

## Student active learning and learning analytics – Studentaktiv læring og læringsanalyse

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### Summary:

This project, first, examines how with-video assignments can be implemented in a typical IT/IS course and how we can use learning analytics to study students attitude during this experiment. We run an experiment in 2020 and 2021, with over 150 students taking part. The main findings show that students have a positive attitude towards such activities, however they tend to use them significantly more when they are part of a formal assessment process (i.e., contribute to the grade). Student performance was not influenced by the times they watched the videos, however not watching them impacted the grade. Most of the students watched the videos at least once, which was one of the goals of the lecturer, and keeping the duration short (4-7min) contributed towards this. Kahoot and Canvas were used to examine different experiences. The use of Kahoot enabled more active discussions in the class, between the lecturer and the students, as well as among the students when they had different opinions on certain questions. Notably, a Kahoot quiz with about 25 questions, expected to last 25-30 minutes, lasted 90minutes due to the active discussion between most questions. The students gave mixed feedback on the use of Kahoot for formal assessment. On the other hand, most were comfortable to use Canvas quiz for formal assessment. However, the use of Canvas quiz did not allow any active interaction in the class, as all students were focused to complete the quiz, even though both the duration and number of questions was the same. We conclude that students enjoy the use of multiple tools and methods for assessment and engagement in class. A variety of tools can make the lecture more fun during the semester and sometimes more interesting considering that some of these tools are either new to the students or used in a different manner. The most notable example was the use of Kahoot for formal assessment, when in other courses the students were used to have it as a fun and engaging activity. The experience from this study was recently published in a journal (Pappas & Giannakos, 2021), in which we describe how we need to rethink learning design in IT/IS education during a pandemic. We plan further publications after the project ends with the existing data to disseminate its results.

Second, this report presented a survey study to identify reasons that may contribute to students' learning experience. We presented an exploratory analysis of relationships among factors identified in the literature as important and students' intention to complete their studies in IT/IS degree at IIS. Our data confirm some general findings (e.g., the important role of the first year), and also identify factors that can predict students' intention to complete their studies. In addition, following an analysis of the qualitative data from focus groups we depict additions considered highly important from students at IIS/UiA.

### 1. With-video assignments

The use of video-based open educational resources is widespread, and includes multiple approaches to implementation. In this project, the term "*with-video assignments*" is introduced to portray video learning resources enhanced with assignments. The goal of this study is to examine students' attitude towards with-video assignments.

#### 1.1. Study Design

The present study follows an established framework for using videos to support students' learning (Pappas, Giannakos, & Mikalef, 2017). The study was conducted in a typical IT/IS course, that was a course on data science applications. During the course the students get an initial understanding of data science and its fundamental principles by offering a high-level overview of concepts and principles, understand the notions of digital transformation, data science, big data and analytics, their relations and

their differences. Finally, they explore data-centered business problems, propose and develop data-driven business models, strategies, and solutions.

The students had to deliver specific assignments and work on a self-selected group project. The course materials, digital communication, and assignments and project work were derived from Canvas, a Learning Management System. Following a video-assisted framework (Pappas, Giannakos, & Mikalef, 2017), we implemented video assignments to scaffold students' self-regulated learning. This is typical in many active learning approaches (e.g., flipped classroom), where students are involved with the learning materials in order to obtain the initial fundamental knowledge. This basic knowledge was made available using with-video assessments throughout the semester.

In Fall 2019, we created 12 videos on data science applications with basic concepts about various topics covered in the course. Typically, an LMS (e.g., Canvas) is used to orchestrate course material, digital communication, assignments, and project work. In the course we prepared short videos (5–8 min duration) with fundamental concepts from the different modules of the course (three videos per module), typical in flipped classroom settings. The videos were designed to be made available a week before the topic was discussed in class. Each set of videos was accompanied with an online quiz consisting of different types of questions (multiple choice, true/false, open ended, put in the correct order). The quiz was given to the students during the class, as formative assessment, for student evaluation and feedback. The videos were recorded in a studio using a green screen as a background. Slides were used to offer selected information while the lecturer offered more details (Figure 1).

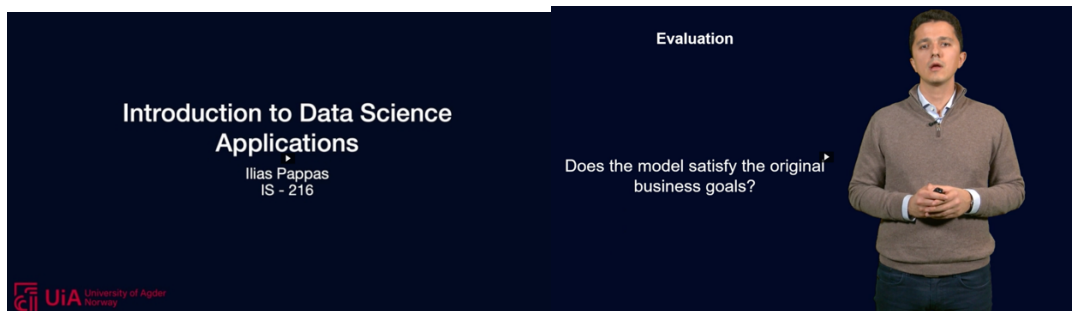


Figure 1. Examples from the videos

## 1.2. Data analysis and findings

The lecturer followed a script to keep a steady pace. Kaltura was used to share the videos, which is embedded in the LMS (i.e., Canvas) and collects analytics (Table 1).

Table 1. Data collected by Kaltura - video analytics

User:	The student's name will show if the video was embedded using the <a href="#">Kaltura Embed Icon in the Canvas Rich Text Editor</a> . Otherwise "Anonymous" will show.
Plays:	The number of times the student started playing the video (i.e. clicked the play button).
Visits:	The number of times the student visited any pages containing the video (anywhere the video is embedded or published)
Plays to Visits Ratio:	The number of Plays divided by the number of Visits. This could, for example, show that a student visited a page several times to read content there, but only started playing the video one time.
Avg. Drop-Off:	The average percentage of video viewed before the student stopped watching, divided by the number of Plays.
Avg. View Time:	The Total View Time divided by the number of Plays.
Total View Time:	The sum total of all recorded minutes that the student watched during all Plays of the video (regardless of playback speed).

The experiment was run twice, in 2020 (65 students) and 2021 (90 students). Due to technical issues, the video analytics from 2020 are aggregated, while in 2021 there are details per student. Table 2 presents an overview of all 12 videos from both years.

Table 2. Overview - Descriptive statistics from videos

Video	Duration	Visits	Plays	View Drop off	Average view time (seconds)
1	220s	294	238	82%	180s
2	236s	242	232	81%	191s
3	352s	261	235	80%	281s
4	311s	302	269	81%	250s
5	317s	270	245	84%	266s
6	342s	254	235	79%	267s
7	296s	151	136	78%	209s
8	472s	141	130	81%	371s
9	366s	147	135	74%	282s
10	377s	62	51	68%	182s
11	393s	53	44	80%	229s
12	369	63	47	70%	186

We note that in almost all cases the average view-drop off was 80%, as most students watched the video at least once, and some of them more than once. In few cases, the students watched parts of the video several times. Figure 2 shows that most watched 2:59 (179s) followed by 3.40 (full duration of the video). Similar viewing activity is observed in the other videos.



Figure 2. Example of viewing activity visualization

Next, we developed 4 quizzes. In 2020, 2 quizzes were given on Kahoot and 2 on Canvas, while in 2021 1 quiz was given on Kahoot and 3 on Canvas. A major difference between the 2 experiments was that in 2020 the quizzes were part of mandatory assignments while in 2021 they did not contribute to the grade. While the videos and quizzes were available at all times to the students, in 2021 we noticed a significant drop in views and participation in the quizzes. Thus, the third quiz was taken only by 7 students, while no student took the fourth quiz. While less students watched the videos that were linked with these quizzes, they did not proceed to take the quiz as well. This shows that such activities to be successful for large number of students they should be part of the formal assessment, as that is a strong motivation for the students.

Next, we offer some findings from the analytics coming from Kahoot and Canvas. We asked the students if they watched the videos, when they watched, and how many times. The findings (table 3) show that having watched video has a *strong correlation* with the score (0.47,  $p < 0.01$ ). However, this was expected considering that most students (90%) watched video before taking the quiz. Next, most of the students watched the videos 2 times (46%) or 1 time (33%), with the vast majority (65%) watching them the day before the quiz. There was *no correlation* between score and when the videos

were watched or how many times. Similar findings occur for all sets of videos-quizzes in both years. This indicates that watching the videos 1-2 times is enough to lead to a good performance. We must highlight here that the quizzes were not considered challenging, as the main goal was to engage the students in active learning. Offering introductory knowledge (e.g., basic concepts) via short videos accompanied with a quiz that counts for a small part of the grade can increase student participation and engagement.

Further, we examined potential group differences regarding score based on when the videos were watched or how many times, by performing ANOVA that compares means of each group. The findings show that in 2021, for quiz 1 (videos 1-3), when the videos were watched had a significant difference on the score ( $F 3.4, * p < 0.05$ ). Total correct answers were 55%, and total incorrect 45% in *both years*, showing that the students had a similar performance on average. Comparing with 2020 (Table 3), we note that more students watched the video on the same day of the quiz in 2021. No differences were found for the other quizzes.

Table 3. Descriptive statistics on when students watched the videos for quiz 1 (Kahoot)

When did you watch the videos?	2021	2020
Today	16.5%	5.8%
Yesterday	57.6%	69.6%
A few days ago	18.8%	21.7%
As soon as they were published	7.1%	2.9%

Further in 2021, for quiz 2 (videos 4-6), how many times the videos were watched had a significant difference on the score ( $F 2.9, * p < 0.05$ ). The average score in 2020 and 2021 was 68%, showing that the students had a similar performance on average. Comparing with 2020 (Table 4), we note that more students watched the videos only once in 2020, while more students (28.8%) watched them several times in 2021.

Table 4. Descriptive statistics on how many times students watched the videos for quiz 2 (Canvas)

How many times did you watch the videos?	2021	2020
Once	29.8%	56.3%
Twice	36.9%	23.4%
Several times	28.6%	14.1%
I don't remember	4.8%	6.3%

## 2. Learning experience

Information Technology (IT) and Information Systems (IS) study programs have seen an enrollment increase in the past decade (Zweben & Bizot, 2015). This increase is driven from the growing demand for IT professionals in Europe (ICT Skills Action Plan 2014-2018, 2014), the United States (U.S. Bureau of Labor Statistics, 2020), as well as in other parts of the world. To this end, in Spring 2020, we implemented a study to examine students' learning experience. The study comprises two parts; an online questionnaire and focus groups.

The findings offer insights on students' overall learning experience at IIS and allow us to take appropriate measures for improving their learning experience in IT and IS education disciplines. Below, we present the methodology for study as well as the main findings.

### 1.3. Online questionnaire

The online questionnaire consists of three parts.

1. Questions on the demographics of the students (age, gender) as well as information related to their study program, the year of their studies and questions related the overall teaching, content quality.
2. Measures of the various factors identified in the literature from previous studies. Table 1 lists the operational definitions and the number of items used for each factor and their source in the literature. We used a 7-point Likert scale anchored from 1 marked as ‘strongly disagree’ to 7 marked as ‘strongly agree’.
3. Measures of the various factors identified in the literature that might impact students’ decision to leave IT/IS studies. Table 2 lists the operational definitions; single question/item was used to measure each factor, with a 7-point Likert scale. Students’ were asked to indicate the degree to which these factors might impact their decision leaving their studies. In particular, the measures used in this study were selected from prior related studies (Biggers et al., 2008; Giannakos et al., 2016; Pappas, Giannakos, Jaccheri, et al., 2017; Xenos et al., 2002)

Table 5. Important factors for studies in higher education

Operational Definition	# of items	Source
Gains cognitive learning and development	6	(Giannakos et al., 2016; Pappas et al., 2016; Pappas, Giannakos, Jaccheri, et al., 2017)
Gains in non-cognitive learning and development	3	
Academic challenge	6	
Active and collaborative learning	5	
Student–Faculty Interaction	5	
Enriching Educational Experiences	6	
Supportive Campus Environment	6	
Degree’s usefulness	3	
Intention to complete your studies	3	
Intention to continue (or reenroll) your studies at IIS	4	
Satisfaction with your studies	4	
Emotions when studying	16	(Litalien et al., 2015; Watson et al., 1988)

Table 6. Main reasons to leave your studies

Operational Definition	Source
Various reasons (not related to the studies)	(Biggers et al., 2008; Giannakos et al., 2016; Pappas, Giannakos, Jaccheri, et al., 2017; Xenos et al., 2002)
Quality of the studies offered	
Focusing to students that are already related in some way to the subject of the studies	
Bad estimation of the time required	
I am not sure I am able to pursue university-level studies in IT Negative opinion about the education offered at IDI	
I do not feel as if I belonged in IT	
I am unhappy with my grades	
Excessive workload	
The curriculum does not provide enough flexibility	
A non-IT career would be more fulfilling to me Classes were unfriendly	
Overall curriculum was too difficult or too lengthy	
Poor teaching by IT faculty or teaching assistants	
Classes were boring	
The curriculum is too narrow and could not bring together my interests out of IT	
The classes are too big	
Few of my friends are studying IT	

### 1.4. Sample

The target sample for this study comprised 357 IS students. Of these, 110 responded to the study, giving a response rate of about 30%, thus we consider the sample representative. Out of the 110 respondents, 22% were females and 78% males. Males' participation is higher and corresponds to the number of male students at IIS. All of students who participated in the study were from 19 to 39 years old, with mean age being 24.3 (S.D. 4.07). The respondents were from mainly from BACIT (80), MASTIT (18), and IT60 (12).

In addition, students' indicated that the most important reason for them to enroll into a IT/IS study program is the career perspectives (Average = 5.59/7), followed closely by their interest in the subject (Average = 5.26/7). The least important reason was Reputation (Average = 3.7) 5.26 (Figure 3).

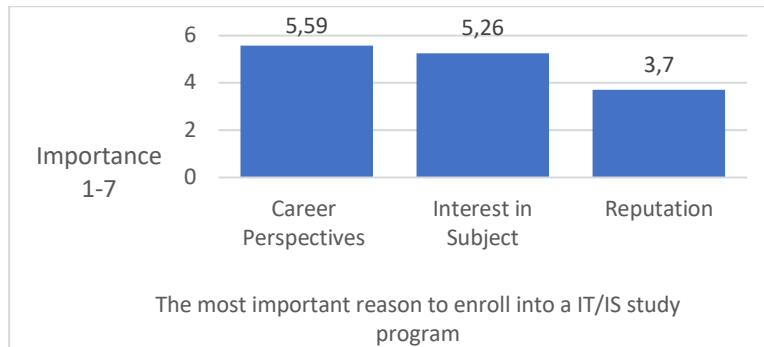


Figure 3. Importance for taking IS/IT studies

As per students' effort, very few believe that they put very little on their studies with most stating that they put enough or a lot of effort, when asked on a scale 1-7 (Figure 4). Also, on average the students report that they spend on course work outside of class 21 hours/week, with about 7% not being able to estimate. Regarding students' attendance in the lectures, more than half of the students are less than three times per course absent, with about 10% being absent more than 6 times.

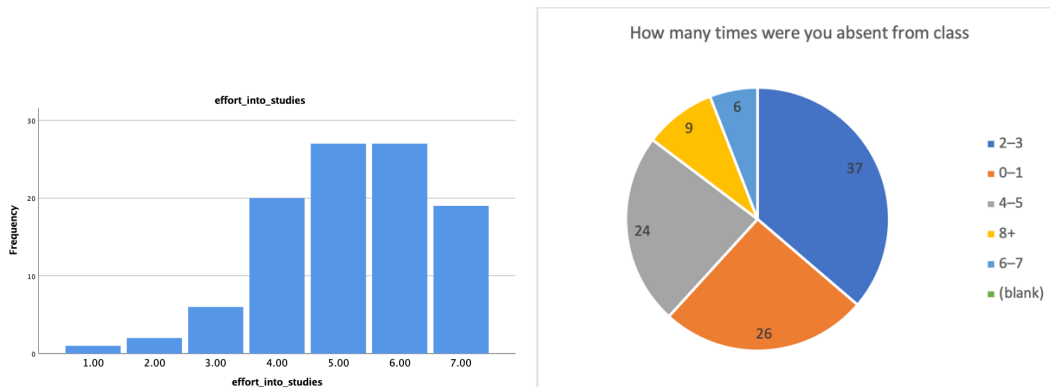


Figure 4. Effort into student and class absence

As per their Grade Point Average (GPA), almost half of the students have a B and a few A; many of them hope to be able to increase their GPA for at least 1 grading scale (Figure 5).

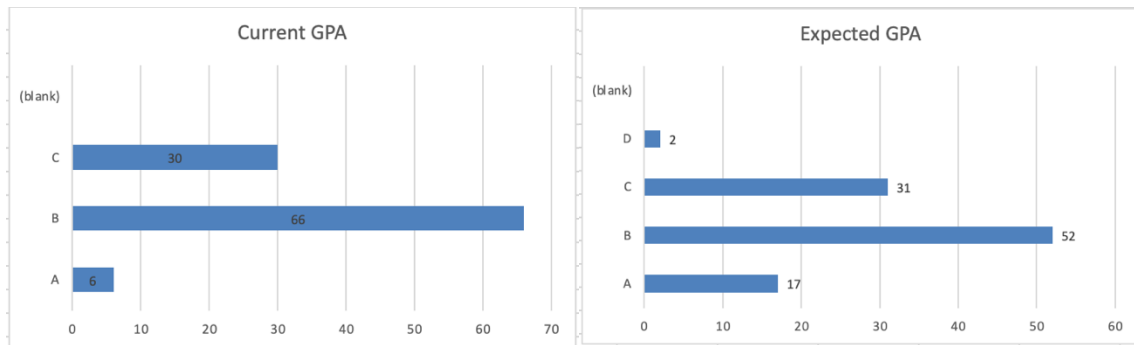


Figure 5. Current and expected GPA

### 1.5. Overall Experience

In order to describe the overall learning experience at IIS we asked students to rate five quite general statements on a scale 1-7 (Poor-Excellent):

- 1) Courses' content overall quality: 4.9 (S.D. 1.5)
- 2) Instructors' overall teaching: 4.4 (S.D. 1.5)
- 3) Selected courses' content that was valuable and worth learning : 4.6 (S.D. 1.4)
- 4) Technology integration in teaching: 4.3 (S.D. 1.7)
- 5) The assignments (projects, presentations etc.) : 4.4 (S.D. 1.6)

Respondents express good courses' overall content quality, content selection, and assignment quality. Additionally, they express slightly lower the technology integration and the overall teaching at IIS.

In our effort to investigate students' learning experience at IIS, we measured factors identified in the literature as important in promoting students' learning in higher education (Figure 6). Respondents expressed very high their intention to complete their studies, as well as the usefulness of their studies. The cognitive gains and active and collaborative learning follow in terms of importance to the students.

Next, student's intention to continue their studies is above average as well as the academic challenge. Finally they rated enriching educational experiences and student-faculty interaction lower than average. We must repeat at this point that this survey was conducted during Spring 2020, when the university was in lockdown due to covid-19, which is likely to have influenced students responses.

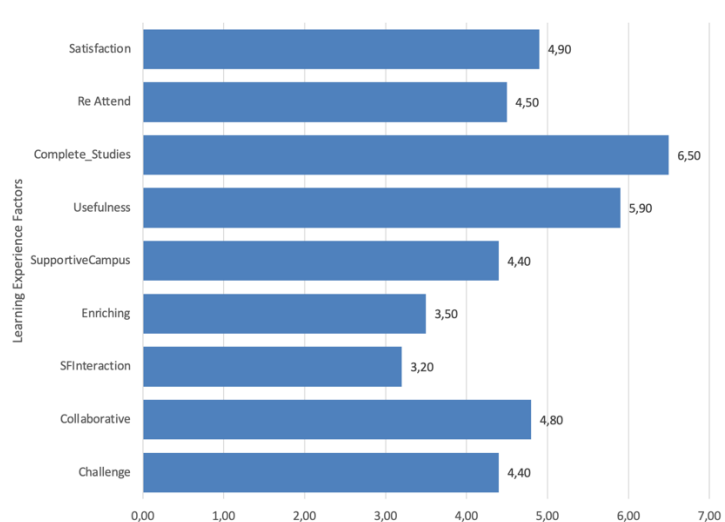


Figure 6. Students' general factors that influence learning experience

After investigating students' learning experience on the basis of factors related to general studies, we measured factors related to tertiary IT/IS studies with the aim to understand if and how they impact students' decision to leave their degree. Hence, in this section a high score of a factor means that this

*factor impacts' students decision to leave their studies.* Respondents expressed that, poor teaching, difficulty, quality of the studies, time required, grades, boring courses, focus on high performers, and big classes might impact their decision to leave their studies (over 3). Nonetheless, almost all barriers remain at low levels (<4) except the quality of studies. This is accordance with the students high intention to complete their studies. Further, we examined students' positive and negative emotions when they study IS/IT. Overall, we see that negative emotions (e.g., Afraid, Hostile, Upset) are at low levels, while positive emotions are higher and typically over the average (i.e., 4) (e.g., Attentive, Active, Excited). The detailed results can be seen at figure 7 below.

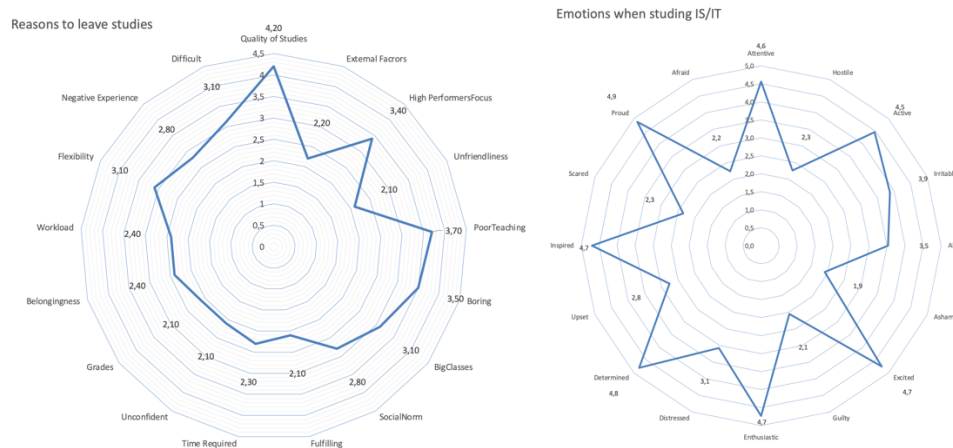


Figure 7. Factors related to tertiary IT/IS studies that influence learning experience

Finally, we examined possible predictors of students' intention to complete their studies, a series of multiple regression equations were calculated using scores 1) on factors generic to studies in higher education and 2) on factors related to IT education. The results of the regression analysis to predict students' intention to complete their studies based on factors generic to studies in higher education are shown in Table 7. The overall model was significant ( $p < 0.001$ ) with R-square 0.8.

Table 7. Predicting students' intention to complete their studies based on factors generic to higher education

Factor	Beta	T	Sig.
Age	.177	2.346	.021*
Gender	.189	2.938	.004**
Career perspectives	.261	4.276	.000***
Reputation	.003	.077	.939
Interest in subject	-.191	-1.975	.006**
Cognitive Gains	-.025	-.224	.823
Challenge	.110	1.086	.280
Collaborative	-.026	-.274	.785
SFInteraction	-.051	-.943	.348
Enriching	.014	.307	.759
SupportiveCampus	.234	2.682	.009**
Usefulness	.093	.821	.414
Satisfaction	.114	1.252	.213
Positive Emotions	.016	.234	.815
Negative Emotions	.020	.473	.637
*** $p < 0.001$ , ** $p < 0.01$ , * $p < 0.5$			



## 1.6. Focus groups

To complete the survey and collect deeper insight on factors that influence student experience we conducted three focus groups with students. We invited student representatives and students that have in general active participation (e.g., student association, Tas). In total, 15 students participated. The 15 persons were split in 3 groups, each facilitated by 1 professor, 1 lecturer, and 1 admin from IIS, respectively. The duration of each focus group was about 2,5 hours. One of the sessions was in English and two in Norwegian. The sessions were recorded and later transcribed. We proceeded with a content-based grouping. Hence, we summarized the following additions, alongside with some exemplar student responses (italicized).

The students were asked to describe their typical day at IIS, followed by questions on:

**What they think as high-quality learning experience at UiA.** The students mention that in IIS different learning methods are used, which is good, and highlight the importance of having several small assignments. This includes hand-ins, videos quizzes, and in-class tasks in which they receive feedback to know their level. Such activities increase their level of activity in class.

*“High quality for me would mean smaller groups, more discussions, and more participation into the discussion from the lecturer. So not that the lecturer presenting something abstract to the crowd, but more interactive learning experience.”*

*“I think it was really good to work with this one project in the third semester. It was crucial that the three courses were connected”*

*“I guess put I higher emphasis on individual learning experience”*

Next, they discuss about **who is involved** in creating a high-quality learning experience for students at university? The students mention the students, teachers, teacher assistants, program leader, student advisor, and external partners.

*“That would be a collaboration between students and teachers”*

*“You can discuss with admins a more individual approach to the programs you are involved in.”*

The students mention **that they feel closer to the teacher** followed by the student advisor, while the department head would be, as a role, further away.

*“Fundamentally it starts with the teachers. That’s primarily the main contact for us students. If there is anything in a specific course”*

*“I could quickly follow up and say that the head of the department is the further away”*

The students mention **the importance of activities to help new students adjust and feel comfortable in the new environment.**

*“I was “fadder” and I think that’s really important because its very scary in the beginning when you feel alone. So, it’s good that students get to know smaller groups in the beginning, I think that help a lot. I have also joined Systematicus and its very fun when students get to know each other there also from different study years.”*

*“So, what gave me friends was forced groupwork in one of the first courses. In second semester I have gotten to know more people now through a disco-server and Thursdays quizzes at Østia (at UiA). So the small social things plus forced groupwork helped me.”*

The students mentioned that **the necessary information and support when making the transition from school level to university, or from bachelor to master**, is available, sometimes overwhelming, and it involves a lot of own work.

*“You have to search for a lot of information on your own”*

*“There are much information available”*

*“Information overload, information should be given in a structured way”*

The students mention that they **expect to spend time learning independently, however it can be time consuming.**

*“I think we have a lot of independent learning..... It is an essential part of the learning experience. You cannot understand what the course is really about if you don't do this.”*

*“The teacher are there to facilitate the learning process, and you are there voluntarily, and I dint think that is clear to everyone that go from high school to university that you are responsible for your own learning. You are not done after your classes”*

*“I expected a lot of self-study. I did not know that I was going to a study program where almost everything is in groups, but that's not disappointing, its very good learning.”*

*“Yes, besides courses I usually do online courses, watch YouTube or other and have my own project.”*

The students describe **how they think of employability during their studies, and highlight the need for getting the skills that are required by the market.**

*“I have absolutely no idea at this point” (1<sup>st</sup> year student)*

*“It would not impact the quality of the program, but rather how in need the marked is for your skills and qualities” (2<sup>nd</sup> year student)*

*“if you have low quality courses employability would be a major factor yes.” (2<sup>nd</sup> year student)*

The students mentioned **how they can work together with the teacher to improve a course.**

*“We get assignments and then present it to the other students, that is a very good setting to have for involving the students”*

*“Making sure that students are engage in any way in class actively, is very important. Also, feedback. I don't think that the students should have the greatest saying in how the structure should be, but its good for the department to receive the feedback to make sure the quality is good. But students should not have a big impact on the course content and yes.”*

The students discuss **teaching quality** and share examples and some characteristics of a good and bad lecturer. The students expect **engaged lectures that teach topics in which they are interested in as well as having courses that have prepared them for the courses that will follow in the next years.** When this is not the case they notice and feel demotivated.

*“My expectations to go into this master program was that the lecturer would have a more participatory role in the learning experience since you have smaller classes and more specialized program.”*

*“For the master program my expectations were met to a great extend I would say. The courses are relevant to IS-field, and the lectures are engaged in what they are teaching. Everyone has been engaged in what they are teaching.”*

*“[Sometimes].. in the bachelor [it feels that] the lecturer is just given a course they just had to do, and did not have that much of a interest to do it and that it impacted the quality... [while] in the master program the teacher was more interested overall and had a higher interested in the topics”*

*“in the bachelor course I think it varies, for example sometimes we use old tools [programs from the 90s] to tackle the tasks” ... “The total was good, but the first semester you hit the wall a little bit.”*

*“The next semester in 105 you learned that the learning curve was stiff, and that you had actually missed out on technological elements from the last semester”*

*“The learning curve in IS-105 is suddenly too high and then they face a wall”*

### **3. Final remarks**

This report presented first a *with-video assignments* study conducted at IIS/UiA to explicate how *with-video assignments* can be implemented in a typical IT/IS course and how we can use learning analytics to study students behavior and attitude during this experiment. Further, this report presented a survey

study to identify reasons that may contribute to students' learning experience. We presented an exploratory analysis of relationships among factors identified in the literature as important and students' intention to complete their studies in IT/IS degree at IIS. Our data confirm some general findings (e.g., the important role of the first year), and also identify factors that can predict students' intention to complete their studies. In addition, following an analysis of the qualitative data from focus groups we depict additions considered highly important from students at IIS/UiA.

Last but not least, although the respondents' rate was adequate and we tried our best to have valid and reliable measures and results, the report is exploratory and has certain limitations. It is important to emphasize that the data collection was performed during the covid-19 pandemic. Also, these analyses are based on one set of data collected from a single survey study; this places significant limitations on how strongly we can interpret and generalize the reported patterns. Future research is needed not only to replicate and verify the patterns we have reported, but also to determine whether these results characterize students who have left their studies (dropout) or others who have graduated and now work in the industry (e.g., via an alumni survey).

#### **4. Changes and deviations**

The project was directly affected by 2 major incidents. First, we experienced technical issues with Kaltura and availability of data from the videos. This issue was partially fixed in Spring 2021, that is 1 year later than originally planned. Thus, the duration of the project was extended by 1 year. Second, covid-19 impacted the project and while we planned to run pilots in 2 courses, we were not able to do so in 2020 as planned. To address both issues, we conducted a second pilot in the same course in 2021. This allowed the lecturer to compare student experience in two different years using the same material. However, the available data analytics from Kaltura regarding year 2020 include only aggregates. Nonetheless, our exploratory findings show the potential of with-video assignments when coupled with quizzes and exemplify how they can be implemented in other classes. Finally, since the studies were designed before the covid-19 pandemic, we expect that the students' responses and experiences in the survey were impacted. To this end, we conducted 3 focus groups with students to gain a deeper understanding of learning experience. Overall, the project reached its original goals.

#### **5. Finance**

Following the application, the main work was done by the project manager. As the duration of the project was extended by 1 year some of the activities took part in 2 years instead of 1. Further, instead of conducting 1 pilot in 2 courses, we conducted 2 pilots in 1 course. Further, to address some of the changes and deviations (section 4), we conducted 3 focus groups with overall 15 students and 3 facilitators, which were not initially planned.

#### **6. Sharing experience from working on a development project at UiA**

The present project was based on the manager's earlier work both on learning analytics and learning experience prior to join UiA. This development project allowed the implementation of existing knowledge to IIS/UiA context paving the way for using more with video assignments in classes as well as the existing analytics from Canvas and Kaltura. The application process was straightforward, and the experience was overall positive. The feedback received helped to shape the application early on. Initially, we had planned for a larger project and based on concrete feedback we revised our work to fit the goals of this call. Regular follow ups helped to make sure that the project was on track. We received support when technical issues occurred as well as when we had to make changes due to covid-19. Overall, such a development project allows the team at IIS/UiA to test and expand their use of analytics in classes but also to investigate students learning experience. This is critical as we need to rethink learning design in IT/IS education during major crises (Pappas & Giannakos, 2021), and it paves the way towards applying for more funding (e.g., NFR-IKTPLUS, NFR-FINNUT, NOKUT-SFU). The project manager is working on this direction and has applied already in some of the above.

## 7. References

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