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What can be learned from university students' video watching behavior during the COVID-19 pandemics: a case study in a medium-sized Japanese university

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Abstract

The number of courses offered online by universities has been increasing in the recent years. To assure that students can engage appropriately with those courses, many universities have been implementing a bring-your-own-device (BYOD) policy. Due to the COVID-19 outbreak, most courses in Japanese universities shifted to online education. In the present study, two aspects of student behavior after this shift towards online education were analyzed: the usage of computers versus mobile phones and other devices to watch videos; length of video watched at one time. Results show that students under the BYOD policy used computers to watch educational videos more often than other devices, while students not under this policy used computers and other devices to roughly the same extent. Following previous research, shorter videos were watched in higher proportions than longer videos. Students watching videos using computers tended to watch a higher proportion of videos than those using other devices. Overall, students watched videos more often during the morning and the afternoon (school time), followed by the evening. Thus, there was no clear change of routine, despite those videos being available at any time. Implications were discussed.

1 Introduction

A direct consequence of the COVID-19 pandemic for education was the increase of classes being offered online. Following this, there was a substantial development of new systems and technologies related to online education.

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Online education is not a new phenomenon; courses have been offered online since the very beginning of the popularization of the internet. However, it is the first time in history that most face-to-face classes were abruptly shifted to online. Despite a large number of previous studies discussing and analyzing online education, the consequences of this shift caused by the COVID-19 pandemic are still to be completely understood.

In recent years, institutional research (IR) has grown in importance and scope inside universities across the world and particularly in Japan, incentivized by the Japanese Ministry of Education, Culture, Sports, Science and Technology. Among the responsibilities of IR offices are monitoring education reform, analyzing data, and providing feedback for institutional policies [1].

Furthermore, learning analytics has advanced in several countries across the world, including Japan [2]. Within its scope is the analysis of tangible and measurable students' behavioral data, such as video watching behavior, in order to understand their patterns and provide insight that can be used to improve education.

The present research aims to analyze two aspects of student behavior after the shift towards online education caused by the COVID-19 pandemics: the usage of computers versus mobile phones and other devices to watch videos; length of video watched at one time.

Nowadays, mobile phones are widely used in daily life around the world, many times replacing personal computers for certain tasks. In most countries, this widespread usage of mobile phone has increased since the beginning of the 2000s; it has been part of the Japanese culture since the 1990s. Thus, it is not uncommon for a Japanese person who grew up in the last 30 years to carry out all their online activities on a mobile phone, never having used a personal computer [3]. This would be reflected in students' e-learning habits, the majority tending to access online materials through a mobile phone [4].

While mobile phones can accomplish most daily tasks without problems and might also be suitable for many e-learning activities, when it comes to workplaces, computers are still dominant. Additionally, in order to make the most of e-learning, computers are considered superior to mobile phones. Following recent trends in Japan (see [5] for an example), and in order to improve students' employability and education, a bring-your-own-device (BYOD) policy has taken place in our university. This policy requires new students to provide a personal computer to be used in classes and other educational activities. Following this policy, students are encouraged to use their computer, rather than their mobile phones, for every possible online educational activity.

Starting from 2019, new students are asked to prepare a notebook computer to be used in classes and other student activities. Instructions are conveyed through a written notification sent by post together with the acceptance notification letter. Even though new students can use a computer that they have been using before enrollment, our university recommends buying a new computer with a Windows operating system installed, since the university can provide support for this system and guarantee that students will be able to follow classes, watch videos on Mediasite (the platform used in our university), and carry out other required activities. Moreover, students are highly encouraged, and sometimes required, to use their notebook computer rather than their mobile phones to engage in classes.

Regarding length of video watched at one time, previous research (see [6] for an example) has shown that shorter videos tend to be watched completely more often than longer videos. However, previous research was done in a different environment; for example, the analyzed courses were made from the beginning to be watched online, and, in most cases, these courses were elective courses or massive open online courses (MOOC), open to individuals outside the university. The majority of our data comprises of courses that were designed to be conducted in person, but due to the circumstances, they were converted to online courses.

In this research, we opted for an exploratory methodology, using inferential statistics, without the usage of machine learning or similar techniques. However, we do support those techniques and plan to carry out such analyses in the future.

2 Methods

2.1 Data

The data comes from the students of our university; it is a mid-sized university (roughly 2,000 new students per year) located in the Kansai region, in Western Japan. Classes at this university are provided by the Institute of Liberal Arts and six faculties: Faculty of Economics, Faculty of Management, Faculty of Regional Development Studies, Faculty of Sociology, Faculty of Psychology, and Faculty of International Liberal Arts. Additionally, there are three graduate schools: Graduate School of Business Administration and Economics, Graduate School of Psychology, and Graduate School of Contemporary Culture and Society.

Students are required to earn 124 credits in order to graduate, which takes our years for most students. Each year is divided into two academic terms: spring semester, ranging from April to July, and autumn semester, ranging from September to January. Classes start at 9:30 and finish at 18:10.

The analyzed data of students' video watching behavior come from the log data of Mediasite (the platform used in our university for online educational activities), from the 1st of April of 2020 to the 31st of March of 2021, encompassing a whole academic year. Due to the COVID-19 pandemic, all classes switched to online during the first semester (spring), and most classes remained online in the second semester (autumn) of 2020.

During this year, teachers were largely incentivized to record videos and upload them to Mediasite, resulting in a total of 4,472 unique videos.

There were 663,670 registered sessions (data points) to the platform in this period. One session being registered each time a student accesses a video (see Table 1 for an example of the data).

The variables available for analysis were: video ID, video length, user ID, user IP address, access time, last active time, watched time (time spent watching the video), watched length (proportion of the video that was watched), user OS, and user browser.

Video ID	Video length (h:mm:ss)	Access time	Last active time	Watched time (h:mm:ss)	Watched length (h:mm:ss)	User OS	User browser
A00	00:10:02	2021/2/5 23:30:49	2021/2/5 23:32:23	00:01:25	00:01:25	Android	Chrome Mobile
A00	00:10:02	2021/2/5 10:55:31	2021/2/5 10:59:37	00:02:08	00:01:29	iPhone	Safari Mobile
A00	00:10:02	2021/2/4 21:34:15	2021/2/4 21:37:59	00:03:14	00:03:11	iPhone	Safari Mobile
A00	00:10:02	2021/2/4 20:59:49	2021/2/4 21:10:18	00:09:57	00:09:57	Mac OS X	Safari
A00	00:10:02	2021/2/4 20:22:36	2021/2/4 20:23:57	00:00:00	00:00:00	iPhone	Safari Mobile

Table 1: Sample of the data (User ID and User IP address omitted)

2.2 Analysis

Firstly, we examined the consequences of our BYOD (Bring Your Own Device) policy. For this, we compared the usage of computers versus mobile phones and other devices in terms of frequency of

students admitted after the implementation of this policy and students admitted before the implementation of the BYOD policy.

Secondly, we examined the video watching behavior of students through an analysis of watching sessions. Which operating system and which type of device was used, what time of the day classes were being watched, and what proportion of the videos were being watched.

3 Results and Discussion

3.1 Policy evaluation

As stated above, BYOD policy came into practice for students enrolling in 2019 and beyond; thus, an increase of computer usage is expected to take place from this year on.

Considering the total number of sessions, students enrolled in 2019 and 2020 used computers more often than mobile phones and other devices to watch classes, while students enrolled in 2017 and 2018 used computers and other devices roughly to the same extent (see Figure 1).

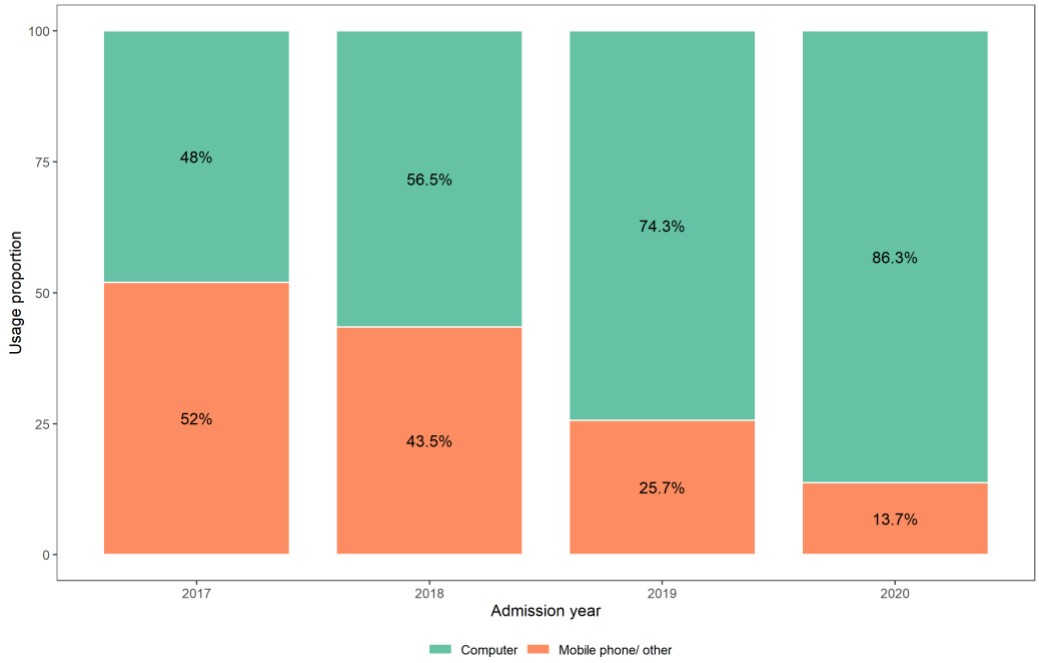

Figure 1: Usage proportion of computer versus mobile phone and other devices per total of sessions for each admission year

Despite students enrolled in 2019 and 2020 watching videos on the computer more often than on other devices, 13.7% of the sessions of students enrolled in 2020 and 25.7% of the sessions of students enrolled in 2019 were done using devices other than computers.

Differences between 2019 and 2020 admission years (2nd and 1st year students, respectively) and 2017 and 2018 the last two years (4th and 3rd year students, respectively) seem to be directly

influenced by the BYOD policy. However, there is also a visible decrease in computer usage along with the school years, which may be related to other factors.

Concerning devices students are using to watch the videos, regardless of admission year, most students used two devices to watch videos, some even using three or more devices (see Figure 2).

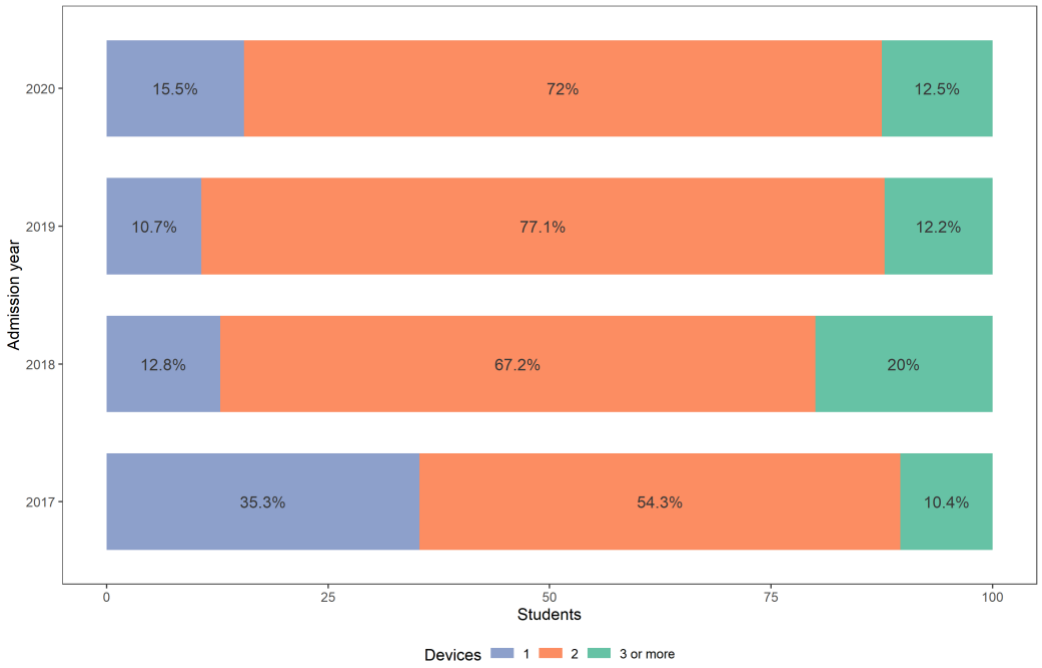

Figure 2: Proportion of students by number of devices used to watch videos per admission year

Considering students using two devices to access the system, more than 90% of them used some combination of mobile phone and computer, iPhone and Windows computer in most cases (see Figure 3).

The effects of the BYOD policy can be perceived through the proportions of device usage of students enrolled in 2019 and 2020. Despite most students having access to both computers and mobile phones, they tend to use computers more often to access the platform than students enrolled in 2017 and 2018. Additionally, the proportion of students under BYOD policy using Mac OS X is about half the proportion of students not under BYOD policy, suggesting that they followed the university's advice to purchase and use a windows computer and reiterating the effects of the policy.

Alternatively, it can be argued that independently of policies, students tend to increase their mobile phones usage as they go through their undergraduate years. However, since there is only minimal oscillation and no clear upwards or downwards tendency during the months of the year, we argue that the differences between admission years are due to the BYOD policy (see Figure 4). However, there is an augment in usage of mobile phones in summer and winter breaks (August, February, and March), when the videos on the platform are all related to extra-curricular activities, particularly videos related to job hunting and scholarships.

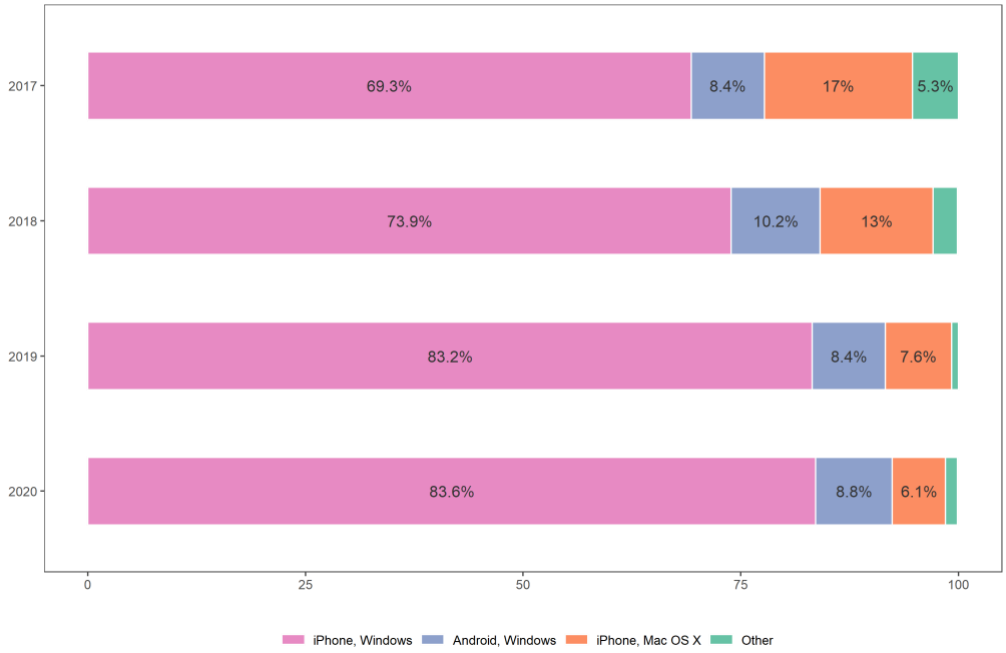

Figure 3: Proportion of device usage of students using two devices to watch videos per admission year

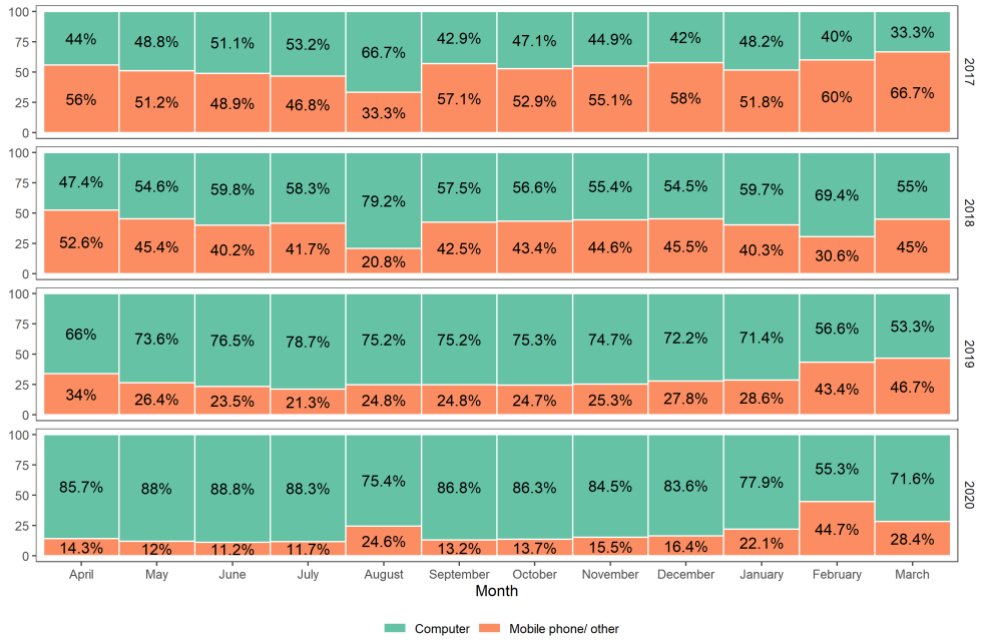

Figure 4: Proportion of students by type of devices used to watch videos in each month per admission year

3.2 Analyses of watching sessions

Spring semester and autumn semester showed the same tendency in the variables analyzed here; thus, we did the analysis without separating the data by semester. The same was done concerning admission year.

Considering time of the day, from the distribution plotted on Figure 5, we can understand that students are the most active during school hours (9:30 ~ 18:10), followed by the evening (18:11~00:00), and finally late hours and early morning (00:01 ~ 9:29).

The videos watched by the students were previously recorded and uploaded to Mediasite. Thus, the students had no obligation of watching these videos during school hours; however, most sessions were carried out in this interval of time. This suggests that despite the implications of the COVID-19 pandemic, students tended to have a routine similar to what they had before COVID-19.

Interestingly, the evening also had a high number of sessions, peaking around 23h. This could be related to student's preferences, such as in Wang and colleagues' [4] research, in which most students reported preferring receiving materials in the evening/night rather than in the morning or in the afternoon. Alternatively, this pattern could be related to homework or preparation for a lesson, which is common practice in Japan.

Japan was mostly in state of emergency during the spring semester; thus, students could not go out freely and engage in activities other than studying due to restrictions, but this was not the case in the autumn semester. However, in our university's case, most students showed the same watching behavior patterns along the year and did not switch to a nocturnal style of studying.

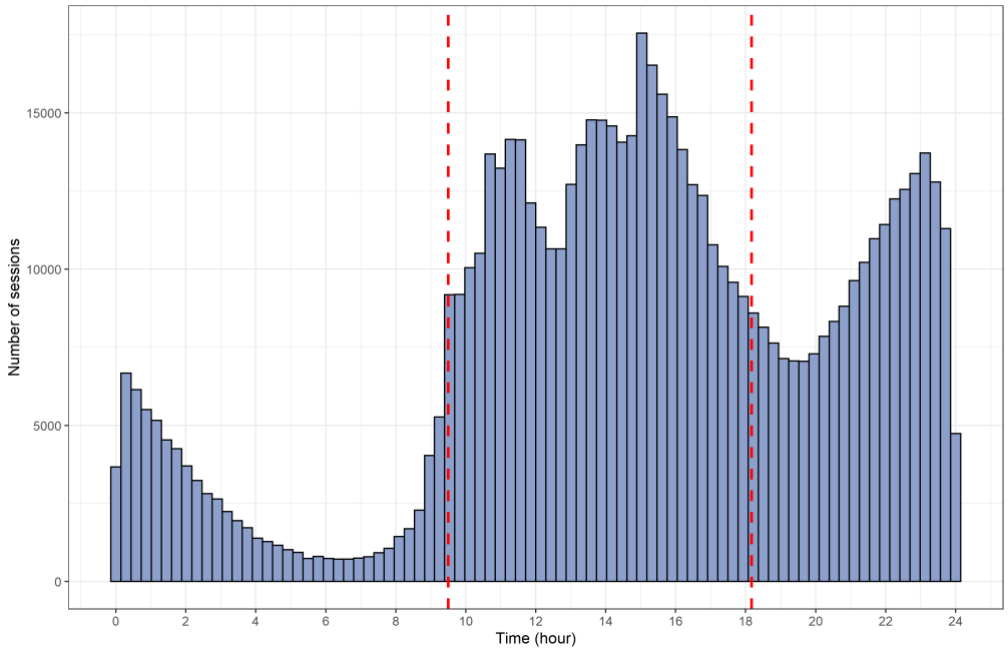

Figure 5: Sessions per time of the day. Red dashed line represents school hours

Regarding the usage of computer versus other devices by time of the day, only about 25% of the accesses are done through devices other than computer during school hours and evening. This proportion gets slightly higher during late night and early morning (see Figure 6).

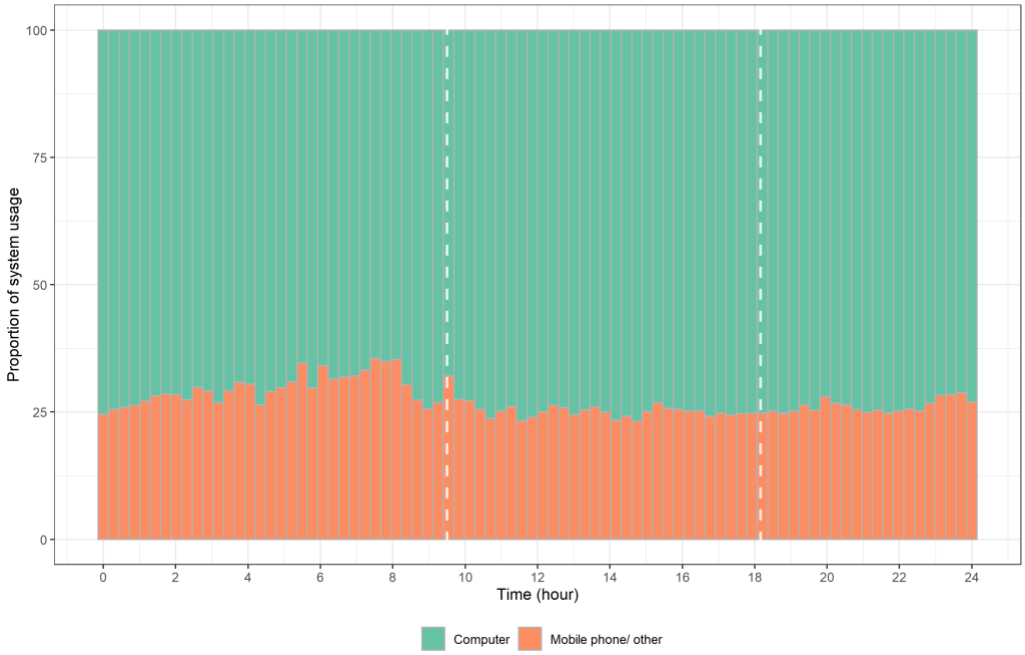

Figure 6: Sessions per time of the day. Red dashed line represents school hours

Finally, in order to investigate how video length and device used to watch a video influence the proportion watched of a video, we conducted a multiple linear regression. Results of the multiple linear regression indicated that there was a significant effect between device used, video duration, and proportion watched of the video ($F(3, 656164) = 197000$, $p < .001$, $R^2 = .47$). The individual predictors were examined further and indicated that device ('mobile phone/ Other', $\beta = -25.9$, $t = -392.8$, $p < .001$), video duration ($\beta = -.27$, $t = -299$, $p < .001$), and their intersection ($\beta = .02$, $t = 16.9$, $p < .001$) were significant predictors in the model.

We can infer from this result that the longer videos are less likely to be watched completely than shorter videos and that students might spend more time watching a video if they are using a computer than if they are using another kind of device (see Figure 7 for scatter plots and simple regression lines).

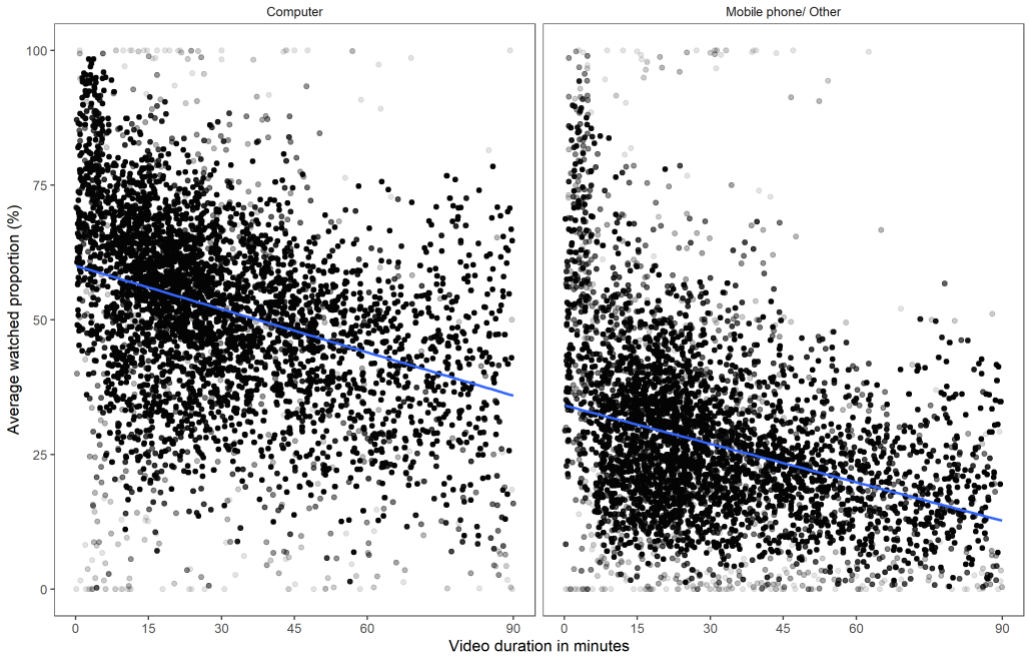

Figure 7: Scatter plots and simple regression lines of video duration versus watched proportion for each device.

3.3 General discussion

From the video-watching-behavior data, we could infer several features of students' learning styles. We could confirm that the BYOD policy works. Students under this policy tend to use computers more often to engage in educational activities than students not under this policy, even though they all have access to computers and other devices. One of the benefits of this policy could also be analyzed and visualized: students tend to watch videos for longer times when using computers. This analysis also showed that videos that are too long tend not to be watched entirely, following previous research [4].

Even under circumstances caused by the COVID-19 pandemic, students tended to keep having a similar routine compared to before the pandemic. Even in the autumn semester, when students could be engaging in other activities, they kept with this routine of watching videos mostly during school hours. Future research should evaluate if this tendency continues to be consistent overtime or if students will tend to adopt a nocturnal life style.

The results presented here shed some light on the phenomena derived from the COVID-19 pandemic, followed by a massification of online education. They are a small but important step that can be used to support managerial decisions regarding principles in education in the near future, evaluate and review policies such as BYOD, and serve as material for guiding faculty development and preparation of educational materials in the future. However, before practical decisions can be made, more studies are needed in order to refine and increase the robustness of the results presented here, as well as to evaluate their generalizability.

This research has some limitations. The data was collected during the COVID-19 pandemic; thus, the observed behavior of the students may not be the same as usual, and the results should be replicated in future research in order to be considered generalizable. The data presented here encompasses the students' watching behavior of videos, but, as it is unfortunately common for IR offices, it could not be connected to other measures such as grades, number of enrolled credits, etc.

The results presented here serve as a basis for future studies. Researchers can investigate how the usage of computers versus other devices affects students' grades and, more importantly, employability. The increase in mobile phone and other devices usage along with the school years should be deeply investigated. Lastly, it is important that the environment and conditions in which the students engage in educational practices are well understood, so the university can provide materials that match students' necessities and improve their experience and educational outcomes.

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