Jurnal Teknologi Pendidikan, August 2022, 24 (2), 271-282
DOI: http://dx.doi.org/10.21009/JTP2001.6
p-ISSN: 1411-2744 e-ISSN: 2620-3081
Accredited by Directorate General of Strengthening for Research and Development
Available online at http://journal.unj.ac.id/unj/index.php/jtp

Development of Website-Based Statistics Learning Videos

Dewi Juliah Ratnaningsih[1(*)], Siti Hadijah Hasanah[2]
[1,2]Faculty of Science and Technology, Universitas Terbuka, South Tangerang, Indonesia

Received: : May 25, 2022
Revised: : August 26, 2022
Accepted: : August 27, 2022

Abstract

One One source of learning is teaching materials. In distance education, learning resources are designed for self-study and self-instruction. The separation of lecturers and students needs to be bridged with learning materials that can be understood by students. Video is one form of learning material that can be used to help students understand the material. This study aims to examine the effectiveness of learning videos in helping motivate students in the learning process, the components in videos that significantly support student understanding, and the effective duration of website-based learning videos. The method used in this study is research and development. The novelty in this research is the existence of learning videos that can guide students in understanding website-based statistical data analysis. This video can be used as a data analysis practicum material that is easily understood by students. The material presented in the video is in the form of concepts or theories and examples of their application using R-software. The results of the study show that the learning materials delivered through videos for lectures that are difficult for students to perceive are more effective and easy to understand. An important component in the video that can motivate students is the intro, greeting, and outro. In addition, the duration of the delivery of the material is also very significant. The effective video duration in learning website-based statistical data analysis is 10-15 minutes. Components of presenting material that is in great demand by students in discussing sample questions and their applications using R-software.

Keywords: data analysis, distance education, learning videos, statistics

(*) Corresponding Author: djuli@ecampus.ut.ac.id, 085288843696

How to Cite: Dewi Juliah Ratnaningsih, & Hasanah, S. H. (2022). Development of Website-Based Statistics Learning Videos. JTP - Jurnal Teknologi Pendidikan, 24(2), 271-282. https://doi.org/10.21009/jtp.v24i2.27153

INTRODUCTION

Distance Education System requires students to be able to study independently (Triana & Aisyah, 2021). Learning through a distance system means that students do not directly face to face with the lecturer of the subject concerned. However, it is necessary to have learning support facilities that are effective, easily accessible, and understood by students.

Learning materials are one source of learning in the learning process (Saragih et al., 2012). Likewise, at the Universitas Terbuka (UT) which implements a distance education system, learning materials are the main thing for students. The Learning materials developed by UT include printed learning materials and non-printed learning material (Universitas Terbuka, 2020). Until now, printed learning materials are the dominant learning materials in demand by students. However, the level of difficulty of the material is inseparable from the consideration of providing non-printed learning materials to help students understand the learning materials.

Universitas Terbuka provides learning materials as a source of learning for students. Available learning materials include (Universitas Terbuka, 2020):

1. Main Learning materials
   Main learning materials at UT consist of a module, a module that is integrated with audio/visual/graphics (or also known as module plus), and practice guides/practicum which is packaged in printed and digital forms.
2. Supporting Learning materials
   Supporting learning materials at UT are in the form of audio CDs, audio graphic CDs, video CDs, interactive video CDs, computer-assisted learning materials, and online-based enrichment materials.

In addition to printed learning materials and non-printed learning materials, UT also provides a Practical KIT for practical courses. However, this KIT is only for some study programs such as PGSD and PGPAUD. In general, printed learning materials in the form of a module are one of the learning materials that must be owned and is most often used by students for all types of services (SIPAS or non-SIPAS) and study programs. However, UT also provides free non- printed learning materials in the form of digital learning materials and learning materials in the Virtual Reading Room (RBV), which is always being developed so that students can enjoy learning facilities both online and offline. Students can obtain digital learning materials through the UT website and can be downloaded so that they can be read offline. However, this digital learning materials are only for certain courses taken by students at that time, and once downloaded, the learning materials cannot be printed. Meanwhile, the learning materials at RBV can be accessed by students on the UT website and can only be read online and cannot be downloaded by students (Universitas Terbuka, 2019). Of course, these two types of learning materials are very easy to carry everywhere and will make it easier for students to study anywhere and anytime.

The content contained in the non-printed learning materials are in the form of digital learning materials and learning materials on the RBV, the same as the content contained in the printed learning materials type module. Students can choose what kind of learning materials they like (printed or non-printed). Because printed learning materials and non-printed learning materials are always being developed, students must pay attention to and have learning materials with the most recent editions.

The forms of non-printed learning materials that have been developed by UT include audio cassettes, audio CDs, audio graphic CDs, video CDs, interactive video CDs, computer-aided learning materials, and web supplements which are an integral part of the module (Universitas Terbuka, 2020). However, not all courses have non-printed learning materials as specified. This is due to the busyness of the lecturers and the excessive workload of the lecturers. In addition, not all courses are appropriate to be developed with the existing non-printed learning materials. The suitability of the developed non-printed learning materials form needs to consider the criteria and characteristics of UT courses and students. Therefore, it is necessary to conduct another study regarding the form of non-printed learning materials that is by the characteristics of the course and students.

Statistics Study Program is one of the study programs in the Mathematics and Natural Sciences Department at the UT Faculty of Science and Technology (FST).

There are 48 courses offered to students, including 6 MKDU courses, 8 cross-faculty supporting courses, and the remaining 34 cognate courses, namely statistics and mathematics courses (Universitas Terbuka, 2021). Characteristics 34 statistics courses have different characteristics and levels of difficulty. Therefore, the development of learning materials supplements material also differs depending on the characteristics of the course.

In some courses, student graduation rates are very low, especially in theoretical subjects, such as Introduction to Probability, Introduction to Mathematical Statistics I, Introduction to Mathematical Statistics II, Sampling, and Introduction to Stochastic Processes. In addition, as a statistician, a statistics graduate should at least be able to operate data processing software and perform data analysis precisely and accurately. For this reason, students need to do a data processing practicum which can be facilitated by using open source software (Tim Kurikulum Prodi S1 Statistika, 2013). Students can understand the steps of data processing and perform data analysis using web-based online practicum facilities. For this purpose, it is necessary to conduct a study on the development of learning materials supplement and web-based data analysis practicum for Statistics students. It is hoped that through the provision of learning services like this, students' understanding of the subject matter will increase. In turn, the passing rate of the courses and the achievement of the student achievement index increased.

Website development is one of the most important aspects of any website, as the development of the site works on coding and programming to make web pages work properly (Ugli et al., 2020). Meanwhile, free site builders can come up with a way to create their site which is not only on a website that will be developed according to taste but also can easily use software such as a Content Management System (CMS) (Vasuthaven & Kaur, 2020). CMS is a dynamic website application that uses a database. This application aims to manage website content in terms of creating, editing, organizing, deleting, and storing HTML content in a way that can be easily managed (Kadam, 2015; Kumar & Nath, 2016). This CMS is applied in website development in the Statistics Study Program and as a way of developing the distance education system at the UT.

Web-based video development is becoming an important and effective part of an educational tool in higher education by considering three aspects, namely how to maximize student engagement with videos, how to manage the cognitive content of videos, and how to promote active learning from videos (Brame, 2016). Quality learning videos according to (Lange & Costley, 2020) are divided based on 5 main categories consisting of quality, clarity, media diversity, suitability, and speed. Some quite effective applicationsare used for online learning media, namely youtube (Rahmatika et al., 2021) and MOOCs (Yousef et al., 2014). Most students think that the use of video media and the occasional use of audio media is a good way to increase their learning motivation (Wardhana & Muhammad, 2021; Chan, 2010). Education currently uses video-based learning (VBL) and VBL is the most powerful approach in increasing learning outcomes and teacher satisfaction (Ou et al., 2019; Beheshti et al., 2018; Scagnoli et al., 2017; Yousef et al., 2014). Based on two-way ANOVA statistics, the learning achievement of students who are taught using Youtube videos is higher when compared to students who are not taught using Youtube videos and students' writing achievement, visual learning style better than

the audio learning style students in the experimental group (Felanie, 2021; Yusuf & Agung, 2021).

Based on these problems, it is necessary to study the development of teaching material supplements and web-based data analysis practicum. The novelty in this research is the existence of learning videos that can guide students in understanding website-based statistical data analysis. This video can be used as a data analysis practicum material that is easily understood by students. The material presented in the video is in the form of concepts or theories and examples of their application using R software, one of the open source software that is often used by statisticians. In addition, it is hoped that with this website-based learning video, students can learn the material more pleasantly. This web-based data analysis practicum facility is expected to provide skills to students to be able to process data and be able to analyze it precisely and accurately. The skills obtained can add to the soft skills of students in data analysis activities. It is expected that Statistka students can make sharp, precise, and accurate data analyses in decision-making and can predict data well and accurately.

METHODS

The method in this study uses a research and development (R&D) approach. The research method was carried out based on the framework presented in figure 1.

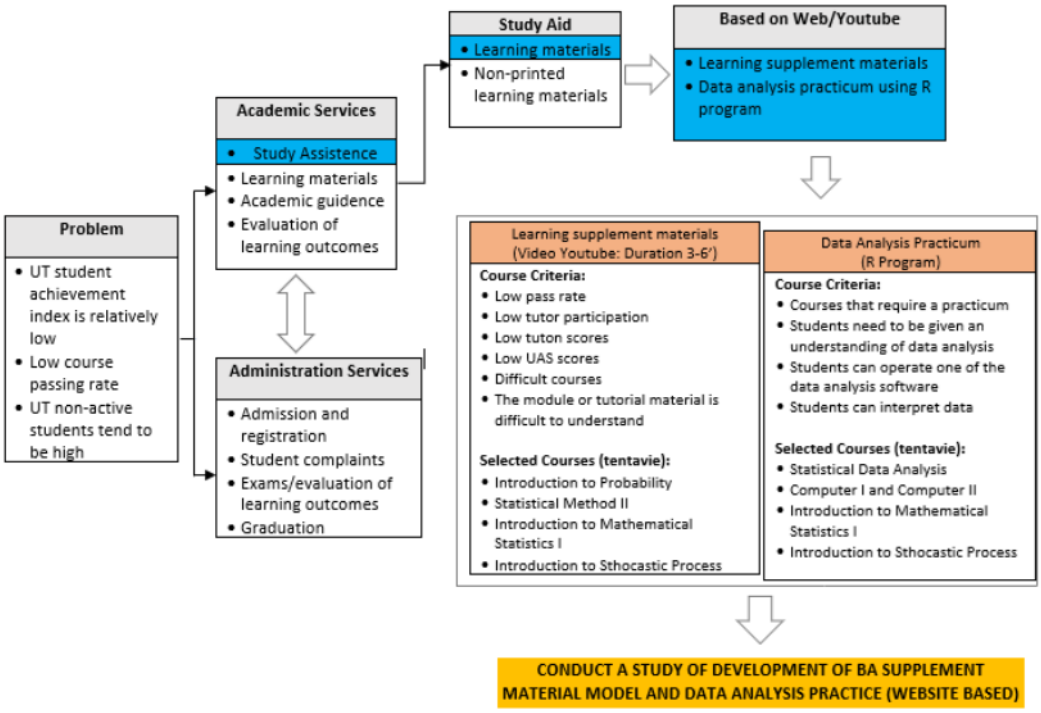

Figure 1. Research Framework

The stages of research and development in making learning videos are carried out through the stages presented in Figure 2. From Figure 2 it can be seen that the first stage of developing a web-based learning video is to determine the courses in

the Statistics Study Program that need to be provided with enrichment material (supplements) in the form of videos. This identification is based on consideration of the difficulty of the material and information from students. A total of 30 students were used as samples to provide information on any material in this first stage that needed to be enriched to better understand the content of the material. The list of names of courses and materials developed in this study can be seen in Table 1.

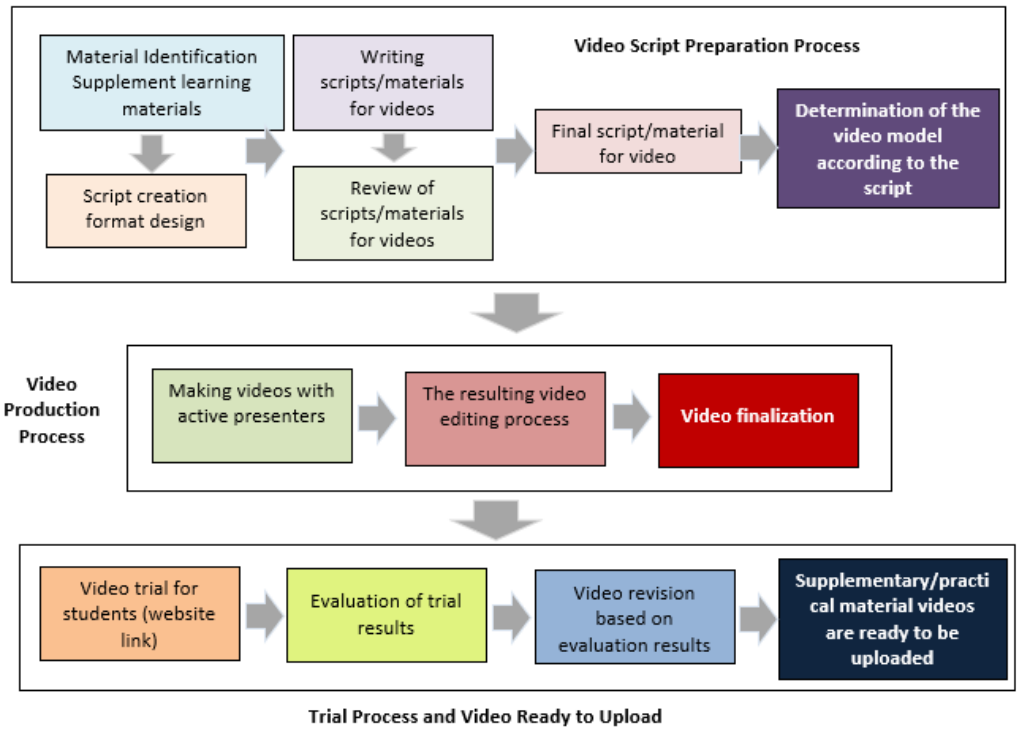

Figure 2. Stages of Website-Based Learning Video Development

The next stage is determining the design of the learning video. The steps are taken in making this design include material design and display design on the learning video that will be displayed. the supplementary material format (enrichment), the designs that are highlighted are: (1) the basic concepts of the material including definitions, axioms, and theorems, and (2) examples of their application in problems or cases that often occur in everyday life. Meanwhile, in practical materials (especially for data analysis and programming, in this case, the R program), the designs that are highlighted are: (1) how to use the application, (2) demonstration of the stages of using data analysis including the syntax used, (3) demonstration of the results of the use of syntax, and (4) interpretation of the output generated by the program.

Table 1. List of Sample Course Names for Development of Statistics Learning Videos

No	Subject		Supplementary Material
1	Introduction to Mathematical Statistics 1 (SATS4410)	1	Parameter Estimation Using Moment Method (Continuous) 1 Parameter
		2	Parameter Estimation Using Moment Method (Continuous) 2 Parameters
		3	Parameter Estimation with Likelihood (Discrete)
		4	Parameter Estimation with Likelihood (Continuous)

Table 1. List of Sample Course Names for Development of Statistics Learning Videos (continued)

No	Subject		Supplementary Material
2	Introduction to Mathematical Statistics 2 (SATS4420)	1	Parameter Estimation with Exponential (Discrete) Family
		2	Parameter Estimation with Exponential Family (Continuous)
		3	Transformation Function
3	Statistical Method 1 (SATS4121)	1	Descriptive Statistics
		2	Inferential Statistics
		3	Normal Distribution
		4	t distribution
4	Statistical Method 2 (SATS4211)	1	One Way ANOVA
		2	Two Way ANOVA
		3	Multiple Regression
5	Introduction to Probability (SATS4221)	1	Basic Concepts of Opportunity
		2	Probability Mass Function
		3	Opportunity Concentration Function
		4	Marginal Function
		5	Joint Chance Function
6	Statistical Data Analysis (SATS4212)	1	Explanation of Centering Size Summary
		2	Spread Size Explanation
		3	Size Decile, Percentile, Quartile
7	Computer 1 (SATS4111)	1	R Language Introduction
		2	Data Input
		3	Graphing With R
		4	Data Structure
		5	Determination of normal value with R
		6	Simple Data Analysis
8	Computer 2 (SATS4223)	1	Data Center Size
		2	Data Spread Size
		3	Application of finding the area of the normal curve
		4	Data Regression and Interpretation
		5	Data Correlation and Interpretation

RESULTS & DISCUSSION

RESULTS

The development of web-based learning videos begins with determining the courses in the Statistics Study Program that need to be provided with enrichment materials (supplements). This identification is based on consideration of the difficulty of the material and information from students. Based on the results of student assessments conducted through surveys, information was obtained that supporting media such as (1) bumpers (intro), (2) thumbnails, (3) presenter introductions, (4) learning materials, and (5) outros made a significant contribution. to start the video presented. To find out how good and useful the learning videos designed for website-based data analysis practices/practices in the Statistics Study

Program are, a survey of students and material reviewers was conducted. The video assessment of the Statistics Study Program is given to 30 active students who have taken several statistics courses. The students who were given the survey were active students who registered from 2015 to 2019. The following are student responses to the Statistics learning video.

Table 2. Student Assessment of Statistics Learning Videos

No.	Learning Video Component	Student Assessment		
		Poorly	Good	Very Good
1.	Intro/Bumper	0.0	28.6	71.4
2.	Presenter Introduction	0.0	39.3	60.7
3.	Image Clarity/Sharpness	3.6	32.1	64.3
4.	Property/Settings suitability	3.6	53.6	42.9
5.	Illustration Compatibility	3.6	46.4	50.0
6.	Captions/Graphics/Animation	7.1	46.4	46.4
7.	Presenter Character	3.6	35.7	60.7
8.	Voice Clarity	3.6	39.3	57.1
9.	Speech Speed	3.6	46.4	50.0
10.	Speech Intonation	7.1	35.7	57.1
11.	Articulation	3.6	39.3	57.1
12.	Material Illustration	7.1	50.0	42.9
13.	Duration of Material Exposure	14.3	39.3	46.4

Table 2 shows that in the instructional video design developed in stage 1, what students considered "very good" were: intro/bumper, sharpness of the image, introduction of the presenter, the character of the presenter, clarity of voice, articulation, and suitability of the illustration material. The percentage of assessments ranged from 50% to 71%. Meanwhile, the highest category of "good" ratings are material illustration, property suitability, duration of material presentation, animation, and speed in speaking. The percentage of assessments ranged from 48% to 50%. In detail, student assessments in these two categorizations can be seen in Figure 3.

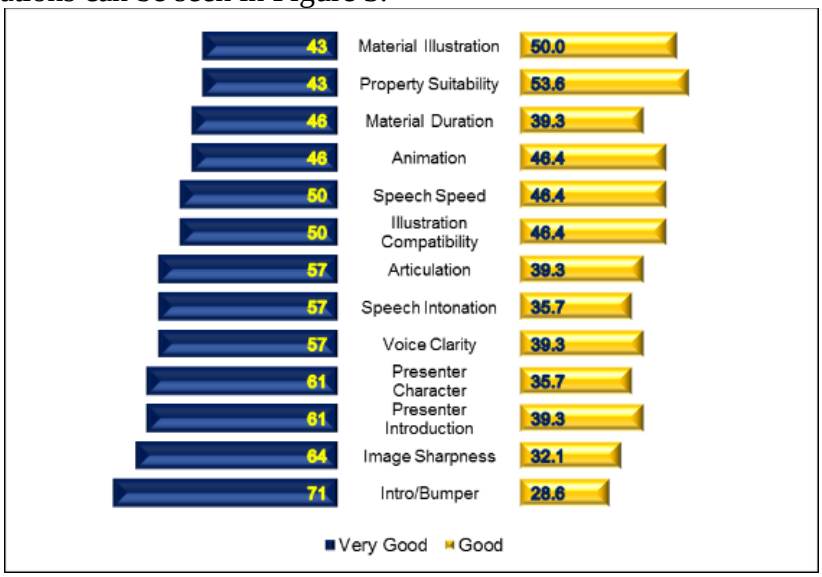

Figure 3. Pyramid Graph of Student Assessment Comparison

However, there are different assessments regarding the duration of material delivery by students. The average delivery of material in the 21 videos developed is 9 minutes to 30 minutes. Students think that the time for delivering the material is lacking. According to material experts, the delivery of material that is 30 minutes long is too long. The average duration of material delivery suggested by material experts ranges from 6-10 minutes or a maximum of 15 minutes. This is done so that students are not bored and bored.

The material learning expert's assessment of the video design developed is presented in Table 3. From Table 3 it can be seen that according to the material learning experts, the accuracy in conveying the content of the material/substance delivered is very good (83%) and can help students understand statistical material. Likewise, the content of the material, the illustrations provided, and the suitability of the illustrations with the material presented was rated as good (50%) and very good (50%). The component that material learning experts feel is lacking is the duration of the video presentation. Experts argue that 30 minutes is too long for a single video view. For this reason, the duration of delivering material through video needs to be reviewed again. According to (Hattie & Yates, 2013) the duration of delivering material through the video should be between 6 (six) to 10 (ten) minutes. However, the possible duration of the video presentation depends on the material provided. It is necessary to conduct further studies by providing surveys to students and material learning experts according to categories based on the level of difficulty of the material.

Table 3 shows the components of the learning video that were assessed and inputted by material learning experts. From Table 3, it can be seen that generally related to the substance and illustrations as well as the accuracy of the explanations of the presenters' illustrations in explaining the material were considered good and very good by material learning experts. However, there are some that are considered to be lacking, namely: the clarity of the speaker's voice, the duration of the exposure, and the animation.

Table 3. Material Expert Assessment of Statistics Learning Video

No	Learning Video Component	Material Reviewer		
		Poorly	Good	Very Good
1	Intro/Bumper	0	100	0
2	Presenter Introduction	0	33.3	66.7
3	Property/Setting compatibility	0	83.3	16.7
4	Content/Substance	0	16.7	83.3
5	Accuracy of Explanation of Material/Substance	0	66.7	33.3
6	Illustration Material	0	50	50
7	Compatibility of Illustration Material	0	50	50
8	Explanation of Material/Substance Illustration	0	83.3	16.7
9	Accuracy of Explanation of Material/Substance Illustration	0	66.7	33.3
10	Voice Clarity	50	50	0
11	Image Clarity/Sharpness	0	0	100
12	Captions/Graphics/Animation	16.7	83.3	0

Table 3. Material Expert Assessment of Statistics Learning Video (continued)

No	Learning Video Component	Material Reviewer		
		Poorly	Good	Very Good
13	Speech Speed	0	83.3	16.7
14	Speech Intonation	0	100	0
15	Articulation	0	83.3	16.7
16	Character Presenter	0	100	0
17	Duration of Material Exposure	50	0	50
18	Outro/Cover	16.7	83.3	0
19	Usefulness of Material/Substance	0	0	100

The duration of the video exposure is considered too long. The advice of material learning experts is that the video duration is between 6 to 10 minutes or a maximum of 15 minutes. Exposure that is too long is assumed to make students bored and lack concentration. In addition, it is hoped that in explaining using animations that are easier to understand, for example by using a ballpoint or explaining like on a blackboard. There is a material whose explanation has been using ballpoints, namely in the material for estimating parameters with the maximum likelihood and moment method (maximum likelihood estimation).

The assessments of students and material experts in several video components that are considered to have "good" and "very good" categories are presented in Figure 4 and Figure 5. Figure 4 shows that there is a difference in assessment between students and material experts in terms of the duration of material presentation. Students expect a longer video duration. However, material experts think that too long a time will make students bored and lose concentration. This will be explored further and adjusted to the weight or level of difficulty of the existing material. Thus, a study will be carried out in the second year by taking into account the characteristics of the level of difficulty of the material, so that the time required and the material delivered are in line with expectations and easy to understand.

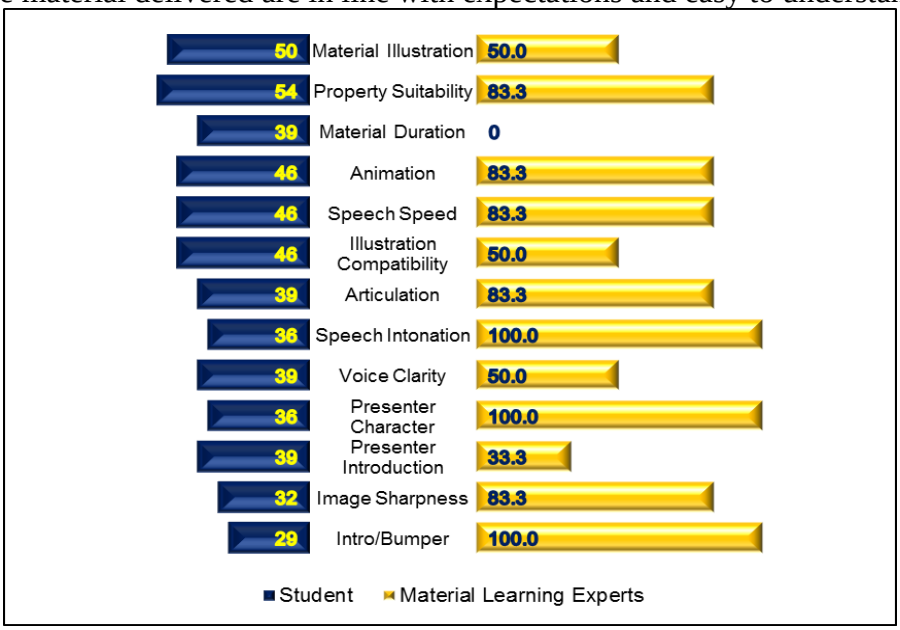

Figure 4. Pyramid Graph of "Good" Category Assessment Comparison between Students and Material Learning Experts

Another thing to consider further is animation and sound clarity. Some of the students requested that the explanations in the videos use animations such as ballpoint pens or other media that can clarify students' understanding of the material. For sound clarity, there is a high probability of interference when recording. It is recommended that presenters use a headset or record in a soundproof area. In the future, videos will be made clearer and clearer, so that they can be heard by students and easy to understand.

Some things that according to students related to the development of learning videos for statistical data analysis practicum models are: the learning videos designed in this study need to be continued by increasing sample questions, an innovation that must be improved by UT, the duration of the video exposure plus a lot of discussion of sample questions in the application of statistics, some lecture materials are delivered via video conference, directly between tutors and students, the learning videos developed are very helpful for students and it is hoped that every statistics course has a video like this, so students can learn it anytime and anywhere, learning videos are used as media in youtube to help students learn.

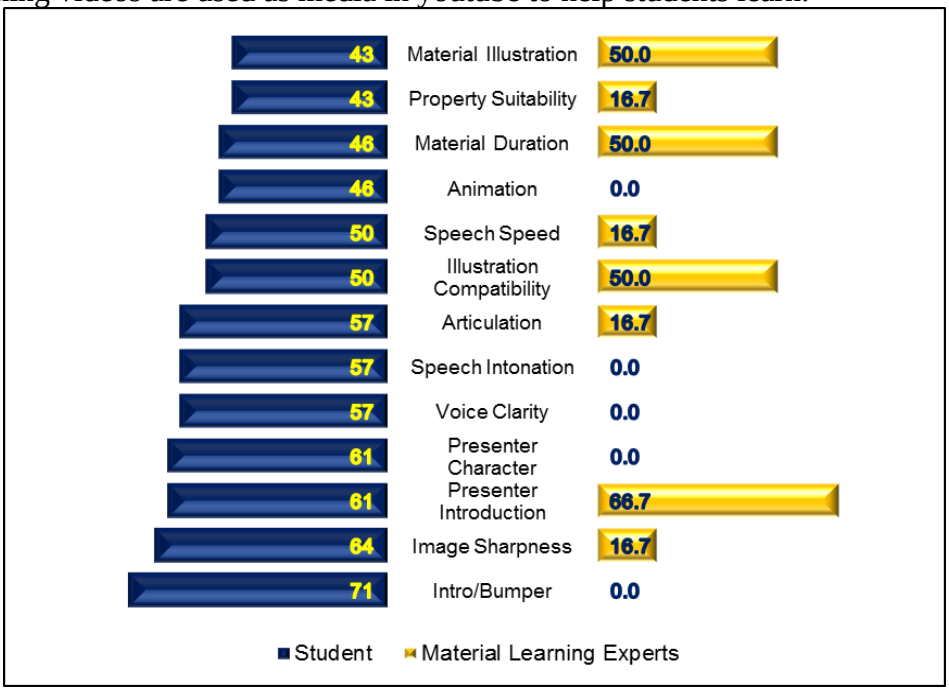

Figure 5. Pyramid Graph of "Excellent" Category Assessment Comparison Between Students and Material Experts

CONCLUSION

The design of the learning videos developed is adequate and very helpful for student learning. The components in a learning video that are needed are: into/bumper, thumbnail, introduction, video material, and cover/outro which are very significant to motivate student learning. Into and outro components need to be present in every video to emphasize the material that has been explained as well as

material that will be continued in the next session. The duration of video delivery is adjusted to the category or characteristic of the difficulty level of the course.

Students want material accompanied by more varied examples of questions to facilitate understanding of the material presented. Explanations using visual aids such as a mouse pen are easier to understand in explaining the concept of solving problems or cases in Statistics. Meanwhile, in the data analysis practicum material using R, it is better to explain using a mouse pen and the presenter directly writes the R script in the editor window.

The development of Statistics learning videos is very much needed by students to understand Statistics material. Through video learning, students can learn it anytime and anywhere. Students expect UT to further optimize the youtube-based learning videos that they have been using to learn from outside UT so that students can learn and make maximum use of this online material.

CONFLICT OF INTEREST

Concerning the research, authorship, and publication of this paper, the author(s) reported no potential conflicts of interest.

ACKNOWLEDGEMENT

The writing team would like to thank the Institute for Research and Community Service of Universitas Terbuka which has funded this research activity so that it is carried out well.

REFERENCES

Beheshti, M., Taspolat, A., Kaya, O. S., & Sapanca, H. F. (2018). Characteristics of instructional videos. *World Journal on Educational Technology: Current Issues*, *10*(2), 79–87. https://doi.org/10.18844/wjet.v10i2.3418.

Brame, C. J. (2016). Effective educational videos: Principles and guidelines for maximizing student learning from video content. *CBE Life Sciences Education*, *15*(4), es6.1-es6.6. https://doi.org/10.1187/cbe.16-03-0125.

Chan, Y.M. (2010). Video instructions as support for beyond classroom learning. *Procedia Social and Behavioral Sciences*, *9*, 1313–1318. https://www.sciencedirect.com.

Felanie, R. (2021). *The Effect of Using Youtube Videos o n Students ' Writing Descriptive Text Across Learning Styles*. *2000*, 109–118. http://journal.um.ac.id/index.php/jptpp/article/view/14402.

Hattie, J., & Yates, G. C. R. (2013). Visible learning and the science of how we learn. In *Visible Learning and the Science of How We Learn*. https://doi.org/10.4324/9781315885025.

Kadam, V. (2015). *How to Choose a Website Content Management System How to Choose a Website Content Management System SSVP ' s Dr . P . R . Ghogrey*

Science College. *April*.

Kumar, M., & Nath, A. (2016). Web Content Management System (CMS). *International Journal of Innovative Research in Advanced Engineering (IJIRAE)*, *03*(March), 1–7. https://doi.org/10.6084/M9.FIGSHARE.3504368.V1.

Lange, C., & Costley, J. (2020). Improving online video lectures: learning challenges created by media. *International Journal of Educational Technology in Higher Education*, *17*(1). https://doi.org/10.1186/s41239-020-00190-6.

Ou, C., Joyner, D.A., Goel, A.K. (2019). Designing and developing video lessons for online learning: A seven-principle model. *Online Learning*, *23*(2), 82-104. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/1449.

Rahmatika, R., Yusuf, M., & Agung, L. (2021). The Effectiveness of Youtube as an Online Learning Media. *Journal of Education Technology*, *5*(1), 152. https://doi.org/10.23887/jet.v5i1.33628.

Scagnoli, N., Choo, J., & Tian, J. (2017). Students' insights on the use of video lectures in online classes. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.12572.

Tim Kurikulum Prodi S1 Statistika. (2013). *Draft Struktur Kurikulum Minimal Prodi S1 Statistika (the Indonesian Mathematical Society-Indoms)*. Himpunan Matematika Indonesia.

Triana, Y., & Aisyah, S. (2021). *Tutor Performance On Face-To-Face Tutorial In The Perspective Of Upbjj Ut Banjarmasin*. *10*(2), 108–117.

Ugli, K. S., Ugli, I. B., & Ugli, A. D. (2020). Website Development with New Technology. *International Journal of Human Computing Studies*, *2*(3), 1–7. https://www.neliti.com/publications/333601/.

Universitas Terbuka. (2019). *Katalog Sistem Penyelenggaraan Universitas Terbuka 2019/2020*. Universitas Terbuka.

Universitas Terbuka. (2020). *Katalog Universitas Terbuka*. Universitas Terbuka.

Universitas Terbuka. (2021). *Katalog Sistem Penyelenggaraan Universitas Terbuka 2021/2022*. Universitas Terbuka.

Vasuthaven, J., & Kaur, P. (2020). A Study on Using Web Content Management Systems in University Sports Club. *PalArch's Journal of Archaeology of Egypt*, *17*(7), 5248–5257. https://www.archives.palarch.nl/index.php/jae/article/view/2678/3019.

Wardhana, Y. Y., & Muhammad, R. N. (2021). An Investigation of Video and Audio to Improve Students' Motivation in Learning Listening during Online Learning at Ban Pongneeb School, Thailand. *Journal of English Teaching, Literature, and Applied Linguistics*, *5*(1), 20. https://doi.org/10.30587/jetlal.v5i1.2156.

Yousef, A. M. F., Chatti, M. A., & Schroeder, U. (2014). The state of video-based learning: A review and future perspectives. *International Journal on Advances in Life Sciences*, *6*(3–4), 122–135.

Yusuf, M., & Agung, L. (2021). The Effectiveness of Youtube as an Online Learning Media. *Journal of Education Technology*, *3*(1), 152–158.