GLOBAL ACADEMIC RESEARCH INSTITUTE

COLOMBO, SRI LANKA

GARI International Journal of Multidisciplinary Research

ISSN 2659-2193

Volume: 06 | Issue: 07

On 31st December 2020

http://www.research.lk

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GARI Publisher | E-Learning | Volume: 06 | Issue: 07

Article ID: IN/GARI/ICSSH/2020/111 | Pages: 50-68 (19)

ISSN 2659-2193 | Edit: GARI Editorial Team

Received: 07.10.2020 | Publish: 31.12.2020

STUDENTS' SATISFACTION OF E-LEARNING USING AUDIO-VISUAL METHOD

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ABSTRACT

Approximately 1.2 billion students all over the world cannot reach their classrooms due to the COVID-19 pandemic. Online education is a major tool to continue educational activities in distance through the internet without disruptions even during the pandemics such as this. Most of the state universities in Sri Lanka including the Sabaragamuwa University of Sri Lanka (SUSL) are focusing on the audio-visual materials which are useful as one of the online teaching methods. The work presented in this paper is conducted to identify the satisfaction of the undergraduates of SUSL on online education using audio-visual materials. The two-stage cluster sampling procedure was applied to select a sample from 4000 undergraduate students in SUSL. However, only 285 responses were considered in analyzing due to the limited responses to the online questionnaire. The data was analyzed by using 4 multiple linear regression models. According to the results, students are more satisfied with the live video lectures containing either the lecturer or lecture slides as the visual material compared to recorded video lectures. Student satisfaction towards referencing the other relevant videos found on the internet containing similar learning content is a minimum. Male students' satisfaction is 6% lower than females. The identified factors which affect student satisfaction are faculty of studying, occupations of the parents, the strength of the signal coverage, and subjects per semester to study. Students' overall satisfaction of audio-visual materials for distant learning is 57% compared to the face-to-face classroom.

Keywords: Audio-visual, E-Learning, Students' Satisfaction

INTRODUCTION

Online learning is flexible because students are not forced to a tight schedule like in a typical traditional classroom environment. As they can access an online class from anywhere at any time, this helps to balance their career with studies. Online learning also helps in reducing expenditure because no transportation cost is needed to attend classes. Moreover, online learning allows a student to easily access the material provided by a school/university located in another geographical location without having to bear the cost of airfare and living. This helps the students to get educated by experts from around the world. Also, students do not need expensive clothes, accessories, and stationary to attend online lectures. In a traditional classroom, the knowledge is limited what is provided by the lecture. However, in an online learning environment, students can explore a wide variety of available resources and gain more knowledge. Another benefit of using online learning is students can maintain an online database of lecture notes and recorded lectures. In most traditional face-to-face classrooms students can hear the

lectures only one time, but in online lecturing, students can refer the recorded videos again and again to get a better understanding.

Although there are many benefits of using online learning students' feedback is limited. In a traditional classroom, the lecturer gives answers to the questions immediately and the lecturer can get a rough knowledge by looking at students' faces whether the lessons were understood or not. However, in online learning, as most of the questions will be answered later, students have to wait to get answers from the lecturers. Furthermore, personal feedback is limited to students' assessments. It is also noted that online learning may limit interaction among the students as they will not get an opportunity to meet one another, share knowledge, and exchange ideas. As a result, students may experience stress and discomfort. Also, as it is difficult to perform group tasks in online learning environments, students may lack the ability to work in groups, which could be devastating to their career. As online learning requires a high level of self-motivation, students with a lack of motivation will fail more often in the online learning environment. The development of communication skills may also deplete due to online learning. Students may not be able to meet new friends and cannot make social connections with others while learning. Moreover, as it is difficult to perform practical experiments in an online environment, students may only gain theoretical knowledge but lack hands-on experience. Online learning materials are the way students receive their online learning activities via the internet. They can be received as lecture slides, video or audio lectures, reading materials from another person, audio materials from another person and video materials from another person. Students can use the learning management system, Whatsapp, Viber, messenger, email, Zoom, Microsoft teams, Google classroom, Skype, etc. to receive online learning materials. The audiovisual method is one of such online learning material, which uses both sounds, images and videos. Among online learning materials lecture slides with voice, video lectures, and video materials from another person can be classified as audiovisual methods. Through the audiovisual method students and instructors can have visual interaction via the internet. The most famous audiovisual technique is video lectures. Students can see the video lectures through the internet which were uploaded by someone or directly by the lecturers. Nowadays students in the world cannot reach to their classrooms due to Covid 19 virus. Therefore, online learning using audiovisual method became more popular in the world. Hence, Sri Lankan universities, schools and other education institutes use this method extensively to continue their education programs.

In the world, online education is becoming more popular since the technology is developing. According to the Global Online Education market – 2020 February forecasts from 2020 to 2025 period, during the forecast period the total market size US$187.877 billion in 2019 is increasing up to US$319.167 in 2025. Sri Lanka is also a country with increasing technology. The National e-learning Movement in Sri Lanka (2010) mentioned students' ICT literacy should be developed using online learning and it will help to develop students' lifelong learning skills.

According to Online Education Trends Report (2020), is the opinion of 49% of the university student population is that online education is similar to classroom education.

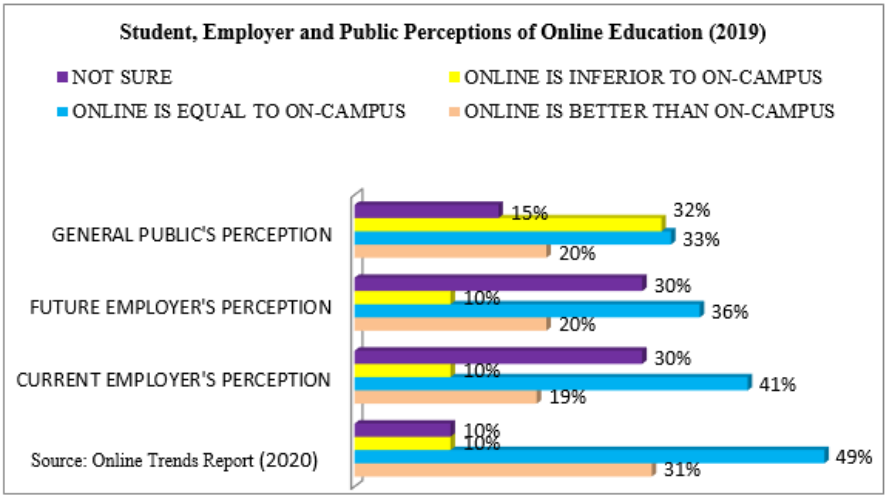


Figure 1 - Perceptions of students, employers and public of online learning

At present, due to Covid 19 pandemic, all universities, schools, and all the educational institutes are closed in Sri Lanka. According to the World Economic Forum (2020), approximately 1.2 billion children cannot reach their classrooms due to Covid 19 pandemic. In this period, there is a rapid increase in the online education system. Hence, most of the students receive their lessons online. In Sri Lanka, several educational websites including edulanka.lk (2020) provides online learning activities to grade 5 scholarship, ordinary level, advanced level, university level, etc. students. Therefore, it is vital to identify the students' satisfaction of online learning using the audiovisual method

Followings are the objectives of this study,

- To explore the magnitude of the major factors that affect the students' satisfaction of online learning using the audiovisual method in the Sabaragamuwa University of Sri Lanka.
- To identify students' overall and gender wise satisfaction towards online learning using the audiovisual method in the Sabaragamuwa University of Sri Lanka.

LITERATURE REVIEW

Anderson (2008) & Skylar (2009) divided online learning into two parts such as synchronous and asynchronous.

1. Synchronous - Students allow making a real-time interaction with lecturers
2. Asynchronous - Students can reach online materials anytime

Cummings (2020) illustrated 6 basic elements of effective online learning. These can be identified as,

1. Transparent Goal-Setting – As instructors, emphasize your goals every day and reemphasize them when you are with students. To navigate students to do online learning, arrange students' goals immediately and use those goals to evaluate students' works and close your unit with a transparent activity which reflects students' progress.
2. Proactive, Planned Communication – In online learning it is needed to be planned even small transactions. If students join each other with video conversations then should be

coordinated the timing of the video call with classmates.

3. A Balance among Structure and Choice – The classrooms with collaboration and discussion are to be required to pre-planned and online learning design provided facilities to divide than students' choice and private classes.

4. Elevation of the Faces and the Voices – When providing facilities to online learning your priority will be relationships. Does it mean when students connect? Does it synchronously or asynchronously? when they work solely? And when they join with a small group as a partner?

5. A Feedback Plan – The feedbacks from students to students, teachers to students, students to teachers are occurring in face-to-face. Due to minimum face actions, body language and other sensitive feedbacks online instructors design a one strong feedback system by using various feedbacks.

6. Student-Friendly Way Finding – The objective of the wayfinding design is to minimize cognitive load for the students. Make video walkthroughs, label the assignments clearly, use of calendars and the Gantt charts are some primary ways to finding methods for online learning.

According to Grigorovici, Nam & Russill (2003) internet and online learning materials have received the attention of all over the world, because the universities and the educators are linked to the internet. Currently, there are some uses of technology for online learning in "posting reading materials, posting class lecture notes, bulletin boards, chat rooms, and specialized software" such as,

- WebCT
- Use of search engines
- Examination tutorials
- Emails
- Instructor and web pages of course
- Course syllabus

According to Ahmad & Al-Khanjari (2011) in these days online learning is increasing with the developing information technology. Online learning is effective because it is easy to use. Therefore, students like to do the courses which use online learning and at the same time, the activities presented through online learning is preferred when compared to that given in face-to-face classrooms. The ideas and preferences of students can be enhanced if the instructors use emails as well.

Considering the students' sense of online learning technologies, research was conducted by Popovici & Mirnov (2015). Through this research, they identified that students' are well skilled to use technology in formal backgrounds and students already use e-learning technology to enhance their learning. Primary data analysis is used and then the online questionnaire method is used here to collect data. The sample size is 115 students. Correlation analysis, bar charts and column charts are used for data analysis and interpretation.

According to the research based personal differences on satisfaction of e-learning systems by Lu and Chiou (2010) revealed that gender and job position are considerably effect to the students' satisfaction of e-learning systems. The sample was the 520 students from 10 classes engaged in online education and the data was collected to using questionnaire method. ANOVA and structural equation modeling were used to analyze the data.

There are so many researches published about students' satisfaction of e-learning and students' satisfaction using audiovisual aids based on various countries. Some of the researches are based on audiovisual aids are Akhmetshin et al. (2019), Mohan et al. (2010), Singh

(2011), Kumar et al. (2013) and Min et al. (2007).

Rodríguez et al. (2015), Lu & Chiou (2010), Peng & Samah (2006), Rahmi et al. (2015), Pourghaznein et al. (2015), Bauk & Jusufranic (2014), Puska et al. (2020), Hammouri & Shanab (2018), Chow & Shi (2014), Sun et al. (2008), Ali (2012) and Goh et al. (2017) have done researches based on the students' satisfaction on e-learning. In Sri Lanka, there are few pieces of research which describe the students' satisfaction towards e-learning. Katukurunda et al. (2018) published research based on the students' satisfaction on program qualiity. Anderson (2008) wrote an article about chalanges of e-learning in Sri Lanka. Ragab & Noaman (2018) published an article by including an assessment model to evaluate satisfaction of students'. But there are no any research based on students' satisfaction of online learning using the audiovisual method in Sri Lanka.

Although there are lots of researches in the world about above areas none of the researchers paid their attention about students' satisfaction of e-learning using the audiovisual method and they did not directly gave attention to students' satisfaction on the audiovisual method or students' perception on audiovisual aids. Therefore, there is a clear research gap to be filled about the students' satisfaction of online learning using the audio-visual method.

METHODOLOGY

This study was carried out at SUSL. In SUSL, the student population is approximated to be 4000. To select the sample probability a sampling method was used. Among probability sampling methods, two-stage cluster sampling technique was selected as the sampling technique because a faculty is to be considered as a cluster and the sample is to be selected through 2 steps.

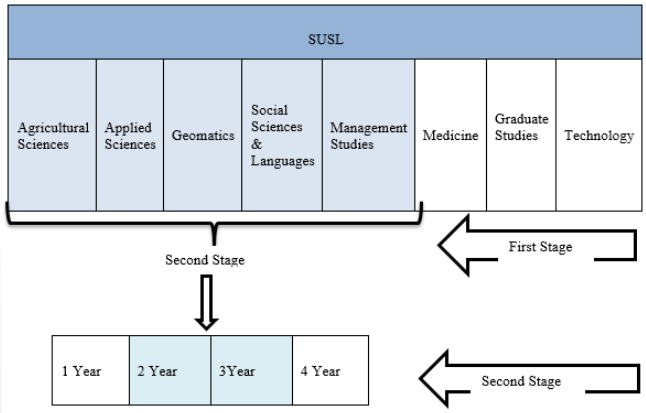


Figure 2 - Cluster stages of the population

Primary data collection method was to be used to collect the data because of all the related information regarding this research combined with the ongoing situation. Therefore, the mailed questionnaire was the main method used to collect the data as it was not possible to reach students physically during university closed periods. An online questionnaire was provided to all population units by sending the questionnaire to students' Whatsapp and Viber groups and directly to the previously collected emails. The questionnaire items were decided by considering the author's perceptions and referring to other articles. The questionnaire consisted of personal, perception, online learning and internet usage information.

The respondents who submitted the questionnaire were considered as the sample. Before the main questionnaire survey, a pilot survey was conducted to test the relevancy and understandability of the questionnaire to the survey. Twenty-five mailed questionnaires were sent to students out of which 20 submissions were received. Some questions were rearranged by considering students' responses. The sampling unit was the university student in SUSL. This was social science research because this research was focused to

consider a social matter. The mode of thinking was inductive because through this research a new knowledge was generated. This is an explanatory study with 2 variables and the response variable was students' perception and the independent variable was online learning using the audiovisual method.

The quantitative research approach was used to conduct the survey. The main data analyzing technique was a multiple linear regression analysis. One way ANOVA and mean comparison were used as a supportive technique. To further description graphical analysis using pie charts, column charts, bar charts and tabulations were used to interpret the data and correlation analysis also to be used.

Conceptual Framework

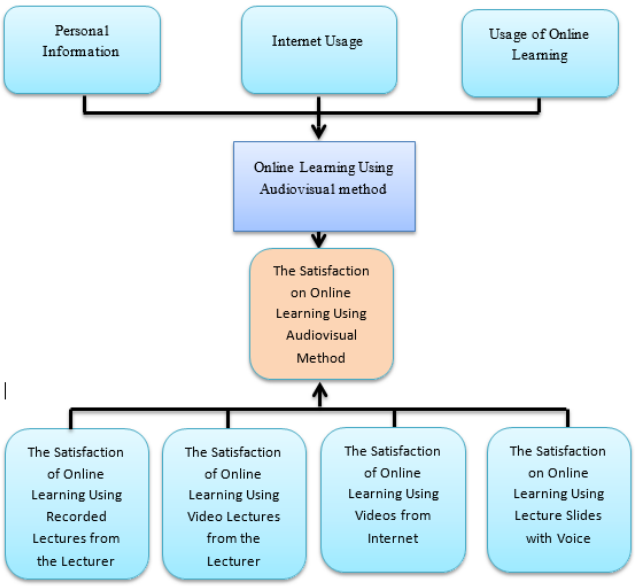


Figure 3 - Conceptual framework

Hypothesis

H1: Students' satisfaction of online learning using recorded lectures from the Lecturer depends on the personal information.

H2: Students' satisfaction of online learning using audiovisual method is depending on the internet usage information.

H3: Students' satisfaction of online learning using audiovisual method is depending on the information on online learning usage

DATA ANALYSIS

Students' satisfaction of online learning using the AV method was recorded under 4 categories.

I. Recorded video lectures from the lecturer

II. Online video lectures from the lecturer

III. Watch videos from the internet

IV. Lecture slides with voice

I. Recorded video lectures from the lecturer

Table 1 - Model summary

R-sq	R-sq(adj)	R-sq(pred)
42%	37%	31%

Source: Sample Survey (2020)

This model describes 42% proportion of students' satisfaction on online learning using recorded video lectures from the lecturer.

Test of model significance

Table 2 - Contribution and the significance of the model

Source	Contribution	P-Value
Regression	41.83%	0.000
AV lecture hours	0.05%	0.007
Subjects per semester	0.00%	0.023
Satisfaction-live video lectures	8.88%	0.006
Satisfaction-videos from internet	3.06%	0.010
Satisfaction- lecture slides with voice	9.94%	0.000
Understanding	5.39%	0.000
Faculty	7.25%	0.000
Recharge methods	2.92%	0.014
Signal to watch videos	1.39%	0.034
Online material	2.93%	0.043
Error	58.17%	
Total	100.00%	

Source: Sample Survey (2020)

To make the model valid enough to describe the students' satisfaction on online learning using recorded video lectures from the lecturer, significant variables are included in the model. However, the evaluation of R square value resulted in a low value indicating that all the explanatory variables that describe the model are not accounted for the model. The reason for the aforementioned factor is that the feelings of the persons are difficult to measure exactly quantitatively. This model fits under the 0.05 alpha level. Therefore, the low explanatory power of this model does not indicate that the model is not good.

The influential factors for the students' satisfaction of recorded video lectures from the lecturer are as follows.

- Satisfactions of recorded video lectures and lecture slides with the voice from the lecturer
- Faculty of studies

AV lecture hours, subjects per semester and signal coverage to watch videos have a very small effect to determine students' satisfaction of online learning using the AV method.

Test of parameter significance

Table 3 - Coefficients

Term	SE Coef	P-Value	VIF
Constant	9.30	0.001	
AV lecture hours	0.139	0.007	1.25
Subjects per semester	0.518	0.023	1.70
Satisfaction – live video lectures	0.0714	0.006	1.42
Satisfaction- videos from the internet	0.0596	0.010	1.25
Satisfaction- lecture slides with voice	0.0617	0.000	1.60
Understanding	0.0645	0.000	1.22
Faculty			
• Applied Sciences	5.75	0.277	3.50
• Geomatics	7.19	0.833	1.72
• Social Sciences & Languages	5.27	0.003	4.25
• Management	5.90	0.745	3.85
Recharge methods			
• Mobile apps	6.78	0.007	1.62
• Postpaid bills	5.33	0.001	2.63
• Data cards	4.64	0.003	3.07
• Other	11.8	0.500	1.21
Signal to watch videos			
• No	4.99	0.011	1.21
• Sometimes	2.99	0.187	1.38
Online material			
• Lecture slides – without voice	4.09	0.584	1.62
• Video lectures – recorded lectures from the lecturer	4.74	0.045	1.59
• Video lectures – online lectures from the lecturer	3.54	0.239	1.80
• Audio lectures – recorded lectures from the lecturer	6.95	0.770	1.23
• Audio lectures – online lectures from the lecturer	6.76	0.728	1.25
• From the web – video materials of another person's	15.8	0.118	1.09

Source: Sample Survey (2020)

Variance Inflation Factor (VIF) values of all the parameters are less than 10 and all values are around 1. It indicates that the fitted model is good and no Multicollinearity situation.

Regression equation

Students' satisfaction of online learning using recorded video lectures from the lecturer =

+32.00 Constant
-0.377 AV lecture hours
-1.188 Subjects per semester
+0.1962 Satisfaction – live video lectures
+0.1538 Satisfaction- videos from the internet
+0.2679 Satisfaction- lecture slides with voice
+0.2869 Understanding
+0.00 Faculty of Agriculture
-6.26 Faculty of Applied Sciences
-1.52 Faculty of Geomatics
-15.54 Faculty of Social Sciences & Languages
+1.92 Faculty of Management
+0.00 Recharging through internet banking
-18.28 Recharging through Mobile apps
-17.14 Recharging through Postpaid bills
-14.12 Recharging through Data cards
-8.0 Recharging through Other methods
+0.00 Having signals to watch videos
+12.75 No Signal to watch videos
+3.96 Sometimes Signal to watch videos
+0.00 Lecture slides – with voice
-2.24 Lecture slides – without voice
+9.52 Video lectures – recorded lectures from the lecturer
-4.18 Video lectures – online lectures from the lecturer
+2.03 Audio lectures – recorded lectures from the lecturer
+2.35 Audio lectures – online lectures from the lecturer
+24.7 From the web – video materials of another person's

Source: Sample Survey (2020)

With the effect of no factors, students' satisfaction using recorded video lectures is 32%.

When all the other factors are constant,

- If students have to increase AV lectures by an additional hour with the lecturer per week, satisfaction of recorded video lectures will be decreased by 0.377%.
- If the number of subjects per semester increases by 1 subject, satisfaction using recorded video lectures will be decreased by 1.188%.
- If students' satisfaction of online video lectures increases by 1%, the satisfaction of recorded video lectures will be increased by 0.1962%.
- If students' satisfaction of online learning by watching videos from internet increase by 1%, the satisfaction of recorded video lectures will be increased by 0.1538%.
- If students' satisfaction with online learning using lecture slides increase by 1%, the satisfaction of recorded video lectures will be increased by 0.2679%.
- If students' understanding of online learning using the AV method increases by 1%, the satisfaction of recorded video lectures will be increased by 0.2869%.
- When compared to the students in the Faculty of Agriculture, if students' faculty is the Faculty of Social Science & Languages, the satisfaction of recorded video lectures will be decreased by 15.54%.
- When compared to internet banking, if students use mobile apps to recharge, the satisfaction of recorded video lectures will be decreased by 18.28%.
- When compared to internet banking, if a student uses data cards to recharge, the satisfaction of recorded

video lectures will be decreased by 14.12%.

- When compared to internet banking, if students use postpaid bills to recharge, the satisfaction of recorded video lectures will be decreased by 17.14%.
- If students have no signal to watch videos from the internet rather than having signal, the satisfaction of recorded video lectures will be increased by 12.75%.
- When compared to lecture slides with voice, if students use video lectures (recorded lectures from the lecturer) as the main method to receive online materials, the satisfaction of recorded video lectures will be increased by 9.52%.

II. Live video lectures from the lecturer

Table 4 - Model summary

R-sq	R-sq(adj)	R-sq(pred)
42%	36%	*

Source: Sample Survey (2020)

This model describes 42% proportion of students' satisfaction of online learning using live video lectures from the lecturer.

Table 5 - Contribution and the significance of the model

Source	Contribution	P-Value
Regression	42.45%	0.000
Signal coverage in the area	0.07%	0.043
Satisfaction-videos from internet	8.49%	0.001
Satisfaction- lecture slides with voice	11.18%	0.000
Effectiveness	2.36%	0.034
Satisfaction- recorded video lectures	0.76%	0.017
Gender	2.65%	0.014
Faculty	1.75%	0.028
Father' job	4.30%	0.002
Signal to watch videos	1.67%	0.015
Online material	3.65%	0.013
Internet connecting instrument	1.93%	0.022
Mother' job	3.64%	0.003
Error	57.55%	
Total	100.00%	

As explained for the model for "recorded video lectures from the lecturer" model is developed with significant variable. Though the R square value is low, this model fits under 0.05 alpha level.

The most influential factors for the students' satisfaction of live video lectures from the lecturer are as follows.

- Satisfactions of lecture slides with the voice from the lecturer and videos from the internet.
- Parents' occupations

But the satisfaction of recorded video lectures has a very small effect on the satisfaction of live video lectures. Signal coverage in the area to watch videos, faculty of study and sources to internet access has very small effect to determine students' satisfaction of online learning using the AV method.

Test of parameter significance

Table 6 - Coefficients

Term	SE Coef	P-Value	VIF
Constant	10.800	0.215	
Signal coverage in the area	0.576	0.043	2.04
Satisfaction- videos from internet	0.0471	0.001	1.24
Satisfaction – lecture slides with voice	0.0501	0.000	1.68
Effectiveness	0.0502	0.034	1.28
Satisfaction- recorded lectures	0.0462	0.017	1.53
Gender			
• Male	2.73	0.014	1.24
Faculty			
• Applied Sciences	4.53	0.305	3.45
• Geomatics	5.92	0.989	1.86
• Social Sciences & Languages	4.08	0.058	4.06
• Management Studies	4.53	0.922	3.62
Father' job			
• Permanent job – Private sector	3.57	0.040	1.57
• Not a permanent job	2.82	0.001	1.86
• Not doing a job	3.98	0.000	1.45
• Father is not alive	4.25	0.030	1.34
Signal to watch videos			
• No	4.71	0.007	1.71
• Sometimes	2.82	0.644	1.96

Online material			
• Lecture slides – without voice	3.26	0.211	1.63
• Video lectures – recorded lectures from the lecturer	3.80	0.130	1.63
• Video lectures – online lectures from the lecturer	2.90	0.009	1.91
• Audio lectures – recorded lectures from the lecturer	5.70	0.065	1.31
• Audio lectures – online lectures from the lecturer	5.51	0.128	1.32
• From the web – video materials of another person's	12.4	0.686	1.08
Internet connecting instrument			
• Laptop	7.69	0.005	12.46
• Smart phone	7.63	0.025	12.80
• Tablet	18.9	0.174	1.25
Mother' job			
• Permanent job – Private sector	5.86	0.338	1.39
• Not a permanent job	4.16	0.513	1.73
• Not doing a job	2.99	0.006	2.04
• Mother is not alive	8.28	0.159	1.18

Source: Sample Survey (2020)

Variance Inflation Factor (VIF) values of all the parameters are less than 10 and all values are around 1. It indicates that fitted model is good and no any Multicollinearity situation.

Regression equation

Students' satisfaction on online learning using live video lectures from the lecturer

13.4 Constant
-1.169 Signal coverage in the area
+0.1554 Satisfaction- videos from internet
+0.2482 Satisfaction – lecture slides with voice
+0.1068 Effectiveness
+0.1112 Satisfaction- recorded lectures
-6.72 Male
4.66 Faculty of Applied Sciences
0.08 Faculty of Geomatics
7.77 Faculty of Social Sciences & Languages
-0.44 Faculty of Management Studies
-7.36 Permanent job – Private sector (Father)
-9.42 Not a permanent job(Father)
-14.47 Not doing a job(Father)
-9.28 Father is not alive
-12.72 No Signal to watch videos
-1.30 Sometimes Signal to watch videos
4.09 Lecture slides – without voice
5.77 Video lectures – recorded lectures from the lecturer
7.58 Video lectures – online lectures from the lecturer
-10.54 Audio lectures – recorded lectures from the lecturer
8.41 Audio lectures – online lectures from the lecturer
5.0 From the web – video materials of another person's
21.55 Connect by Laptop
17.17 Connect by Smart phone
25.8 Connect by Tablet
5.62 Permanent job – Private sector (Mother)
-2.73 Not a permanent job(Mother)
8.24 Not doing a job(Mother)
11.70 Mother is not alive

Source: Sample Survey (2020)

With the effect of no factors, students' satisfaction using online video lectures is 13.4 units.

When all the other factors are constant,

- If signal coverage in the area increase by 1 unit, satisfaction on online video lectures will be decreased by 1.169%.
- If students' satisfaction on online learning by watching videos from internet increase by 1%, satisfaction on online video lectures will be increased by 0.1554%.
- If students' satisfaction on online learning using lecture slides increase by

1%, satisfaction on online video lectures will be increased by 0.2482%.

- If students' effectiveness of online learning using the AV method increase by 1 unit, satisfaction on recorded video lectures will be increased by 0.1068%.
- If students' satisfaction on online learning using recorded video lectures from the lecturer increase by 1%, satisfaction on online video lectures will be increased by 0.2482%.
- When compared to female students, if the student is male, satisfaction on online video lectures will be decreased by 6.72%.
- When compared to student's father is doing a permanent job in the government sector, if student's father is doing a permanent job in the private sector, satisfaction on online video lectures will be decreased by 7.36%.
- When compared to student's father is doing a permanent job in the government sector, if the student's father is not doing a permanent job, satisfaction on online video lectures will be decreased by 9.42%.
- When compared to students' father is doing a permanent job in the government sector, if the student's father is not doing a job, satisfaction on online video lectures will be decreased by 9.42%.
- When compared to student's father is doing a permanent job in the government sector, if the student's father is not alive, satisfaction on online video lectures will be decreased by 14.47%.
- If students have no signal to watch videos from the internet rather than having signal, satisfaction on online video lectures will be decreased by 12.72%.
- When compared to lecture slides with voice, if students use video lectures (online lectures from the lecturer) as the main method to receive online materials, satisfaction on online video lectures will be increased by 7.58 units.
- When compared to desktop, if students use the laptop to connect to the internet, the satisfaction of recorded lectures will be increased by 21.55%.
- When compared to desktop, if students use the smartphone to connect to the internet, satisfaction on online video lectures will be increased by 17.17%.
- When compared to student's mother is doing a permanent job in the government sector, if the student's mother is not doing a job, satisfaction on online video lectures will be increased by 8.24%.

III. Watch videos from the internet

Table 7 - Model summary

R-sq	R-sq(adj)	R-sq(pred)
30%	26%	21%

Source: Sample Survey (2020)

This model describes a 30% proportion of students' satisfaction in online learning by watching videos from the internet.

Test of model significance

Table 8 - Contribution and the significance of the model

Source	Contribution	P-Value
Regression	29.84%	0.000
Satisfaction – live video lectures	8.51%	0.000
Satisfaction – recorded video lectures	2.82%	0.002
Current usage of online learning	0.93%	0.004
Subjects per semester	0.95%	0.002
A/L stream	7.19%	0.000
Most like method to online learning	2.78%	0.015
Signal coverage to join video lectures	4.84%	0.000
Online learning method	1.82%	0.032
Error	70.16%	
Lack-of-Fit	70.16%	
Total	100.00%	

Source: Sample Survey (2020)

According to the above table,

P-Value < α, therefore, null hypothesis, H_0 is rejected.

0.000 < 0.05, therefore there is enough evidence to reject H_0 at 95% confidence level.

It indicates that the model is significant and this model is a good model to describe the students' satisfaction on online learning by watching videos from the internet. The conclusion made depending on the R square value alphas level is as explained in previous sections.

The most influential factors for the students' satisfaction to watch videos from the internet are as follows.

- The satisfaction of live video lectures from the lecturer
- A/L stream
- Time flexibility in accessing the videos when internet coverage is good

But the satisfaction of recorded video lectures has a very small effect on the satisfaction of watch videos from the internet. Online learning method, subjects per semester and current usage of online learning have very small effect to determine students' satisfaction of watch videos from the internet.

Test of parameter significance

Table 9 - Coefficients

Term	SE Coef	P-Value	VIF
Constant	9.62	0.000	
Satisfaction – live video lectures	0.0630	0.000	1.21
Satisfaction – recorded video lectures	0.0498	0.002	1.22
Current usage of online learning	0.571	0.004	1.19
Subjects per semester	0.428	0.002	1.26
A/L stream			
• Commerce	3.04	0.006	1.46
• Mathematics	5.80	0.178	1.15
• Biological Science	3.86	0.000	1.50
• Physical Science	8.67	0.090	1.06
• Technology	10.70	0.046	1.08
Most like method to online learning			
• Only audio	8.58	0.004	6.96
• AV method	8.19	0.012	7.06
Signal coverage to join video lectures			
• No	4.65	0.639	1.19
• Sometimes	2.66	0.000	1.20
Online learning method			
• Email	4.41	0.202	1.33
• Zoom	2.81	0.122	1.30

Source: Sample Survey (2020)

Variance Inflation Factor (VIF) values of all the parameters are less than 10 and all values are around 1. It indicates that the fitted model is good and no Multicollinearity situation.

Regression equation

Students' satisfaction on online learning by watching videos

From the internet =

+40.24 Constant
+0.2380 Satisfaction – live video lectures
+0.1540 Satisfaction – recorded video lectures
+1.648 Current usage of online learning
+1.357 Subjects per semester
+0.00 Arts
-8.43 Commerce
-7.84 Mathematics
-21.22 Biological Science
+14.75 Physical Science
-21.3 Technology
+0.00 Most like method is reading
-24.93 Most like method is audio
-20.71 Most like method is AV method
+0.00 Having signal to join video lectures
+2.18 No signal to join video lectures
-10.58 Sometimes signal to join video lectures
+0.00 Online learning method is LMS
+5.65 Online learning method is Email
-4.36 Online learning method is zoom

Source: Sample Survey (2020)

With the effect of no factors, students' satisfaction of online learning by watching videos from the internet is 40.24%.

When all the other factors are constant,

- If students' satisfaction on online learning using live video lectures with the lecturer increase by 1%, satisfaction on watching videos from the internet will be increased by 0.2380%.

- If students' satisfaction on online learning using recorded video lectures from the lecturer increase by 1%, satisfaction on watching videos from the internet will be increased by 0.1540%.
- If students' usage of online learning increases by 1 unit, satisfaction on watching videos from the internet will be increased by 1.648%.
- If the number of subjects per semester increases by 1 subject, satisfaction using watching videos from the internet will be decreased by 1.357%.
- When compared to the arts stream, if students did commerce as the A\L stream, satisfaction on watching videos from the internet will be decreased by 8.43%.
- When compared to the arts stream, if students did biological science as the A\L stream, satisfaction on watching videos from the internet will be decreased by 21.22%.
- When compared to the arts stream, if students did technology as the A\L stream, satisfaction on watching videos from the internet will be decreased by 21.3%.
- When compared to reading, if students' most like method to use in online learning is audio, satisfaction on watching videos from the internet will be decreased by 24.93%.
- When compared to reading, if students' most like method to use in online learning is audio, satisfaction on watching videos from the internet will be decreased by 20.71%.
- If students sometimes have signal to join video lectures with the lecturer via the internet rather than have signals, satisfaction on watching videos from the internet will be decreased by 10.58%.

IV. Lecture slides with voice

Table 10 - Model summary

R-sq	R-sq(adj)	R-sq(pred)
44%	41%	37%

Source: Sample Survey (2020)

This model describes 44% proportion of students' satisfaction in online learning by using lecture slides with voice.

Test of model significance

Table 11 - Contribution and the significance of the model

Source	Contribution	P-Value
Regression	44.05%	0.000
Satisfaction- live video lectures	16.27%	0.000
English skills	0.61%	0.002
Satisfaction- recorded video lectures	9.91%	0.000
Subjects per semester	6.93%	0.008
Faculty	6.08%	0.001
Year	1.14%	0.039
Most like method to online learning	1.23%	0.021
Effectiveness	0.80%	0.035
Gender	1.08%	0.023
Error	55.95%	
Total	100.00%	

Source: Sample Survey (2020)

According to the above table,

$0.000 < 0.05$ □ P-Value $< \alpha$

Therefore, there is enough evidence to reject H_0 at 95% confidence level.

It indicates that the model is significant and it is a good model to describe the students' satisfaction on online learning by using lecture slides with voice. But less R square value means all the explanatory variables that describe the model were not accounted for the model because feelings of persons are difficult to measure exactly. Although the explanatory power is less in this model does not indicate this model is not good because this model fits under 0.05 alpha level.

The most influential factors for the students' satisfaction of lecture slides with voice are as follows.

- Satisfactions of live and recorded video lectures from the lecturer
- Subjects per semester
- Faculty of study

The following factors are having very less effect on students' satisfaction to watch videos from the internet.

- The most preferred method of online learning
- Study year
- Effectiveness of online learning
- English skills
- Gender

Test of parameter significance

Table 12 - Coefficients

Term	SE Coef	P-Value	VIF
Constant	10.50	0.003	
Satisfaction- live video lectures	0.0630	0.000	1.27
English skills	0.663	0.002	1.14
Satisfaction- recorded video lectures	0.0493	0.000	1.26
Subjects per semester	0.484	0.008	1.71
Faculty			
• Applied Sciences	5.21	0.000	3.31
• Geomatics	6.80	0.394	1.78
• Social Sciences & Languages	4.77	0.039	4.01
• Management Studies	5.14	0.006	3.38
Year			
• Third year	2.83	0.039	1.45
Most like method to online learning			
• Only audio	8.31	0.014	6.89
• AV method	7.84	0.087	6.85
Effectiveness	0.0565	0.035	1.18
Gender			
• Male	3.19	0.023	1.22

Source: Sample Survey (2020)

Variance Inflation Factor (VIF) values of all the parameters are less than 10 and all values are around 1. It indicates that fitted model is good and no any Multicollinearity situation.

Regression equation

Students' satisfaction of online learning using lecture
slides with voice

+32.0 Constant
+0.2629 Satisfaction- live video lectures
-2.050 English skills
+0.2851 Satisfaction- recorded video lectures
+1.297 Subjects per semester
+0.00 Faculty of Agriculture
+20.45 Faculty of Applied Sciences
+5.80 Faculty of Geomatics
+9.89 Faculty of Social Sciences & Languages
+14.35 Faculty of Management Studies
+0.00 Second year
-5.88 Third year
+0.00 Most like method to online learning is reading
-20.52 Most like method to online learning is audio
-13.47 Most like method to online learning is AV method
+0.1199 Effectiveness
+0.00 Gender
-7.28 Male

Source: Sample Survey (2020)

With the effect of no factors, students' satisfaction on online learning using lecture slides with voice is 32%.

When all the other factors are constant,

- If students' satisfaction on online video lectures increases by 1%, satisfaction on lecture slides with voice will be increased by 0.2629%.
- If students' English skills increase by 1 unit, satisfaction on lecture slides with voice will be decreased by 2.05%.
- If students' satisfaction on online learning using recorded video lectures increase by 1%, satisfaction on lecture slides with voice will be increased by 0.2851%.
- If the number of subjects per semester increases by 1 subject,

satisfaction using lecture slides with voice will be decreased by 1.297%.

- When compared to students in Faculty of Agriculture, if student's faculty is Faculty of Applied Sciences, satisfaction on lecture slides with voice will be increased by 20.45%.
- When compared to students in the Faculty of Agriculture, if student's faculty is Faculty of Geomatics, satisfaction on lecture slides with voice will be increased by 20.45%.
- When compared to students in the Faculty of Agriculture, if student's faculty is Faculty of Social Sciences & Languages, satisfaction on lecture slides with voice will be increased by 20.45%.
- When compared to students in the Faculty of Agriculture, if student's faculty is Faculty of Management Studies, satisfaction on lecture slides with voice will be increased by 20.45%.
- When compared to the second year, if a student is in the third year, satisfaction on lecture slides with voice will be decreased by 5.88%.
- When compared to reading, if student's most like online learning method is audio, satisfaction on lecture slides with voice will be decreased by 20.52%.
- When compared to reading, if student's most like online learning method is the AV method, satisfaction on lecture slides with voice will be decreased by 13.47%.
- If students' effectiveness of online learning using the AV method increase by 1 unit, satisfaction on lecture slides with voice will be increased by 0.1199%.
- When compared to female students, if the student is male, satisfaction on lecture slides with voice will be decreased by 7.28%.

DISCUSSION

Test Students' satisfaction on,

1. Recorded video lectures from the lecturer
2. Online video lectures from the lecturer
3. Videos from internet
4. Lecturer slides with voice are equal or not,

Hypothesis

H0: All means are equal H1: Not all means are equal If P-Value < α (0.05), H0 can be rejected at 95% confidence level.

Equal variances were assumed for the analysis.

Table 13 - Analysis of variance

Source	DF	P-Value
Factor	3	0.000
Error	1136	
Total	1139	

Source: Sample Survey (2020)

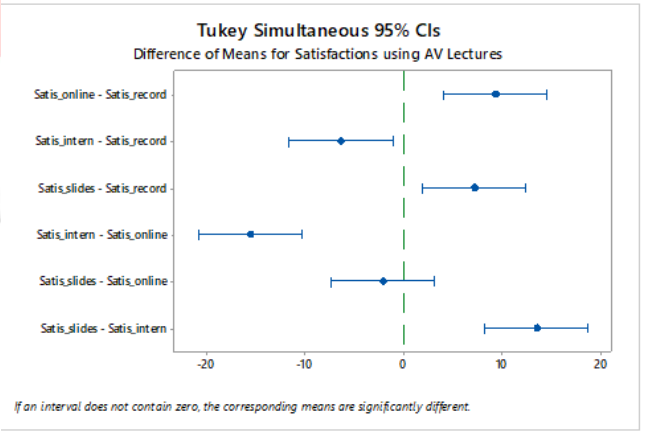
According to the above table,

0.000 < 0.05 □ P-Value < α

Therefore, H_0 with a 95% confidence level is rejected.

It indicates that students' satisfaction in online learning using the above 4 categories is different.

Figure 4 - Test the satisfaction difference between different AV methods

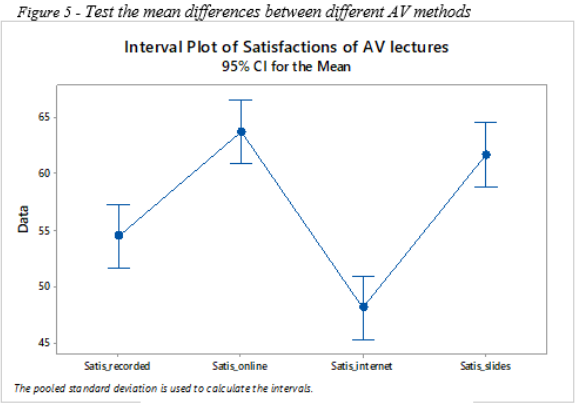


Source: Sample Survey (2020)

According to the above plot,

- Students' satisfaction of live video lectures from the lecturer and recorded video lectures from the lecturer are different.
- Students' satisfaction of watch videos from the internet and recorded video lectures from the lecturer are different.
- Students' satisfaction of lecture slides with voice and recorded video lectures from the lecturer are different.
- Students' satisfaction of watch videos from the internet and live video lectures from the lecturer is different.
- Students' satisfaction of lecture slides with voice and live video lectures from the lecturer is same.
- Students' satisfaction of lecture slides with voice and watch videos from the internet are different.

Figure 5 - Test the mean differences between different AV methods



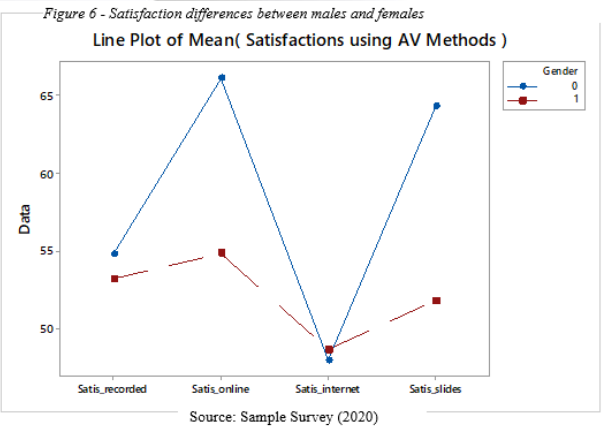
Source: Sample Survey (2020)

Students' Average satisfaction when compared to face-to-face classroom,

- Students' satisfaction of online learning using recorded video lectures from the lecturer is 54%.
- Students' satisfaction of online learning using live video lectures from the lecturer is 64%.
- Students' satisfaction with online learning by watching videos from the internet is 48%.
- Students' satisfaction of online learning using lecture slides with the voice from the lecturer is 62%.
- Students' overall satisfaction of online learning using the AV method is 57%.

Gender wise satisfaction

Figure 6 - Satisfaction differences between males and females



Source: Sample Survey (2020)

Students' satisfaction between male and female students have a considerable difference when online learning using live video lectures and lecture slides with voice.

Female students' average satisfaction when compared to face-to-face classroom

- Female Students' satisfaction of online learning using recorded video lectures from the lecturer is 55%.
- Female Students' satisfaction with online learning using live video lectures from the lecturer is 66%.
- Female Students' satisfaction with online learning by watching videos from the internet is 48%.
- Female Students' satisfaction of online learning using lecture slides with the voice from the lecturer is 64%.

- Female Students' overall satisfaction of online learning using the AV method is 58%.

Male students' average satisfactions when compared to face-to-face classroom

- Male Students' satisfaction of online learning using recorded video lectures from the lecturer is 53%.
- Male Students' satisfaction of online learning using live video lectures from the lecturer is 55%.
- Male Students' satisfaction with online learning by watching videos from the internet is 49%.
- Male Students' satisfaction of online learning using lecture slides with the voice from the lecturer is 52%.
- Male Students' overall satisfaction of online learning using the AV method is 52%.

Comparisons of satisfaction between male and female students

- Female students are more satisfied with AV online learning except learning by watching videos from the internet than male students.
- Female satisfaction is 2% higher than males while online learning using recorded video lectures from the lecturer.
- Female satisfaction is 11% higher than males while online learning using live video lectures from the lecturer.
- Female satisfaction is 12% higher than males while online learning using lecture slides with the voice from the lecturer.
- Male satisfaction is only 1% higher than females while online learning by watching videos from the internet.

CONCLUSION

There are four main methods of online learning, i) recorded lectures from the lecturer ii) online lectures from the lecturer, iii) watching videos from the internet and iv) lecture slides with voice. Students' satisfactions on these different online learning methods are not the same.

Students' satisfaction on,

online learning using recorded video lectures from the lecturer < online video lecturers

online learning using videos from internet < online video lecturers

online learning using lecture slides with voice = online video lecturers

online learning using recorded lectures > watching videos from the internet

The evaluation results indicate that the students' satisfaction is higher when online learning is carried out using lecture slides with voice and online video lectures from the lecturer than other methods. Students' satisfaction is minimum when doing online learning activities by watching videos from the internet.

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