each module. Every question bank contains 20 to 25 questions on the module subject. These are single-select or multi-select multiple choice questions.

3.3.6   Module tests

Each module ends with a module test that pulls its questions from the question banks mentioned in 3.3.5. All tests have 10 questions and as they are multiple choice, the platform evaluates them automatically and adds the points to the students' overall course score. Students have 30 minutes to finish the tests and they have two attempts with the higher score kept for the evaluation. As the system chooses the questions randomly from the question bank, the second attempt may have different questions from the first one.

Figure 5: Module test

3.3.7 Lab work and modules 8 and 9

The course contains lab work, which was brought into the platform by the lecturer. Modules 8 and 9 revolve around visiting lecturers and materials brought by them.

4 Questionnaires 1 and 2

The objective of this thesis work was survey student opinion on what kind of learning resources on the course platform would benefit their learning experience and create engagement. This was done by adding two two questionnaires to amongst the platform modules to collect data from the registered students. The first questionnaire was opened to the students at the mid-point of the course in February 2022, and the second one at the course finish in the end of March 2022.

4.1 Questionnaire 1

The first questionnaire concentrates in the course content and the hypothetical assignments that might typically be available in online digital course materials.

The first part of the questionnaire consists of 8 activities or resources that are present or linked on the course platform. These should be placed in number order as to their effectiveness in supporting the learning experience of a student. These activities are:

1. Lectures or Lecture videos
2. Lecture outlines
3. Video tutorials
4. Workshops or Lab work
5. Interactive assignments
6. Course Textbook
7. Flashcards
8. Tests

Students were asked to rank these in order of opinion, value one being the most engaging and value eight the least.

The second part of the questionnaire asked the students to evaluate hypothetical activities and resources that are often present on a digital online course which are not available on this one. The evaluation was to be done on a values 1 to 5 Likert scale where 1 was assigned the value "No advantage in learning" and 5 the value "Beneficial for learning." The following resources or tasks were chosen for this part of the questionnaire:

1. Writing assignments / essays
2. Team projects
3. Guided online conversations
4. Collaborative concept mapping
5. Peer reviewing

4.2   Questionnaire 2

The second questionnaire concentrated on specific assignments on the course platform and asked the students to evaluate on a 1 to 5 Likert scale how beneficial they felt these resources were to their learning results. Value 1 on this scale represents "Not at all" and value 5 represents "A great deal."

The specific tasks and resources are:

1. Lecture recording module 1
2. Lecture notes module 2
3. Video tutorial module 3
4. Interactive task module 4 "Common Switch Configuration Modes"
5. Key Term Flashcards module 5

6. Module tests
7. Module 7 lab assignment
8. Module Study Guide

5 Analysis

The first thing to consider is the fact that the sample size of students answering the questionnaires ended up being quite small. The course had 84 registered students and 26 of them answered the first questionnaire. Only 13 answered the second one. All were first year students of Business Information Technology, as the course Data Networks and Information Security is part of Competence in ICT Core Competence studies of the degree.

The second thing to consider here is the fact that deviation in answers was large which leads me to conclude that even though the questionnaires give numerical answers, a qualitative graphic analysis of the results would be appropriate to get some approximations of students' take on activities used as tools on this platform and online learning in general.

5.1 Questionnaire 1, part 1

Part 1 of questionnaire 1 requests the students to rank the course activities in order from 1 to 8 according to their experience of the chosen activity. The data that rose from the answers connected to these activities is presented in the order it is presented in the actual questionnaire. Each of the activities has been represented by two charts, first one to show the spread of chosen values and the second one to present the count of each numbered value chosen by a student.

The first chart type was chosen to present the large deviation in the chosen answers. As the goal is to find approximation of student opinion, the charts show that even if we find the mean of each type of activity it will still give the interpreter a loose estimation of the student opinion on engagement.

The second way to represent the data in a chart shows the count of each value. This way to look at the count of selected values gives a somewhat clearer idea of the spread in the sense that however more times value one has been chosen, the more helpful in the learning experience the activity type is to the person answering the question.

5.1.1 Lectures or lecture recordings

The first activity on the questionnaire is lectures or lecture videos. The course Data Networks and Information Security was carried out as an online course, but it did contain zoom lectures

that were recorded and added on the platform for later reviewing. As mentioned earlier in chapter 3.3.1, these were scripted and delivered by the lecturer of the course.

The recordings of the lectures were added on the learning platform for the students that may have been unable to attend during the scheduled time. Recordings can also be used for catching up on the missed content, for studying, or possibly revisiting the subject at a later point during the course.

In looking at the graphic representations in the first chart of each activity one needs to remember that the lower the point on the y-axle, the higher the value of the activity is to the respondent's learning experience. It is apparent that as we are talking about opinions, there are many and they vary quite a lot. This is easy to see looking at chart 1 below, as the values present a wild zigzagging line on the chart. Notable here, though is the fact that the line dives downwards more often than it climbs upwards. Only one peak reaches the value eight here, although there are a few that reach seven. The first impression then is that more students have found the lectures and lecture recordings helpful for learning than not very helpful.
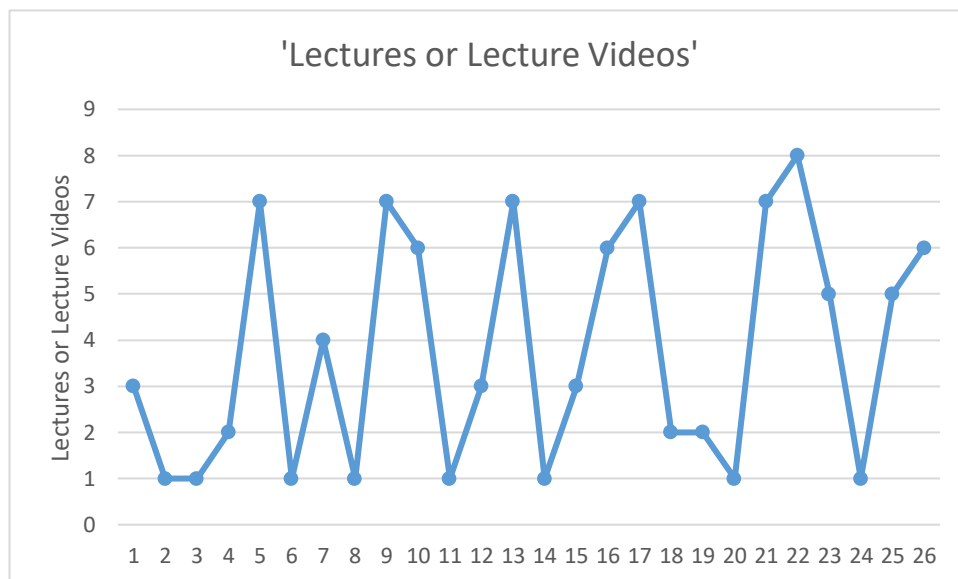

Chart 1: Lecture or Lecture Videos 1

Looking at chart 2 the conclusion that could be cautiously read from the line and its peaks and valleys is easier to find here. The most chosen value for lectures and lecture videos was one which was the choice in eight responses. That is not to say that this gives an unambiguous answer to what kind of resources students find most engaging as the second most common value is seven which is at the opposite end of the spectrum and shows that some students would place lectures as the second to last on their list of evaluating all activities and resources.
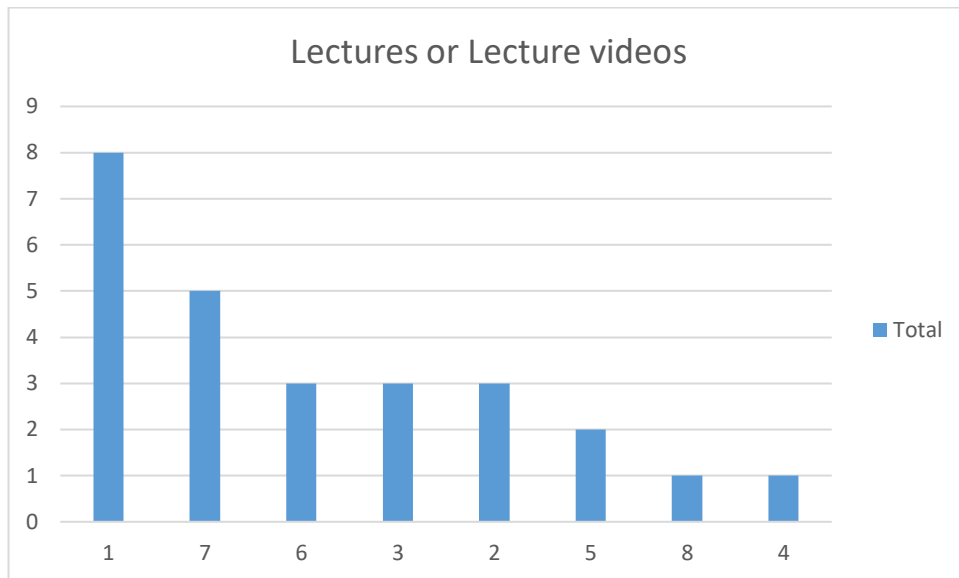
Chart 2: Lectures or Lecture Videos 2

5.1.2   Lecture outlines

Attached to the lecture recordings are lecture outlines which contain a slideshow or pages of information about subject of the lecture. Most of these have been added by the lecturer, but some of the material has been produced by me during the development stage of the course.

Looking at chart 3, attention is first drawn to the apparent gap in the line. Someone has forgotten to give a value to lecture outlines in this part of the questionnaire. After noticing this detail, when looking at the line more carefully it becomes noticeable that it does not dive quite as low as the line for previous activity. It stays further up, which hints that outlines are maybe not as important as the lectures themselves are.
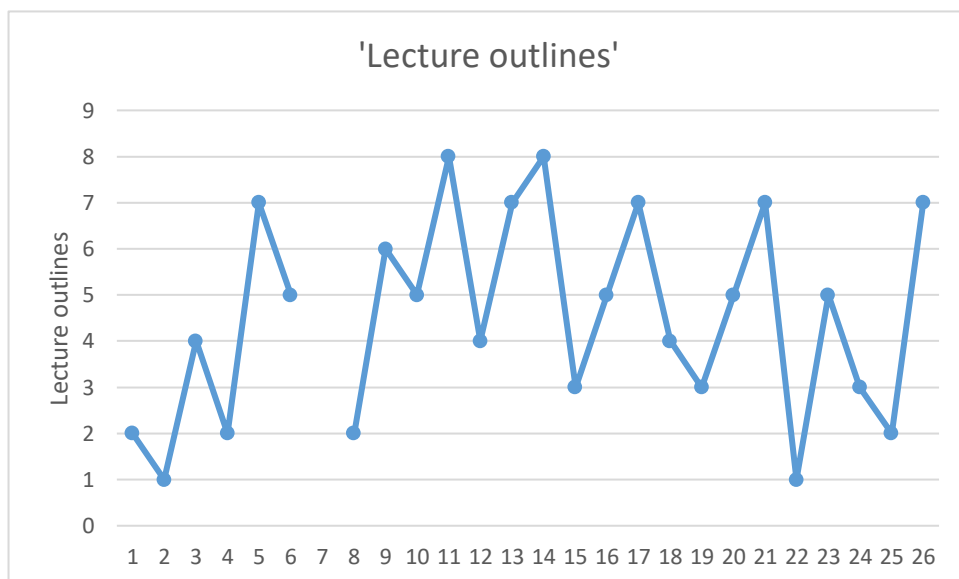

Chart 3: Lecture Outlines 1

In looking at chart 4, the most chosen values are 5 and 7, and they demonstrate that this resource is not as highly valued as the lectures were. At this point the fact that there are clear exceptions in each case needs to be mentioned. Values 1 and 8 have both been chosen twice and there are multiple others in the middle to demonstrate that the spread of opinion is wide, although the pattern is somewhat different from the one in the previous activity.
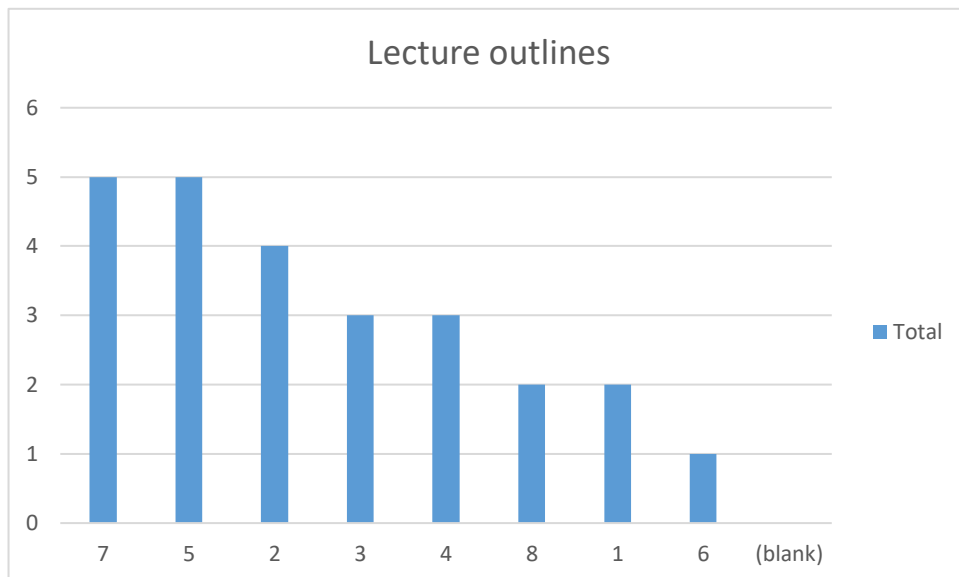
Chart 4: Lecture Outlines 2

5.1.3 Video tutorials

The third resource on the course platform that was used give the students some more guidance on the topic was video tutorials. They concentrated on the module subjects and were carefully chosen to complement the lecture materials and course textbook. Each module starts with a study guide and a link or links to these tutorials which were not embedded on the platform due to copyright law. These were used to bring variety to the ways of acquiring the knowledge needed to understand the contents of the module and pass the course.

In chart 5 the zigzag of the line is again steeper than it was considering lecture outlines in chapter 5.1.2. Looking at this graphic, more points can be seen on the lower end of the scale which hints that again this was a resource that the students considered more valuable to their learning than lecture outlines. The spread is wider here though and there are several choices on the higher numbers as well. By just looking at this graph, one may conclude that more students find video material a more effective study tool than ineffective. This opinion is somewhat easy to read from chart 5.
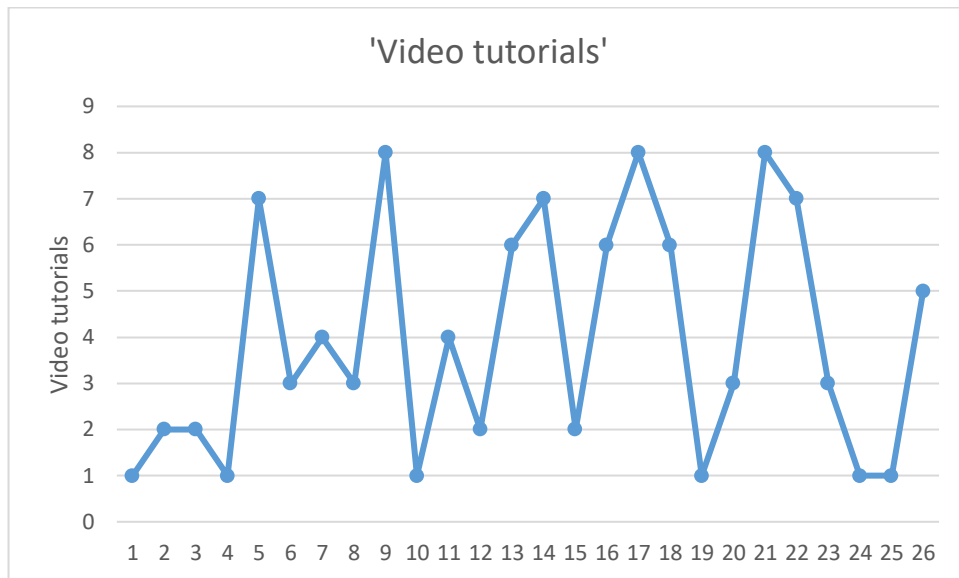
Chart 5: Video Tutorials 1

Considering the count of chosen values of video tutorials in chart 6 below, compared to the 8 value ones in lectures 5.1.1, fewer students chose value one for video tutorials, but values two and three have been chosen more frequently here. This indicates that video tutorials were valued by quite a number of students as a resource. Of course, we see the same effect that has risen from the earlier resources and charts as well, there are always students whose opinion is the exact opposite and choose video material to be one of their least preferred resources in studying and learning.
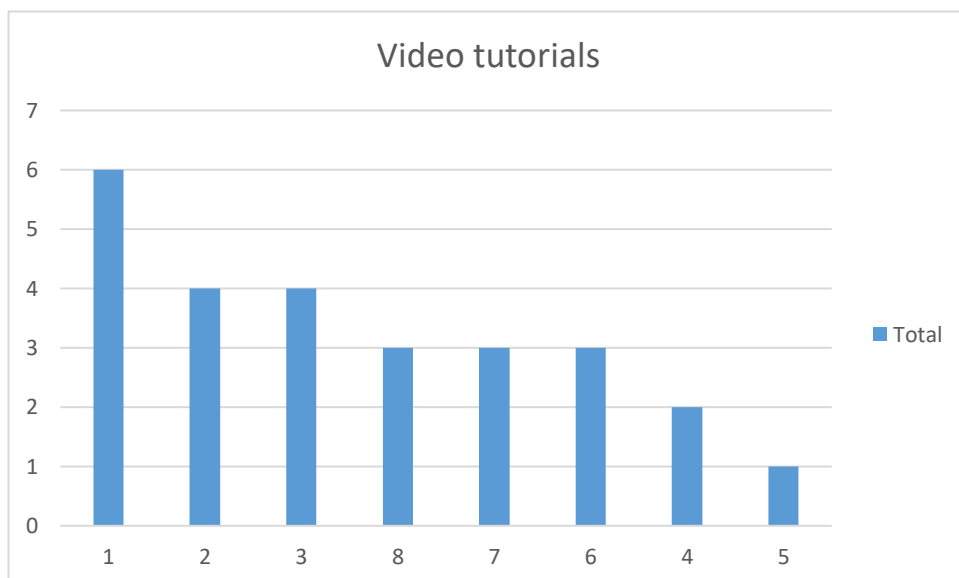

Chart 6: Video Tutorials 2

5.1.4   Lab work

Data Networks and Information Security is a difficult course for someone who is not already well versed in the subject. The course source material CCNA 200-301 Official Cert Guide Library Volume 1 contains practical lab work that brings a different kind of clarity to it. The course platform contains several lab work assignments as well, and these were provided and evaluated by the lecturer. These activities are presented as assignments on the platform, but during the course, students finished the actual work in Microsoft Azure cloud environment.

In looking at chart 7, it appears just as varied as all the earlier ones. The first thing that the eye goes to is the value one, and after that the second glance sees the high peaks on the value line. There aren't quite as many higher values here as in earlier activities meaning sevens and eights, but sixes are quite prevalent here. Opinions are varied, some students find practical work engaging whereas others do not.
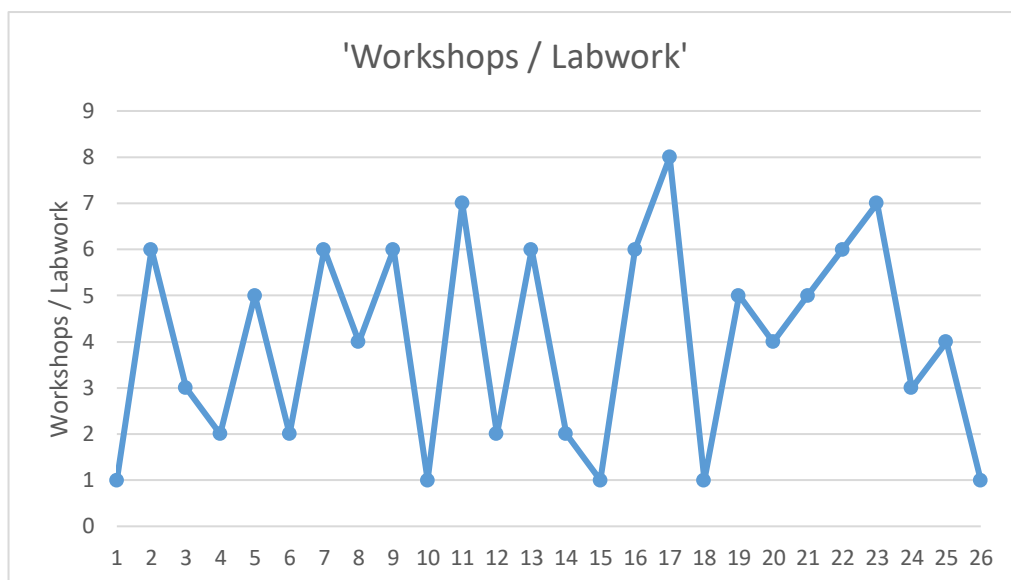

Chart 7: Workshops / Labwork 1

Value count shows the same conclusion more clearly. The highest count in values falls to six, which means that quite a few students found the lab work assignments somewhat unhelpful. The second and third highest choices have been value one and two, though, which would indicate the opposite. Altogether, by looking at these two graphs one must conclude that practical lab work is not quite as highly regarded by the students as a learning method as the lectures and video tutorials were according to the collected results.
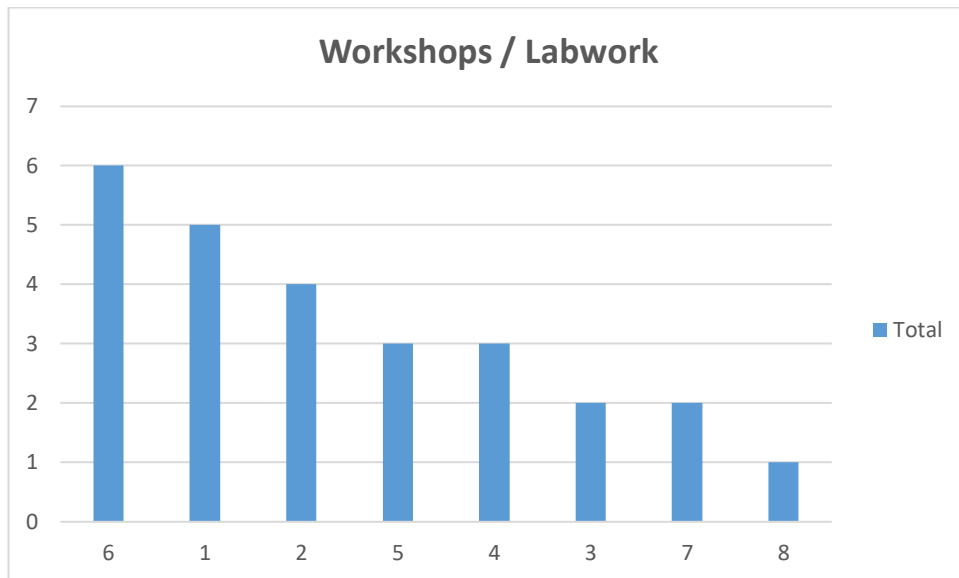
Chart 8: Workshops / Labwork 2

5.1.5   Interactive assignments

Canvas Learning Management System allows easy embedding of interactive educational content and building h5p assignments and embedding them to the course platform is one of the ways to get a multitude of automatically evaluated tasks, assignments, and contents for the students to use as learning resources. The assignments were set to allow retries more than once and Canvas LMS would take the highest evaluation of them to the grade book of the learner.

When looking at chart 9, the fact that a lot of values chosen fall somewhere to the higher end of values one and eight. There are some steep rises and quick plunges between the higher and lower values, but just by evaluating this line and comparing it to the earlier ones, it presents itself as a higher one in which would in practicality mean lower in appreciation as a tool.
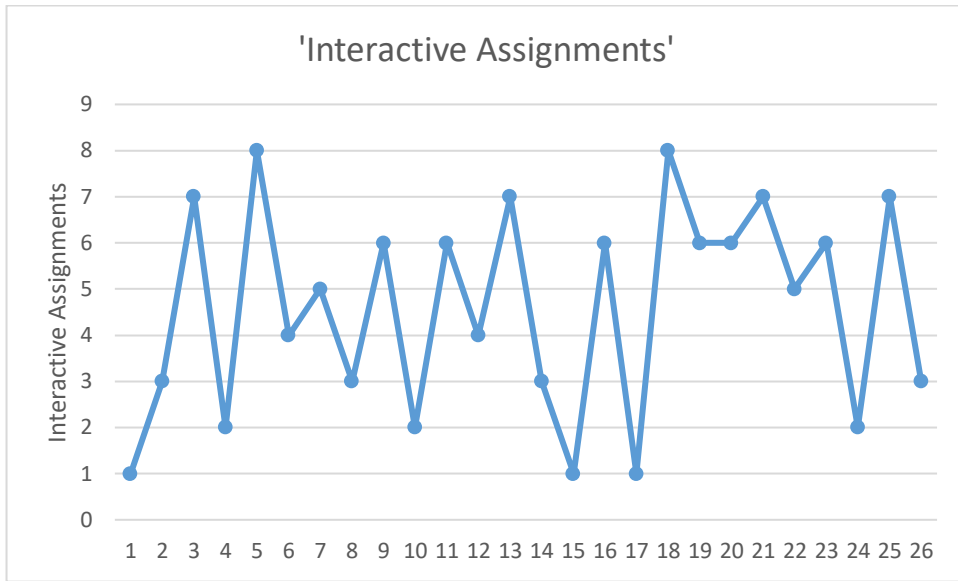
Chart 9: Interactive Assignments 1

Count of values in chart 10 shows this to be true. Six, three, and seven are the most popular values for interactive assignments. The student opinion indicates that the majority feels this kind of tools may be an additional support device to learning and understanding the course content, but most of the students do not find these necessary for their learning results. It may be a welcome additional resource for some, but not for everyone.
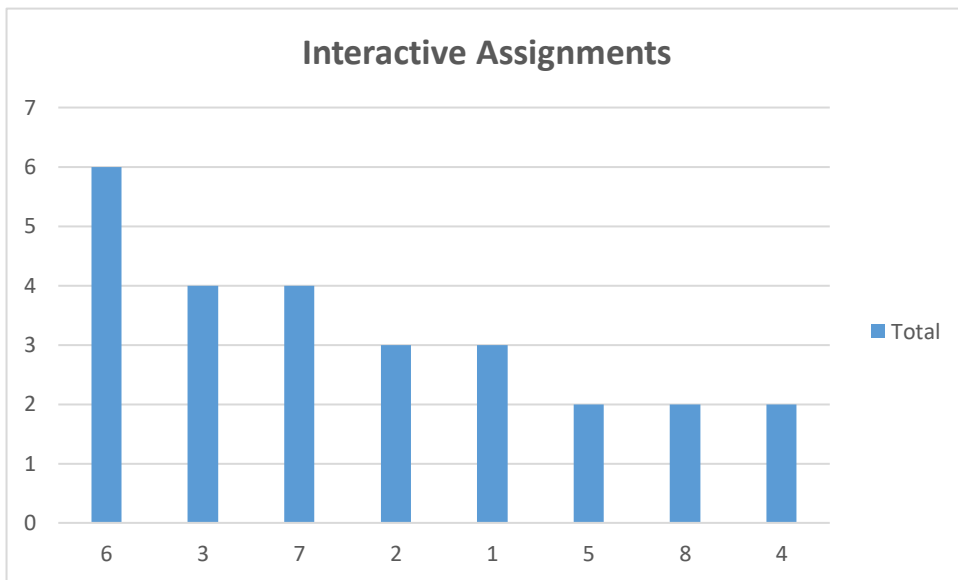

Chart 10: Interactive Assignments 2

5.1.6   Course textbook

The course textbook is part of the course resources in the sense that the study guide in each module contains a direct link to the corresponding section in the digital version of CCNA 200-301 Official Cert Guide Library Volume 1, by Wendell Odom. The whole course is based on this source material, and it contains everything a student needs to pass the course.

Chart 11 shows that the spread of chosen values is concentrated more in the midrange and the higher side of the scale and there is only one dive to the lowest value one. This by itself indicates that reading a digital course textbook may be less preferable to students than following a lecture or watching a video both of which are based on this abovementioned source material.
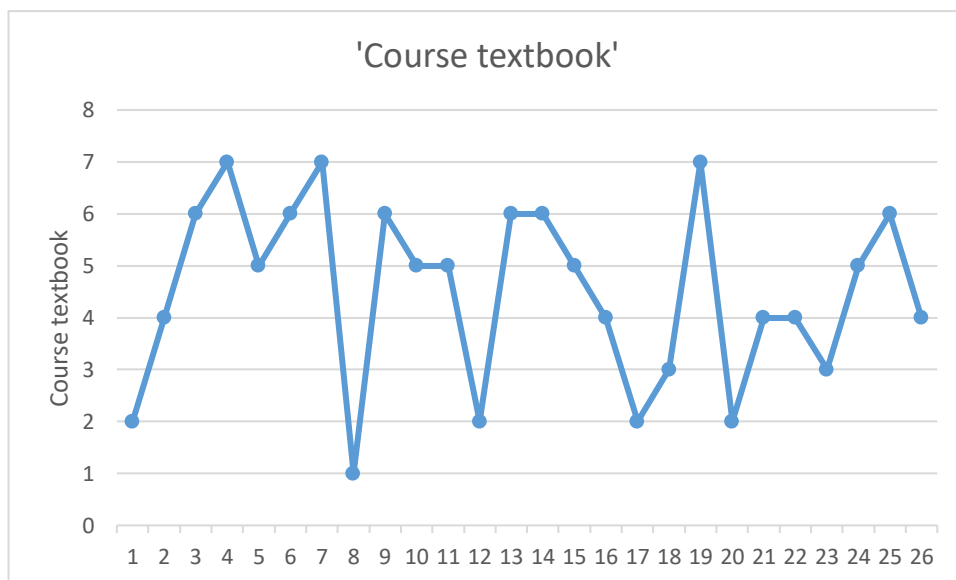

Chart 11: Course Textbook 1

Again, in chart 11, the value count bar chart makes this clearer. Although it is easier to mark the fact that the course textbook was not completely disagreeable to the answering students as there are not any value eights chosen, the highest bars on the chart show that reading is not the preferred tool in learning to most respondents here. More than two thirds of them chose the values six, five, four, and seven, which indicates that a majority of them would find some other activity more helpful in supporting their learning experience.
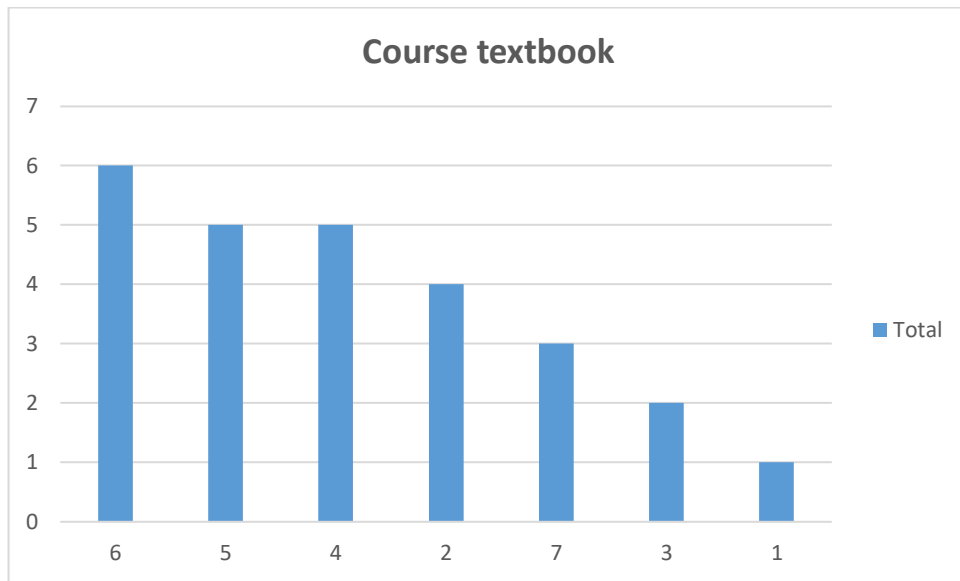
Course textbook

Chart 12: Course Textbook 2

5.1.7   Flashcards

The second to last resource on the questionnaire and on the course platform, is flashcards which are often used as spaced repetition tools in learning. They are common in learning things such as new vocabulary or terminology and on this course, the material contained a vast amount of specialized terminology. The flashcards were built in Quizlet™ and embedded on Canvas LMS with html code. These were chosen as they contain a dropdown menu with various activities if the traditional flashcard system is not one you would prefer. The flashcards are a completely additional resource on the course, there is no evaluation attached to using them.

Looking at chart 13, there are steep climbs and dives, but noticeable is the fact that most of the peaks are high on the chart which suggests that values eight and seven were the most commonly chosen options for this resource. There are few points around value one and the midrange values, but the line gives an impression that students mostly did not find flashcards to be a helpful tool for their learning experience.
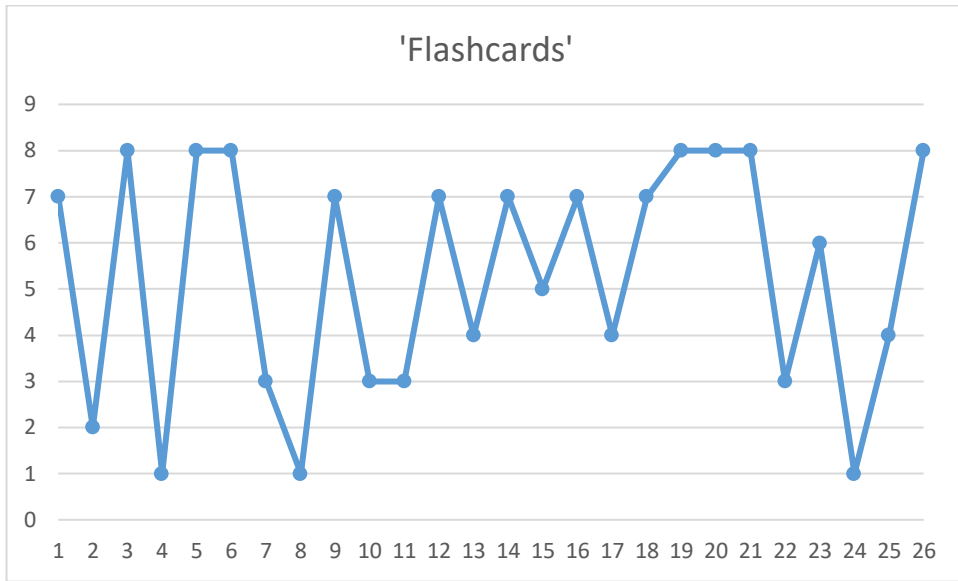
Chart 13: Flashcards 1

The same conclusion is apparent when looking at the count bars in chart 14. Half of the students who answered this questionnaire chose values eight and seven, although the two next bars indicate that there were students, who did find this activity useful by choosing values three and one. On the whole, seems clear that the responding students have not seen the flashcards as a very engaging resource in learning.
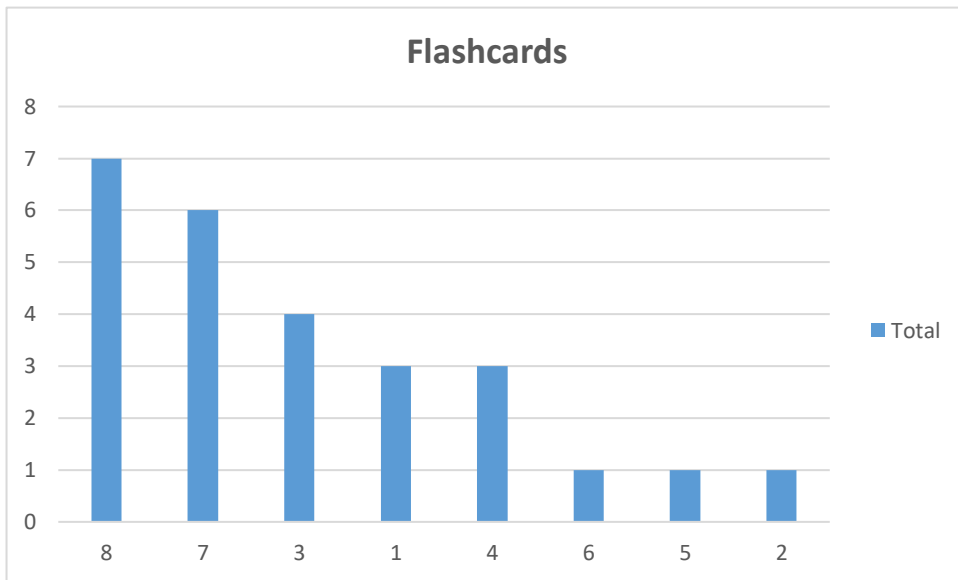

Chart 14: Flashcards 2

5.1.8   Tests

The final resource on the questionnaire is tests. Each module ends in a test that presents the student ten randomly selected questions from an item bank. These questions are single-select and multi-select multiple choice questions and they are not learning tools as such rather they

measure the acquired knowledge and work as an evaluation tool for the teacher. As mentioned in 3.3.1, students were able to retake the test once and the learning platform brings the better score to the grade book. If the student is driven to get a good evaluation of the course, the tests may be seen as a motivating tool for learning then, as if the first result is not good enough it may motivate to revise more for the second attempt.

Chart 15 shows a line that zigzags back and forth between higher and lower values. It appears that the spread is clearer than in some other activities above, there are many choices of value seven, but also multiple choices of value one, not to mention the values in the middle. By looking at this line, there are many students who found the tests a helpful tool but also many who did not or found them to be somewhere in the middle of their preferred resources. Lectures and videos are still above tests, but the opinions of the students seem to be higher on tests than some other activities in their usefulness.
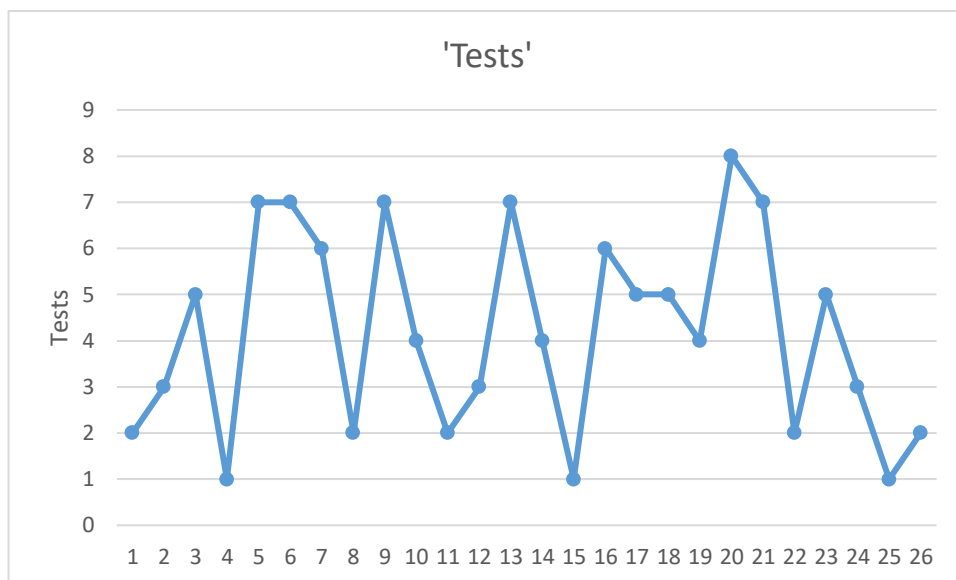

Chart 15: Tests 1

When studying chart 16, the count bar chart of tests, the interpretation made from chart 15 is fortified. Equal number of values seven and two were chosen to represent the helpfulness of tests as a studying resource, and they were the values with highest count. Next most chosen values after the two above are five, one, and three. All in all, the conclusion from the graphic above does not change by looking at this bar chart. Some students found tests helpful whereas others did not.

Chart 16: Tests 2

5.1.9 Compiled results

The graphic interpretations made in the chapter above are ambiguous and uncertain, but even if the sample group does not give enough results for statistically significant conclusions, counting mean and standard deviation from the data and investigating the graphic representation of those in chart 17 shows similar approximate results that rose from interpretation of the spread and count of the collected data.
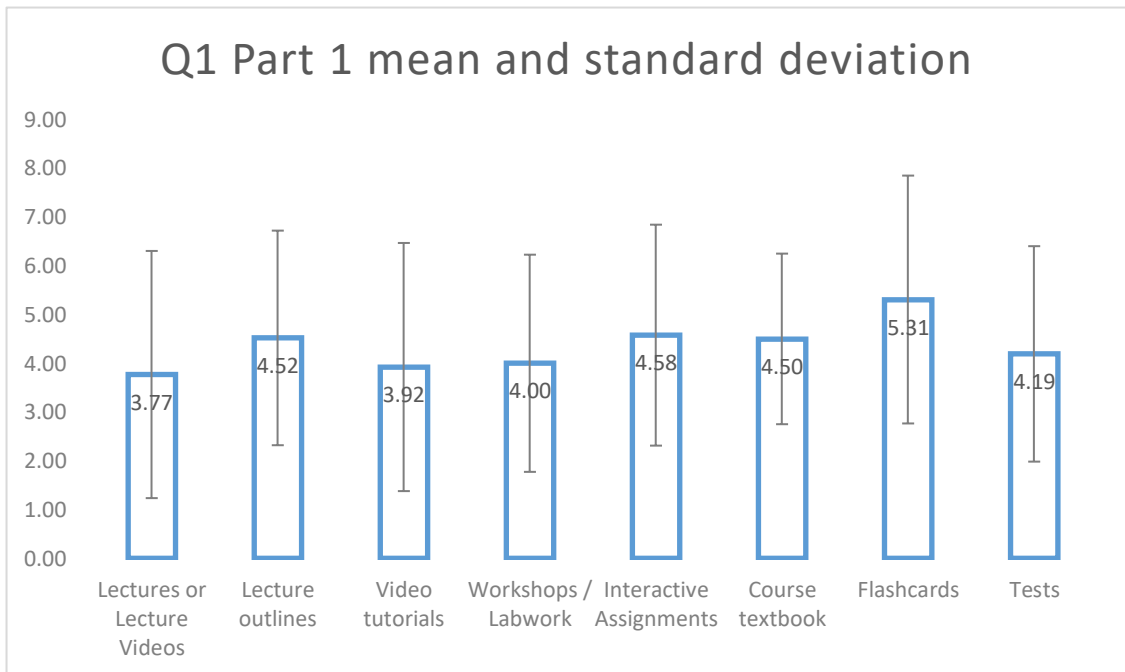

Chart 17: Q1 part 1 mean and deviation

The bars in chart seventeen show a way to put these resources and tasks in an order according to their helpfulness to respondents' learning results. The lower the value, the more engaging and useful the resource according to the student opinion. If one were to make a list, it would look as follows:

1. Lectures or Lecture Videos
2. Video Tutorials
3. Workshops / Labwork
4. Tests
5. Course Textbook
6. Lecture Outlines
7. Interactive Assignments
8. Flashcards

This list seems to indicate that even on an online course, the most engaging and helpful resources are the more "traditional" and often classroom -leaning activities and everything else is additional and secondary. One must remember, though, that the standard deviation bars in chart 17 are high and as the sample group is small, the opinions of the students have a great deal of variation. Nothing is definite, with a larger sample group, the results might look very different and give actual results instead of approximate evaluations rising from the data.

5.2   Questionnaire 1, part 2

Questionnaire 1 was divided in two parts and the second part inquires about resources and activities which are not present on the Data Networks and Internet Security course platform in Canvas LMS but are often used as learning tools on a digital learning platform. These are activities that often give good learning results but are not automatically evaluated by the system and therefore require active of evaluation work, from the person who is the course instructor.

The students were asked to think about these hypothetical activities and evaluate how beneficial they would be in their learning process. In this section of the questionnaire, I utilized the Likert scale using the value 1 as the lowest meaning "No advantage for learning" and 5 being the highest with "Beneficial for learning."

The data from this part of the questionnaire was analyzed by converting the count of each value per answer to percentages after which these numbers were presented in chart 17 below. What is obvious from this chart, in all five suggested activities value three, the midpoint is very visible. Three as a value on the scale could be interpreted as the neutral "non-answer" which leads to the conclusion that a many of these activities do not raise strong feelings in the student sample that answered this questionnaire.
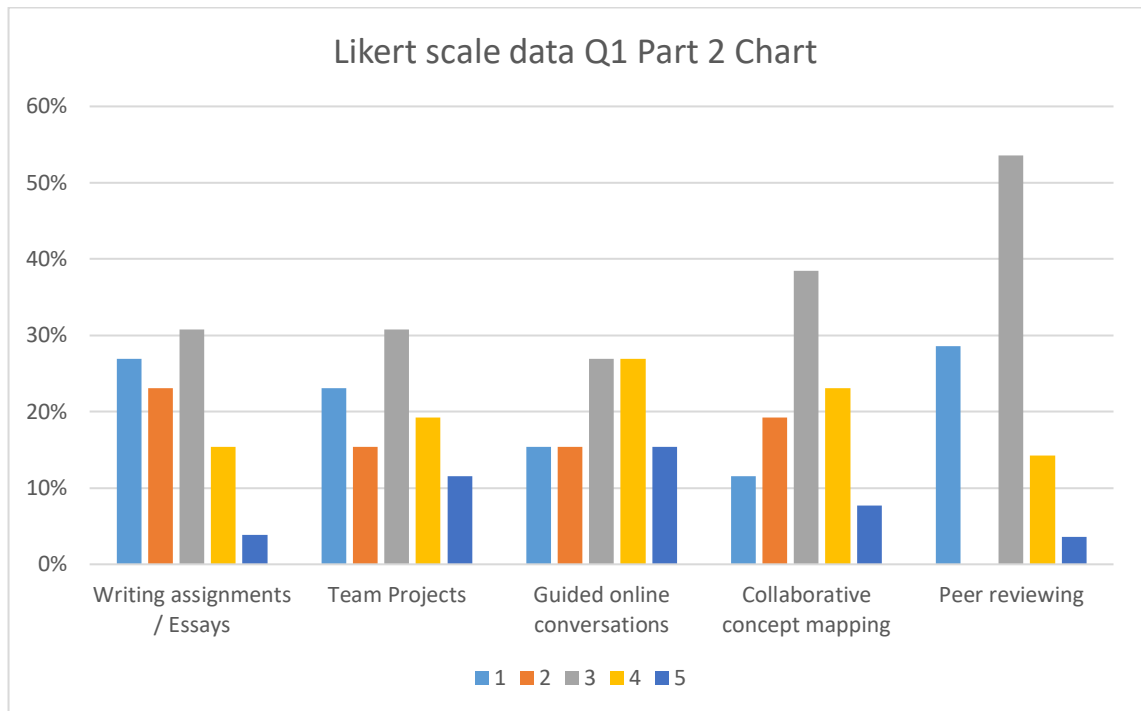
Chart 18: Q1 part 2, data bar chart 1

The first suggested activity on the list was "Writing assignments/Essays". When looking at the bars in chart 17 corresponding to the value percentages, seems clear, that writing is not a preferred learning activity. Values one, two, and three are the most represented ones here, but the percentage of students who find writing somewhat beneficial or beneficial is very low. The question that comes to mind is this: Does the fact that writing is slow, sometimes difficult, and tedious for some surpass the fact that it may be a good way to learn? This is where I find that my background in teaching raises its head and wonders. As the idea here is to survey opinions, one needs to refrain from clinging to their own ones.

As one can see in chart 17, the second hypothetical assignment type is Team Projects. Here values one, "No advantage for learning", and value three, the midrange neutral choice, are the most popular as well. What differs from the first option in the questionnaire is the fact that the percentages for values four and five are higher which indicates that this kind of activity would be preferable to a learning assignment like an essay. Percentagewise, the combined percentages of values that show preference for an assignment surpass the one that definitely does not, value one.

When one moves on to guided online conversations the spread is more equal but somewhat slanted into the positive side of student opinion. As in every case, value three is high, but so is value four. Every other value on the scale is equal. Looking at the five hypothetical activities the equality of choice added to the two higher values appears to make this the most preferred of the online task types. Percentages of value four and value five are highest here.

Online conversations are a common part of life nowadays, why wouldn't they be a good way to assist learning a new and challenging subject.

Collaborative concept mapping, where a group of students creates concept maps to gain insight, is an effective group activity for constructing knowledge and it would lend itself quite well in an online environment. There are a variety of online tools that are available for this kind of work and a some of them are easy to embed in a digital learning environment to bring the tools to the platform instead of taking the students to an outside resource. In the questionnaire scale while considering it as a learning tool, students most popular choice of value is three, the most neutral option. Thirty percent of the students find this kind of activity disagreeable whereas 30 percent would prefer this kind of work in their learning efforts. The rest seem to have the opinion that they could take it or leave it, which is to say that they do not have a strong preference.

The final activity on which the students' opinions are surveyed on this questionnaire is peer reviews, which are present in some forms in all stages of education from comprehensive school to university. In chart 18, it is easy to see, though, that this is the least preferred or at least neutral learning activity to the students that gave their opinions on the matter. More than half of the answerers picked value three, the midrange one between "No advantage for learning" and "Beneficial for learning". The second most popular choice value was one. Not very much enthusiasm in opinions. Peer reviewing is a common part of any kind of learning nowadays, but it seems that its value as a learning tool is not highly appreciated by these students.

5.3   Questionnaire 2

The second questionnaire was concentrated on specific tasks during the course, and it was presented to the students during the second half of the course. Only 13 out of 84 registered students answered this questionnaire so it is possible to make only rough and approximate estimations on student opinion considering the specific tasks. The students were asked to evaluate on a Likert scale from 1 to 5 on how helpful a particular assignment, resource, or task had been for their learning experience value one representing "Not at all" and value five representing "A great deal".

The specific activities were presented in chapter 4.2 but to be more precise, they are as follows:

1. Lecture recording in Module 1: Introduction to TCP/IP Networking

2. Lecture notes in Module 2: Fundamentals of Ethernet LANs
3. Video tutorial in Module 3: Fundamentals of WAN and IP routing
4. Interactive task in Module 4: Using the Command-Line Interface
5. Key term flashcards in Module 5: Ethernet LAN Switching
6. Module tests in all modules
7. Lab assignment in Module 7: Configuring and Verifying Switch Management
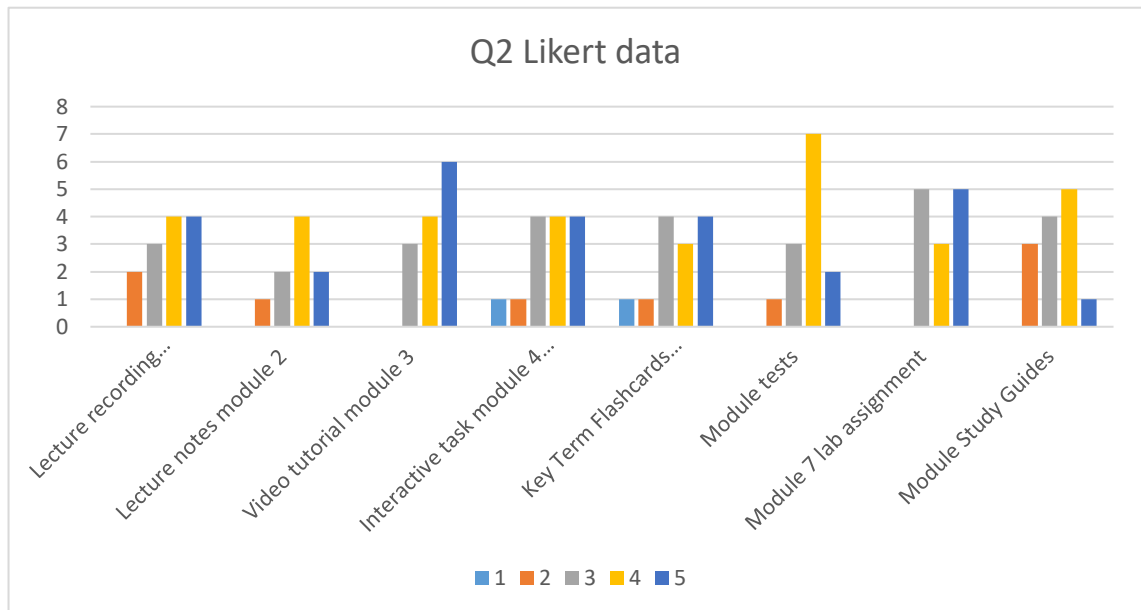8. Module Study Guides

Chart 19: Q2 data bar chart

The collected data was organized by the count of each value as it wouldn't have been a good idea to think about percentages with such a small sample group. Chart 19 presents the collected data and in almost all tasks and resources there were students who found them to be helpful for their studies. It is notable though, that the resource which rises somewhat above others is the video tutorial, which was carefully chosen for this topic, a scripted and produced tutorial on the subject presented by an entertaining and charismatic professional. This was an outside resource only linked to the study guide as the video tutorials are not embedded to the platform for copyright reasons. Ten out of thirteen students chose this video tutorial to be a good or great resource for learning, six out of those ten chose the value five, "A great deal".

Other resources were also found to be helpful, although not quite as much. Lecture recording for Module 1, eight out of thirteen students chose values four or five while considering it which can be interpreted as a preference in this small group of students. The same goes with the interactive h5p assignment in Module 4, again eight out of thirteen students chose values four or five. Nine out of thirteen students found module tests helpful for their studies but

only two of them chose the value five, which lowers the preference below video tutorials. Module 7 lab assignment was useful for the student as well, again eight out of 13 found it helpful for themselves.

6 Conclusions

The objective of this thesis work was to survey student opinions on activities, resources, and assignments on a digital learning platform as a tool to enhance the learning experience and results. The approach was to develop a prototype online course environment for a Senior Lecturer in Laurea University of Applied Sciences with the topic of Data Networks and Information Security and to collect student views on the platform tools and their helpfulness in acquiring the subject matter during the course.

The two survey questionnaires were presented to the students while they were enrolled on the course and studying. After the data was collected, it was analyzed using graphic interpretation as a method of qualitative study, as the sample groups for both questionnaires were not large enough to give statistically significant results through quantitative analysis. Therefore, the conclusions made through the analysis are not definite but rather approximations that give some indication of the direction of opinion.

Seen through this approximate lens of graphic interpretation, following trends rose through the course platform as a base for the data collection and the collected data:

1. The most helpful resources were found to be the ones where an actual person took the time to explain the subject matter to the students, be it lectures, lecture recordings, or video tutorials.
2. Practical work was found to be useful for learning, activities like lab work and workshops.
3. Tests were seen as a learning tool, and they were found to be more valuable than reading materials like course textbook and lecture notes.
4. Interactive tools and resources were a welcome extra for some and not so much for others.
5. Reading and writing are not the preferred learning activities for the online course students. They would much rather watch and listen or participate in some kind of group learning activity.
6. Any of the trends above are not definite as opinions are varied and many.

The list above allows one to conclude that the most engaging content on an online course may still be the one, where students get real and tangible instruction from a real live person instead of studying by themselves doing solitary interactive tasks and reading source

materials. Teamwork and group interaction are also engagement tools that can be helpful for learning experiences as everything that connects people may be an advantage. This is not to say, that there are no exceptions as people are different, some prefer communication and interaction whereas others prefer to do solitary work. There may be a lot of advantages to online learning, but convenience may be one of the most important ones and leaves one to wonder, if the learning results would be better in a classroom or lecture hall environments.

In a real online platform development situation these findings would be used for developing the course platform further but in this case, there is no need or demand for that even if it was the original direction of the development part of this study. If there was need or demand for further development though, the course could benefit of a wider variety of activities and tasks that are not based on the ease and automation of evaluation work. A good start would be adding a team project and collaborative concept mapping assignments to improve student engagement and co-operation. As the platform development is not the main objective of this study although workwise it was a major part of it, these student opinions will be utilized elsewhere, perhaps on other course platforms in the future.

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Figures

Charts

Appendices

Appendix 1: Course Questionnaire 1

Course Questionnaire 1

In this questionnaire, I'm trying to map your priorities on what kind of activities you students feel will support your learning results in online learning the most.

Your answers will stay anonymous, user credentials will not be attached to the answers.

* Indicates required question

Part 1
Background information, answer the following questions, please.

1.   1. What is your major? *

    _____

2.   What year of studies are you currently in?

    Mark only one oval.

    ◯ 1

    ◯ 2

    ◯ 3

    ◯ 4

    ◯ Other: _____

3.   How old are you?

Mark only one oval.

- ⬭ 18-25
- ⬭ 26-30
- ⬭ 31-35
- ⬭ 36-40
- ⬭ 40-45
- ⬭ Other: _____

Part 2

Prioritise the following 9 course activities from 1 to 9, 1 being the most important and 9 being the least important. For example, if you feel that video tutorials would be the most important learning activity for your learning results, you would choose number 1 for that.

Before you move on to Part 2, make sure you have used all the numbers from 1 to 9 in Part 1.

4.   Lectures or lecture videos

Mark only one oval.

- ⬭ 1
- ⬭ 2
- ⬭ 3
- ⬭ 4
- ⬭ 5
- ⬭ 6
- ⬭ 7
- ⬭ 8
- ⬭ 9

5.   Lecture outlines

Mark only one oval.

◯ 1

◯ 2

◯ 3

◯ 4

◯ 5

◯ 6

◯ 7

◯ 8

◯ 9

6.   Video tutorials

Mark only one oval.

◯ 1

◯ 2

◯ 3

◯ 4

◯ 5

◯ 6

◯ 7

◯ 8

◯ 9

7. Workshops / Labwork

Mark only one oval.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9

8. Interactive assignments

Mark only one oval.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9

9. Course textbook

Mark only one oval.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

10. Interactive assignments

Mark only one oval.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

11.   Flashcards

Mark only one oval.

◯ 1

◯ 2

◯ 3

◯ 4

◯ 5

◯ 6

◯ 7

◯ 8

◯ 9

12.   Tests

Mark only one oval.

◯ 1

◯ 2

◯ 3

◯ 4

◯ 5

◯ 6

◯ 7

◯ 8

◯ 9

Part 3

What about the activities that are not present on the course. Which ones would you feel may be beneficial for your learning results. Rate them from a scale of 1 to 5, 1 being the least important and 5 being the most beneficial kind of activity for your learning.

13.   Writing assignments / Essays

Mark only one oval.

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Beneficial for my learning results

14.   Team Projects

Mark only one oval.

	1	2	3	4	5	
No a	◯	◯	◯	◯	◯	Beneficial for learning

15.   Guided online conversations

Mark only one oval.

	1	2	3	4	5	
No a	◯	◯	◯	◯	◯	Beneficial for learning

16.   Collaborative concept mapping

Mark only one oval.

	1	2	3	4	5	
No a	◯	◯	◯	◯	◯	Beneficial for learning

17. Peer reviewing

Mark only one oval.

	1	2	3	4	5	
No a	◯	◯	◯	◯	◯	Beneficial for learning

18. Something else, what?

If there is another activity that would be beneficial for your learning results, write it down below a prioritise it by numbering from 1 to 5, like you did in the previous assignments above.

Google Forms

Appendix 2: Course Questionnaire 2

Course Questionnaire 2

This form is the second one for collecting data from students in a thesis project. In this form you will be asked to evaluate the effectiveness of several different activities in supporting your learning.

Part 1
Background information, answer the questions, please.

1. What is your major?

    _____

2. What year of studies are you currently in?

    Mark only one oval.

    ⬭ Option 1

3. How old are you?

    Mark only one oval.

    ⬭ 18-25
    ⬭ 26-30
    ⬭ 31-35
    ⬭ 36-40
    ⬭ 41-45
    ⬭ Other: _____

4. On a scale of 1 to 5, how well do the following activities support your learning results, 1 bei not at all and 5 being a great deal.

Mark only one oval per row.

	1. Not at all	2.	3.	4.	5. A great deal
Lecture recording module 1	◯	◯	◯	◯	◯
Lecture notes module 2	◯	◯	◯	◯	◯
Video tutorial module 3	◯	◯	◯	◯	◯
Interactive task module 4 "Common Switch Configuration Modes"	◯	◯	◯	◯	◯
Key Term Flashcards module 5	◯	◯	◯	◯	◯
Module tests	◯	◯	◯	◯	◯
Module 7 lab assignment	◯	◯	◯	◯	◯
Module Study Guides	◯	◯	◯	◯	◯

5. 1. Is there some other kind of activity you feel would support your learning? If there is, what would it be?