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Tu web (Web-Based Tutorial) with Scrapbooks and Videos to Improve Students' Learning Outcomes

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Abstract

Online learning has its perks and challenges to student learning outcomes. This study aims to develop educational products that meet the validity, effectiveness, and practicality criteria in the form of scrapbooks and videos on Tu web (Web-based Tutorial) for the Statistics Education course to tackle these negative impacts. In this developmental research, field tests were conducted on 83 Open University students from three different study groups in East Java. The development stages started from planning, exploratory studies, initial product development, expert validation, and initial field tests had been carried out in the previous year. The instruments used in this research are Tutorial Activity Design, Tutorial Activity Unit, scrapbook, video, student response questionnaire, and final test. The results showed that students responded positively to the use of these products in the Tuweb of Statistics Education courses. Since all students solved problems in the scrapbook, the product met the practicality criteria. Furthermore, the average student learning outcomes were 82.17 with a minimum of 70, better than students who did not participate in the study. Therefore, these products met the effectiveness criteria. As the research has demonstrated, the scrapbooks and videos developed can improve student learning outcomes in the Statistics Education course.

Keywords: Web-based tutorial; Mathematics problems; Scrapbooks; Videos

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INTRODUCTION

The Open University (OU) carried out online learning during the Covid-19 pandemic with a Web-based Tutorial (Tuweb) as a substitute for Face-to-face Tutorials. Tu web is a synchronous tutorial mode where tutor-student and student-student interactions are carried out at the same time (real-time), but not side by side (non-contiguous) and in different rooms/places. Learning interactions are carried out using a Webinar application that is connected to the internet. Tu web implementation is equipped with Learning Management System (LMS) from OU (Rektor, 2020).

Online learning has its obstacles and negative impact on student learning outcomes. First, most students cannot afford large internet quotas for learning with Webinar due to financial hardships during the Covid-19 pandemic (Febrianto et al., 2020; Putra et al., 2020). Second, students do not yet have the awareness to learn the

material independently (Azhari & Fajri, 2021). Third, students face difficulty in comprehending the material because of the less interaction between lecturer-student and student-student compared to face-to-face learning. This condition causes low student learning outcomes (Abdullahi et al., 2020; Adnan & Anwar, 2020).

Students' hardships in understanding the material can also be caused by the complexity of the material itself. This occurs in OU students in the Statistics Education course for three academic years, from 2016/2017 to 2018/2019. The average number of students getting a C or D in that year was 63.7%. The learning outcome was caused by the students could not interpreting statistical symbols, determine the unknown and the target, write down the calculation steps in detail, and conclude the final solution. Furthermore, internal error in completing the test since the students did not look back the solution (Sari, 2018). The condition was caused by many factors including unmeaningful understanding and the inappropriate learning method such that the students did pseudo thinking processes (Natalia, 2020).

The subject matter of the course requires procedural knowledge, complex computing, and the ability to interpret and draw conclusions from computational results. The study materials are basic knowledge of statistics, data representation in the form of tables and diagrams, summarizing data in terms of concentration and distribution, normal curves and their uses, other curves, and their uses, hypothesis testing, normality test, homogeneity test, the difference in mean test, correlation analysis and simple linear regression (Herhyanto et al., 2018). Students learn these materials using the Basic Materials Book (BMP) as the main source.

Consequently, Tuweb requires other learning resources or conditioning that helps students understand complex material and motivates students to study independently. One of these learning resources is a scrapbook, a book that contains sticky notes, pictures, articles, pictures, or videos to convey messages or information (Zain, 2017; Dwikoranto et al., 2022). The previous research result showed that the scrapbook could increase the students' learning outcome and critical thinking (Aulisia & Gunansyah, 2019; Wusqo, et al., 2021). The results showed that students responded positively to the use of scrapbooks (Sari et al., 2019), felt motivated (Puspitasari et al., 2018), increased creativity (Muktadir, et al, 2020) and learning outcomes (Satria et al., 2020).

The integration of learning videos in scrapbooks can improve the process and learning outcomes. The improvement process occurs because students respond positively to the use of video in class (Rosiyanti, Adriansyah, Widiyasari, & Dewi, 2020). This response was shown by students being motivated to study materials independently using videos (Ammy, 2020; Nuritha & Tsurayya, 2021). In addition, videos can help students get a better grip on the material (Mairing, 2020), therefore, improving student learning outcomes (Mairing et al., 2020; Octavyanti & Wulandari, 2021; Widiantari et al., 2021).

This study aims to develop learning products in the form of scrapbooks and learning that are valid, effective, and practical. The research is differed from the previous researches. Firstly, the scrapbook in this research was implemented in the higher education. Secondly, the scrapbook integrated learning videos and computer software (Microsoft Excel and Minitab). Thirdly, the scrapbook was used in the suggested learning model namely problem-based learning.The product is valid when the scrapbooks and videos developed are following learning theory, statistical materials, and educational contexts. The product is effective when the average

students learning outcomes reach at least 75, no students reach less than 60 (out of 100), and the learning outcomes of students who use the product are better than those who do not. The product is practical when all students solve every problem in the scrapbook and 80% of students respond positively to the use of the two products.

METHOD

General Background

This research is intended to develop educational products in the form of scrapbooks and videos to overcome online learning challenges for the Statistics Education course so that it is classified as developmental research. The development stages are planning, exploratory studies, initial product development, expert validation, initial field tests at limited locations, major field tests, and improvements at a wider location (Karyadi & Tantra, 2007; Nieveen & Folmer, 2013). This research was conducted for two years. The first year was in the second half of 2020 and the second year was in the second half of 2021.

The activities that have been carried out in the first year were formulating specifications from scrapbooks and videos, designing the scope, sequencing materials, and analyzing how students learn at the planning stage. In the exploratory study stage, the researcher examined the material from the Statistics Education BMP published by OU, the literature, and the characteristics of OU students when studying. In the initial product development stage, the researcher developed prototype I and research instruments. Prototype I have been validated by two experts. All experts stated that the product had met the validity criteria and gave some suggestions to improve the effectiveness and practicality of the product. Researchers made improvements and produced prototype II in the validation stage (Prastiti et al., 2021). Prototype II was tested against 56 OU students in one study group in the small group field test stage. Researchers made improvements based on the test results and produced prototype III. The research then continued in the second half of 2021 by testing prototype III as the main field test in three different study groups.

Procedure, Participant and Instrument

In the second year, the researcher conducted the main field test where the research subjects were 83 OU Education Statistics students from three different study groups (Study groups T, J, M). The number of students in each Study group is 35, 20, and 28. The results of the three experimental groups were compared with the control group (Study group K) where 27 students in this class did not learn to use the two products. The main source of learning in the control class was Statistics Education BMP. In general, the characteristics and learning styles of OU students in this study were the same as in the previous registration period.

The main field test activities used a post-test control and experimental design model (Cohen et al., 2007). The activities in the test were as follows.

1. Researchers uploaded learning tools for each Tu web in LMS OU (link: https://lms.ut.ac.id/). The tools were Tutorial Activity Plan, Tutorial Activity Unit, scrapbook, and video (Prototype III). The number of Tuwebs in one semester at OU is 8 meetings.
2. The researcher implemented prototype III to all subjects in Study groups T, Study groups J, and Study groups M simultaneously. The implementation was carried

out by researchers who were also tutors for the Statistics Education course in the three Study groups.
3. Students solved the problems contained in the scrapbook individually.
4. On the 6th Tuweb, the researcher distributed student response questionnaires that had been developed in the previous year.
5. At the end of the Tu web, the researcher distributed the final test which was developed in the previous year.
6. The data obtained from the three Study groups (experimental class) were compared with the control class. The analysis used a one-way analysis of variance with 4 treatment groups. The results of the analysis are used to assess the effectiveness of the product.
7. The data obtained was also used to improve prototype III into a valid, effective, and practical educational product.

A summary of these stages can be seen in Figure 1.

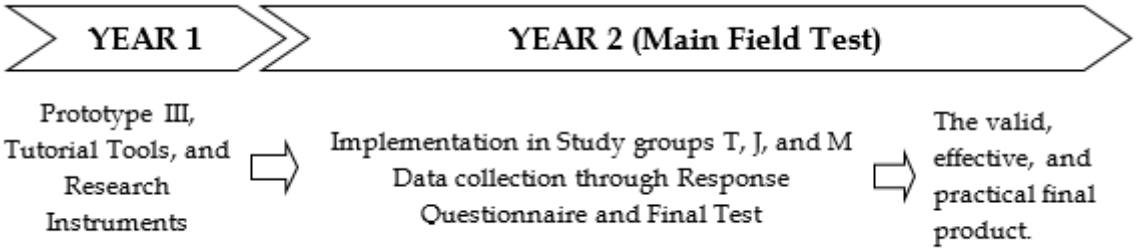

Figure 1. Research Activities Summary

The instrument used was a research instrument in the first year of this grant that met the validity requirements in the valid criteria and reliability in the reliable criteria (Prastiti et al., 2021).

Data Analysis

The learning outcomes compared using the Kruskal Wallis nonparametric test due to the abnormality of the data. Kolmogorov-Smirnov test for data is not normal with a 95% confidence level. Kruskal-Wallis test for showed a significant difference between the student's scores in the four Study groups with a 95% confidence level. These differences were further tested using Tukey's multiple comparisons with a 95% confidence level outcomes.

RESULTS AND DISCUSSION

Product Practicality

The study applied prototype III which had been developed in the previous year to a wider range of subjects in three different Study groups T, J, and M as an experimental class. The number of students in each Study group is 35, 20, and 28. The control class is Study Group K where 27 students in this class did not learn by using the two products. The main source of learning in the control class is Statistics Education BMP. Students in both classes studied in Tuweb mode and completed the same final test.

In the preparation stage of implementing the product, the researcher uploaded prototype III and the contents of each Tu web on the LMS. In general, the contents are

specific learning outcomes, discussion forums, attendance lists, Tutorial Activity Plan, Tutorial Activity Unit, short materials, YouTube video links, problems contained in the scrapbook, and upload space for student completions (Figure 2).

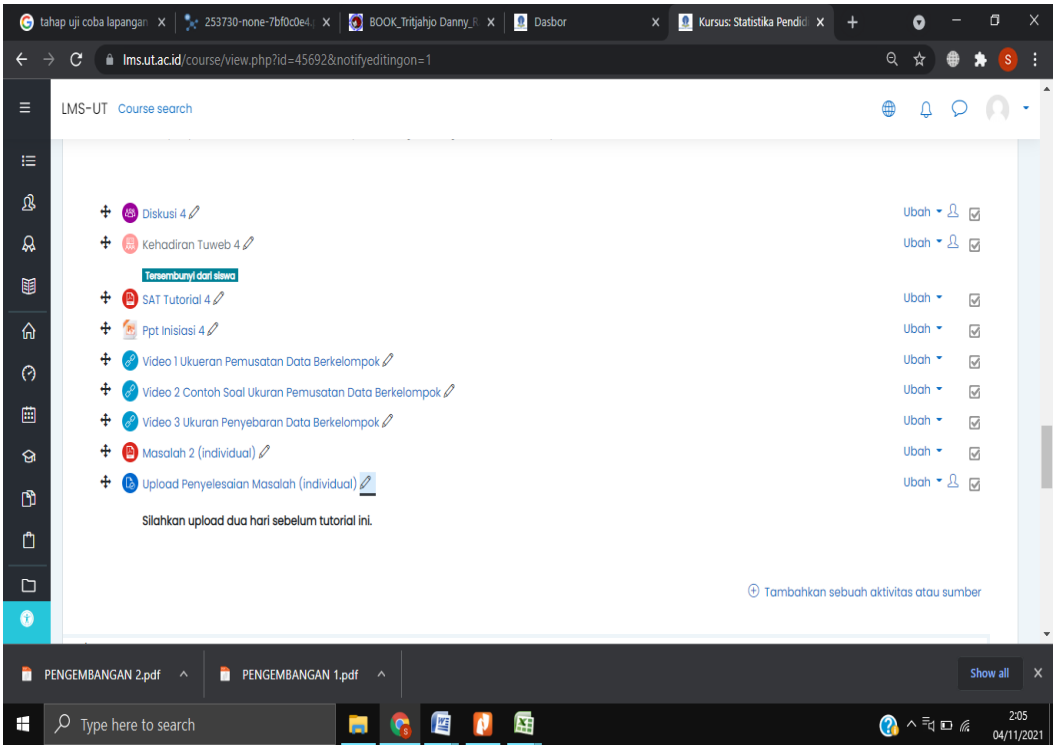

Figure 2. Sample Content from Tu web on LMS OU

Tuweb's activities in the experimental class were divided into two main stages. The first stage was asynchronous preparation. Activities at this stage were learning material independently through BMP, scrapbook, and YouTube videos which links are on the LMS. Students solved problems in the scrapbook using Microsoft Excel and uploaded their solutions to the LMS individually. The materials and solving tutorial were studied by students via scrapbooks and YouTube videos. The video was developed by the researcher based on a scrapbook and BMP uploaded on the YouTube channel of one of the research members (https://bit.ly/3mDJXtk). The link for each video was already implanted. Then, students had a group discussion through their respective WhatsApp groups to agree on the completion of the group problem uploaded on the class WhatsApp.

The second stage was synchronous learning using the Microsoft Teams platform. The learning activities in this stage were as follows.

1. The tutor greeted and checked student learning readiness.
2. Tutors delivered specific learning outcomes.
3. Discussed the benefits of the material.
4. The tutor initiated a short discussion through a PowerPoint presentation.
5. Discussed material that has not been understood during independent study.
6. Students presented and demonstrated problem-solving using Microsoft Excel in groups.
7. The tutor facilitated class discussion by asking “why” and “how” questions. Tutors also provided opportunities for students who have different answers.
8. Students concluded.
9. The tutor gave a reminder for the next Tu web activity.

The results showed that all students solved every problem in the scrapbook. Next, researchers assessed each problem through the LMS. The students' average scores on these problems in Study groups T, J, and M were 90.09, respectively; 96.35 and 92.89 (on a scale of 100). Examples of problem-solving uploaded by students at LMS can be seen in Figure 3.

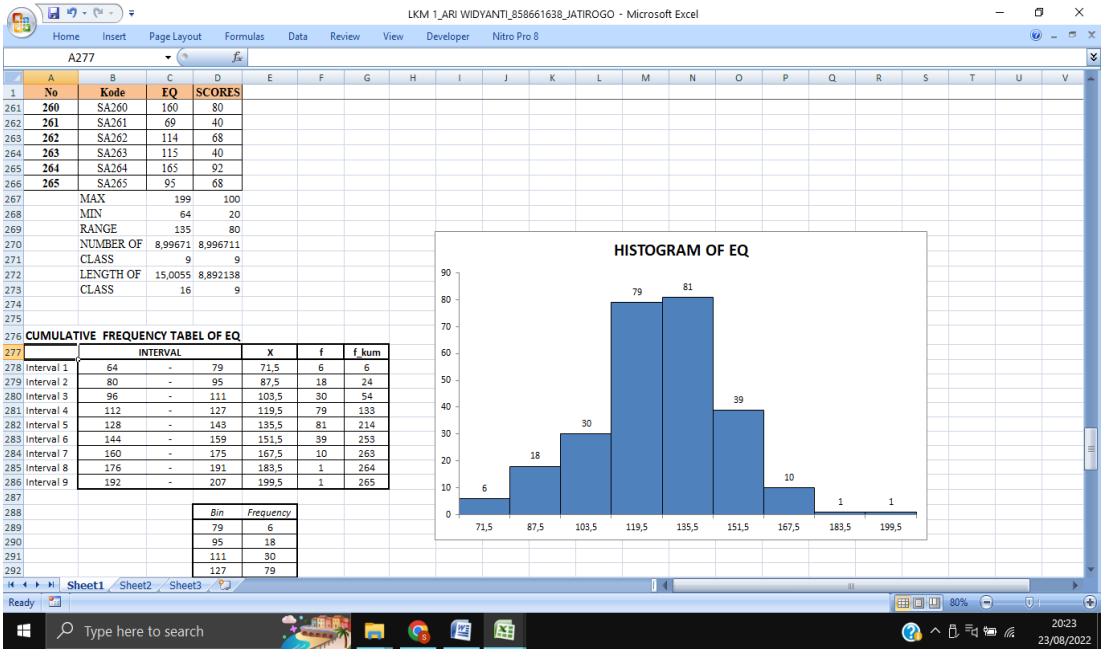

Figure 3. Students' Problem Solving Example

On the 6th Tu web, students filled out a questionnaire using a google form at the link: https://forms.gle/hVgTYmUsJFtk8dse8. The results showed that all students strongly agree or agree on each indicator (Table 1). All students responded positively to the use of scrapbooks and videos. Thus, the practicality criteria of the product have been met.

Table 1. Student Response Results to Scrapbooks and Videos

No	Question	SA (%)	A (%)	D (%)	SD (%)
1	You are happy with the use of scrapbooks and videos in the Education Statistics course	58.1	41.9	0.0	0.0
2	The scrapbook and videos provided helped you understand the material	67.7	32.3	0.0	0.0
3	The material in the scrapbook and videos is easy to learn and understand	41.9	58.1	0.0	0.0
4	The use of videos on YouTube helped you develop the ability to analyze data	51.6	48.4	0.0	0.0
5	Using computers in scrapbooks helped you learn Education Statistics	64.5	35.5	0.0	0.0
6	You wish other courses also use scrapbooks and videos like Education Statistics	54.8	45.2	0.0	0.0
7	You are motivated to learn Statistics Education using scrapbooks and videos	54.8	45.2	0.0	0.0

No	Question	SA (%)	A (%)	D (%)	SD (%)
8	The look or layout from scrapbooks and videos is Interesting	35.5	64.5	0.0	0.0
9	The writing in the scrapbook and videos is easy to read	48.4	51.6	0.0	0.0

Note: SA=strongly agree, A=agree, D=don't agree, SD= strongly disagree

Product Effectiveness

The final test was given to all students (in the experimental and control group) on the 8th Tuweb. The results showed that the minimum value of learning outcomes in the three experimental classes is 70/100 (Table 2). The average learning outcome for the experimental class as a whole is 82.17 higher than the control class with 71.11 (on a scale of 100). The median line in the boxplot of the three Study groups in the experimental class is higher than that in the control class (Figure 4).

Table 2. Final Test Results Summary

Variable	Groups	N	Mean	SD	Min	Q1	Median	Q3	Max
Score	Experiment 1	35	80.29	9.70	70.00	70.00	80.00	85.00	100.00
	Experiment 2	20	84.50	5.83	70.00	80.00	85.00	85.00	100.00
	Experiment 3	28	82.86	7.00	70.00	80.00	85.00	85.00	100.00
	Control	27	71.11	5.77	60.00	70.00	70.00	70.00	85.00

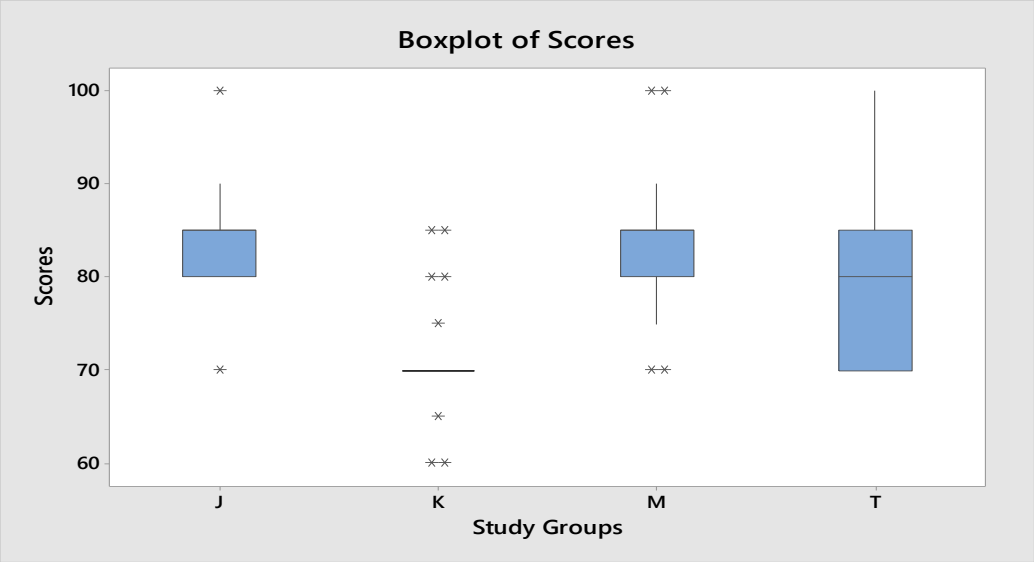

Figure 4 . Boxplot of Students' Score in Experiment Class (Study groups T, J, M) and Control Class (Study groups K)

The learning outcomes in the four Study groups were compared using the Kruskal Wallis nonparametric test due to the abnormality of the data. The results of the Kolmogorov-Smirnov test showed a p-value < 0.01 < 0.05, which means that the final test data value is not normal with a 95% confidence level. The results of the Kruskal-Wallis test showed a p-value = 0 <0.05, which means that there is a significant difference between the student's scores in the four Study groups with a 95% confidence level. These differences were further tested using Tukey's multiple comparisons. This indicated that the learning outcomes data in the experimental group were not significantly different with a 95% confidence level (which was

indicated by the same letter), while the learning outcomes of the control class were significantly different (different letters) with 95% confidence level (Table 3). Thus, the criteria for the effectiveness of this research product have been met.

Table 3. Tukey's Multiple Comparison Test Results

Study Groups	Class	N	Mean	Grouping
Study Groups J	Experiment 2	20	84.50	A
Study Groups M	Experiment 3	28	82.86	A
Study Groups T	Experiment 1	35	80.29	A
Study Groups K	Control	27	71.11	B

Means that do not share a letter are significantly different.

Discussions

The development of scrapbooks in this research was intended to improve learning outcomes and to help students have the ability to conclude the data. The trick was integrating Microsoft Excel in collecting, representing, summarizing, analyzing, and drawing conclusions from the data. The results of previous studies showed that students responded positively to the use of Microsoft Excel in asynchronous and synchronous online learning in the Advanced Statistics course. Positive responses encouraged students to study independently and obtained an average learning outcome of at least 71.59/100 (Mairing, Sidabutar, Lada, & Aritonang, 2020). The results of this study are in line with those results where students obtained learning outcomes of at least 70/100. Furthermore, the use of Microsoft Excel also had a positive effect on student learning outcomes in problem-based face-to-face learning, group collaboration, or teaching teams(Fajriyah & Rodriguez, 2018; Mairing, The effect of advance statistics learning integrated Minitab and excel with teaching teams, 2020).

The scrapbook also contained math problems related to the context of students' research in education. Students solved problems starting from representing to concluding on the 2nd to 8th Tu web. An example of a problem in Tuweb 2 was students drew descriptive conclusions from correlational research data using tables and diagrams. The data itself came from students' thesis, then students made tables and diagrams using Microsoft Excel. The use of such problems in the classroom could improve student learning outcomes (Indah, Mania, & Nursalam, 2016; Khotimah & Masduki, 2016). Not only that, but students could also develop a positive attitude when learning to solve problems (National Council of Teachers of Mathematics [NCTM], 2000; Sariningsih & Purwasih, 2017).

Using videos that were integrated with scrapbooks, was intended to assist students in self-study. The explanation in the video helped students perform statistical computations using Microsoft Excel. In addition, the material in the explanation video was based on the material in the scrapbook and BMP Statistics Education. The advantage of using video was for students to be able to replay it over and over again until they understand certain statistical materials or procedures. Students were also able to study anywhere and anytime without being bound by a specific schedule. These research findings indicated that scrapbooks and videos met the criteria for effectiveness on student learning outcomes. These results are in line with previous research which states that the use of video helps students achieve high learning outcomes (Jafar et al., 2020; Tan et al., 2020).

CONCLUSION

This research is a continuation of the development of the Statistics Education scrapbook and video in the previous year. The result of previous research was that the product met the criteria of validity. Next year, researchers conducted a major field test in three different Study groups. The findings indicated that the product meets the practical criteria based on students' positive responses to the use of the product. All students also stated that using scrapbooks and videos helped them understand the material and develop data analysis skills. Furthermore, all students solve each problem in the scrapbook and then uploaded it to the OU LMS. Thus, scrapbooks and videos have met the criteria for practicality.

The use of scrapbooks and videos also affected student learning outcomes. The data showed the average student learning outcome as a whole was 82.17/100 (more than the minimum standard of 75). The lowest student's score was 70 (more than the minimum standard of 60). The learning outcomes of students who used the product were then compared with students who did not use the product. The learning outcomes of students who used the product in the three Study groups were significantly different from those of students in one Study group who did not use it with a 95% confidence level. The product has met the criteria for effectiveness. Therefore, the use of scrapbooks and videos can help students improve student learning outcomes in Tuweb Statistics Education based on asynchronous-synchronous online learning and independent learning using LMS.

RECOMMENDATION

The research recommends that learning at the higher education should use information technology-based learning media, namely the scrapbook. Using the media needs to be integrated with videos and mathematical problems. The integration is intended to increase students' higher order thinking skills and technology literacy. Such learning should be well planned in the lesson plan. The learning activities, the digital learning resources and the scrapbook should be embedded in the learning management system. The embedding is intended to encourage students learn independently anytime and anywhere. Such learning can improve the student learning outcomes.

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Declaration of interests

The researchers declare no conflict of interests.

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