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Development of module prototypes and statistical learning videos in the new normal era of COVID-19

Mutmainnah Said, Universitas Negeri Makassar, Makassar 90221, Indonesia https://orcid.org/0000-0001-5036-8127

Arismunandar Arismunandar *, Universitas Negeri Makassar, Makassar, Makassar 90221, Indonesia https://orcid.org/0000-0003-1844-768X

Anshari Anshari, Universitas Negeri Makassar, Makassar, Makassar 90221, Indonesia, https://orcid.org/my-orcid?orcid=0009-0003-7113-7792

H Nurhikmah, Universitas Negeri Makassar, Makassar, Makassar 90221, Indonesia, https://orcid.org/0000-0002-0396-5858

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Abstract

This research was carried out with the main objective of developing tools that can help the learning process of students in statistics courses who have had difficulty improving their learning outcomes because of the lack of learning materials prepared by lecturers for them to be used as the main reference while programming the course. Departing from the in-depth needs analysis carried out and the research method used, namely research and development, the researcher then designs a prototype of teaching materials that will be developed in the form of modules and learning videos. After that, the prototype was validated by two experts in the field of teaching material development. The results showed that 20 students out of a total of 27 respondents saw that they needed the latest learning modules and videos that could make it easier for them to complete the subject matter because what had been used by lecturers so far still made it difficult for them to learn because the instruction and exposure to information did not meet the needs of students. The prototype modules and learning videos that have been developed are declared valid by experts in several aspects, namely self-instruction aspects, self-contained aspects, stand-alone aspects, adaptive aspects, and user-friendly aspects, so they are suitable for use by lecturers because they can help student's complete lessons so that their learning outcomes can improve.

Keywords: Prototypes, modules, learning videos, statistics, new normal, COVID-19.

* ADDRESS FOR CORRESPONDENCE: Arismunandar*, Universitas Negeri Makassar, Makassar, Makassar, 90221, Indonesia
Email address: arismunandar@unm.ac.id / Tel.: +6-281-146-4813

1. Introduction

In the IR 4.0 era of the 21st century is marked by artificial intelligence, super-computers, genetic engineering, nanotechnology, automatic cars, and innovation (Satya, 2018). Such changes occur at exponential speed and impact various fields, including education, the economy, industry, government, and so on.

To face the era of the Industrial Revolution 4.0, education is needed that can form a creative, innovative, and competitive generation (Doringin et al., 2020). It can be achieved by optimising the use of technology as an educational tool, especially in the new normal era due to the spread of COVID-19, which requires humans, including lecturers and students, to interact through cyberspace.

This condition forces educational institutions, especially lecturers, to develop learning so that it can still be held optimally even though they have to go through online meetings to maintain the mission of responding to the challenges and needs of the Industrial Revolution 4.0 era, namely equipping students with critical thinking, communication, creative thinking, and collaboration skills, or known as 4C (Hakkarainen & Ahtee, 2007).

The learning strategies that can be used to improve student critical thinking are problem-based, project-based, cooperative, group investigation, inquiry learning, and others (Unaenah & Rahmah, 2019). For collaboration skills, students can be trained through cooperative learning strategies (Rosita & Leonard, 2015). For communication skills, students can be trained through the compilation of reports on activity outcomes, project assignment presentations, and group or class discussions (Syafira & Zulkarnaen, 2022).

In addition, to increase creativity, students can be trained in problem-based learning, project-based learning, cooperative group investigation, and inquiry learning (Novellia, 2018). The learning strategy recommended by these experts is to fulfill 4C skills for students, in line with the new normal-era learning policy to prevent the transmission of COVID-19 in Indonesia, which requires students to study from home.

The independent campus learning policy by the Minister of Education and Culture is a framework for preparing students to become excellent academics who are responsive to the requirements of the times and prepared to become leadership with a strong national spirit (Director General of Higher Education of the Ministry of Education and Culture, 2020). On the other hand, all Indonesian people must be actively involved in preventing the transmission of COVID-19, including lecturers and students.

Seeing the conditions of online learning organised by lecturers using makeshift learning media makes researchers interested in seeing students' responses to find out the objective conditions they feel regarding the continuity of the learning process, whether it runs optimally or needs other support so that the learning process can be maximised.

Researchers then explore to obtain factual conditions related to the teaching materials and learning media used and the conditions of them expected by students in statistics courses during learning in the new normal era (COVID-19). The information collection was carried out using Google Forms, and 72 students participated in this exploration.

According to the findings, 51.38% of lecturers utilised reference books to educate, 16.67% used lecturers' modules, and 31.95% used PowerPoint, social media, and other methods. In contrast, student learning outcomes in statistics classes revealed that the average score attained by the 33 students who attended statistics courses was 71.2, or the grade on the C predicate at intervals (70–74).

These results show poor grades for students because they should get better grades to be approved, so lecturers must answer the needs of these students so that their learning outcomes can be maximised, which is marked by an average of at least 80 or at a B education program with an interval of 80–85. One solution to this problem is to develop teaching materials in modules and learning videos that allow students to learn anywhere and anytime.

Therefore, through this research, researchers will conduct an in-depth analysis of student needs for learning modules and videos, then develop prototypes according to those needs, which experts then measure so that they are suitable for use by lecturers and students to improve student learning outcomes in statistics courses.

2. Methods and Materials:

The type of research used in this research was the Research and Development method which started with the needs analysis stage by making students of the Education study program for elementary school teachers, teaching and education faculties, Muhammadiyah University of Makassar, as many as 27 students. At this stage, the needs analysis data were collected using a questionnaire declared valid by the expert. The collected data was then analysed using simple statistics by utilising Microsoft Excel.

After knowing what the students need, researchers entered the next stage: designing modules and learning video prototypes by paying attention to relevant learning theories. Furthermore, the prototype was faced with two experts to assess their validity through an expert assessment sheet.

For more details, the collected data is analysed with the following stages:

For the questionnaire data assessment score using Likert scale guidelines, as shown in the following Table 1:

Table 1

Table 1. Assessment score

Category	Score
Excellent	4
Good	3
Less	2
Very less	1

To calculate the average score from the questionnaire data using the following formula:

$M = (\sum X)/N$

To convert the average score obtained into an assessment, use the following criteria:

Table 2

Table 2. Conversion criteria

Score range	Criteria
X ≥ M + SBi	Highly valid
M + SBi > X ≥ M	Valid
M > X ≥ M − 1 SBi	Less valid
X < M − 1 SBi	Invalid

To conclude the assessment of the validity or feasibility of the modules and learning videos developed, use the following criteria:

Table 3**.** Conclusion criteria

Score	Score range	Category
4	X ≥ 3.0	SV (highly valid)
3	3.0 > X ≥ 2.5	V (valid)
2	2.5 > X ≥ 2.0	KV (less valid)
1	X < 2.0	TV (invalid)

3. Results /Findings

As the stages of development described in the methods section above, the results of research and discussion are described into three stages: 1) analysis of needs for module development and learning videos, 2) designing prototype products (modules and learning videos), and 3) development (validity test) of the product by experts.

3.1. Needs analysis

In the research and development method used by all experts, the needs analysis process was always the first step that must be passed by the researcher, even though the researcher was given the authority to formulate their method to get an idea related to the extent of the needs of the research subject, which in this study was a student who has programmed a statistics course.

In this section, researchers described the needs of students for development activities carried out with two main aspects, namely aspects of learning conditions when statistics courses were running and aspects of the level of student needs for the development of modules and learning videos for statistics courses.

3.1.1. Learning conditions of statistics courses

In the aspect of learning conditions for statistics courses, based on data from researchers' findings through the distribution of questionnaires to 27 students who have programmed statistics courses, and 5 indicators asked by researchers, the following figures were found:

1) indicators of the level of difficulty faced by students during continuous learning, it was found that 21 students felt difficulties when participating in learning statistics courses, and 6 others felt that they did not find difficulties;

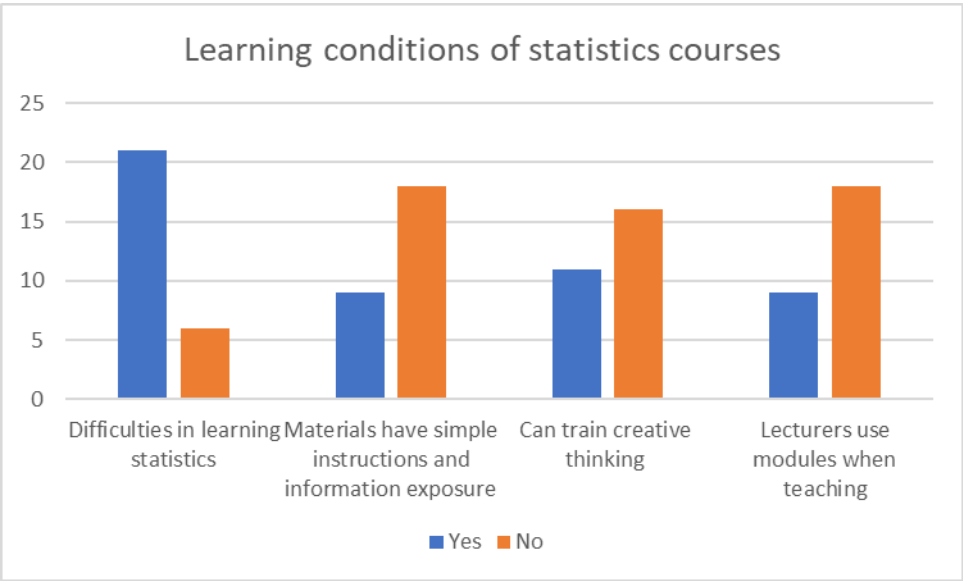
2) indicators of teaching materials used by lecturers having simple instructions and exposure to information, it was found that 9 students said the instructions and exposure to the information were clear, while 18 others stated that it was not simple;

3) indicators of whether the teaching materials used by lecturers who teach statistics courses can train students' creative thinking skills, it was found that as many as 11 students stated that they could train them to think creatively, and 16 others said they could not train them to think creatively; and

4) indicators of lecturers using modules when teaching, 9 students stated that they used modules, while 18 others said they did not. For an overview of the data in general, it can be seen in the following Figure 1.

Figure 1

Figure 1. Learning conditions of statistics courses



According to Anriani and Hendrayana (2018), good teaching materials must meet several characteristics, one of which is that they are helpful to facilitate users according to their access wishes so that instructions and exposure to information must be simple. If viewed from the findings above, it can be said that the teaching materials used by lecturers who teach statistics courses in the form of course modules are still in a bad category because the instructions and exposure to information in accordance with student wishes are still not fulfilled.

Meanwhile, according to Rahayu (2021), good teaching materials can increase students' creativity, so every teaching material used or developed by lecturers should be able to help students train their creative thinking skills in accordance with the learning needs of the 21st century.

This view is contrary to the findings in the field because the lecturers who teach statistics courses in accordance with the assessment of students above are considered to be still unable to facilitate the

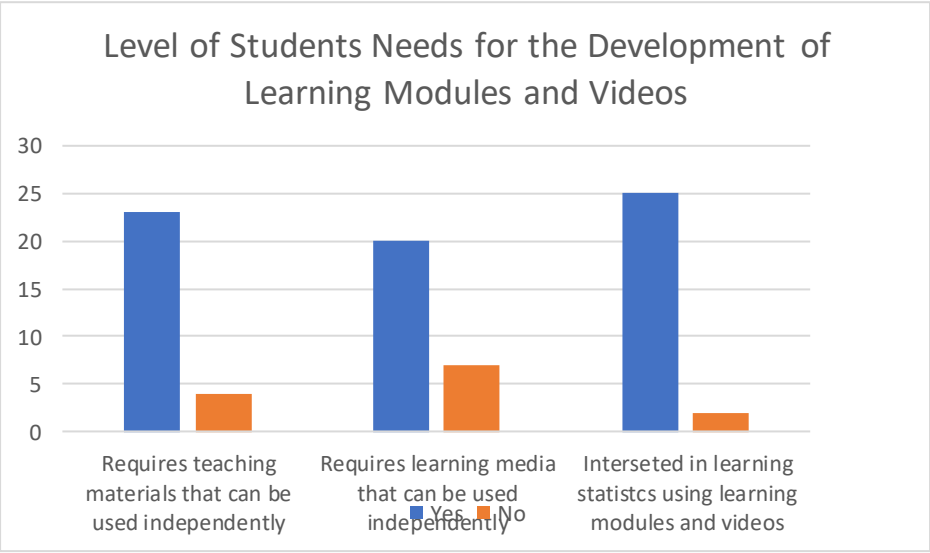
development of their creative thinking skills, so they need to develop teaching materials that can help them improve their creative thinking skills.

3.1.2. Level of student needs for module development and learning videos

In this section, researchers measured the level of student needs for the plan of module development activities and learning videos for statistics courses. That data showed that as many as 20 more students out of 27 respondents felt the need to develop teaching materials and learning media in the form of modules and learning videos to support the learning process in the statistics course class. For an overview of the data in general, it can be seen in Figure 2 below.

Figure 2

Figure 2. Level of student needs for module development and learning videos



According to the data above related to the level of student needs for the development of modules and learning videos, which are quite high, the researcher concluded that it is very urgent for students who program statistics courses to stimulate ease of learning through the procurement of teaching materials and learning media so that it is necessary to immediately develop modules and learning videos that can at the same time train students' creative thinking skills.

This is in line with the view (Sungkono, 2009), which says that the development of teaching materials is important for educators so that teaching and learning activities can run effectively and efficiently. However, it is also important to focus on competence so that the teaching materials developed can align with the competencies to be achieved.

One way that can be done is to find out that the teaching materials developed do not deviate from the competencies to be achieved, namely adjusting to the needs of students, of course in terms of this research are students.

3.2. Product prototype design

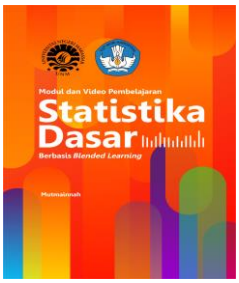
Martono (2018) explained that the prototype of a product is proof of a product concept, so a prototype is an overview of a product that contains the important points of the product. This view is the basis for researchers' revealing the design or prototype of the products produced from this research and development, namely course modules and learning videos. For the statistics course module, the prototype is described as follows:

Cover

The cover section contains the title, namely 'Modul Mata Kuliah Statistika Berbasis Blended Learning', the author or module developer's name, and the area of implementation of the 'University of Muhammadiyah Makassar' module, as well as the year of product manufacture. To be clear, it can be seen through the following Figure 3:

Figure 3

Figure 3. Statistics course module cover



Introduction

The section contains introductory remarks from the author or developer regarding the urgency and purpose of compiling the statistics course module.

Table of contents

This section contains an overview of the module's entire content, which is compiled by containing the key points.

Module position map

This section contains mind mapping from the statistics course module, which will be compiled so that users can find an overview of the content and vision of the book.

The content of the module consists of the following:

- Introduction

The introductory section contains course learning outcomes, a brief description of the course, instructions for using modules, and learning planning.

- Teaching materials

This section contains teaching materials that will be delivered in statistics courses in 1 semester or materials for 14 meetings, excluding midterm exams and final semester exams.

- Evaluation of learning

This section contains indicators for assessing students' creative thinking skills, equipped with a grid of midterm exam questions and final semester exams.

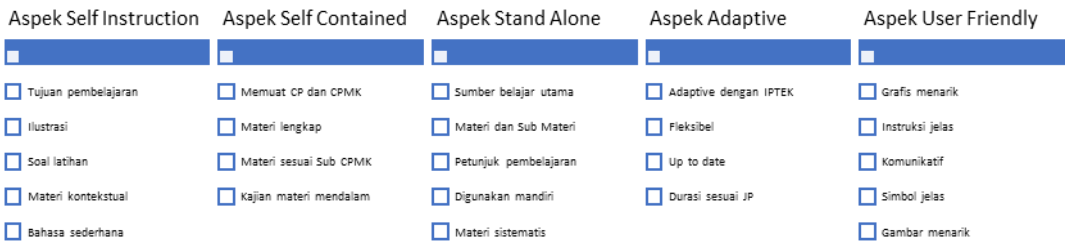
References

This section contains a list of knowledge references contained in the module.

For learning videos related to statistics course material, the prototype is described as follows:

Figure 4

Figure 4. Prototype learning video



3.3. Validity test

In this section or stage of the validity test, the researcher presents the results of expert assessments related to the instruments used in this study as well as the assessment of the products developed to ensure that the results achieved are valid and feasible to be used according to their objectives so that the researcher's description of the results is biased to ensure objectivity.

It is because every element of the research instrument and the product developed must be tested first by experts in their fields (Ihsan, 2016). Therefore, below, the researcher describes the validity test results from the instruments used to develop the product validity test in the form of modules and learning videos for statistics courses.

Validity of questionnaire instruments

The results of the validity test of the questionnaire instrument used in this study are:

1) clarity of questions and statements in the questionnaire; the first expert gives a value of 4 and the second expert gives a value of 3.67, so the average is 3.84 (very valid category);

2) the accuracy of the content of the questionnaire, the first expert = 4, the second expert = 4, so the average is 4 (very valid category);

3) the relevance of the questionnaire contents to the research objectives, the first expert = 3.5, the second expert = 4, so the average is 3.75 (very valid category);

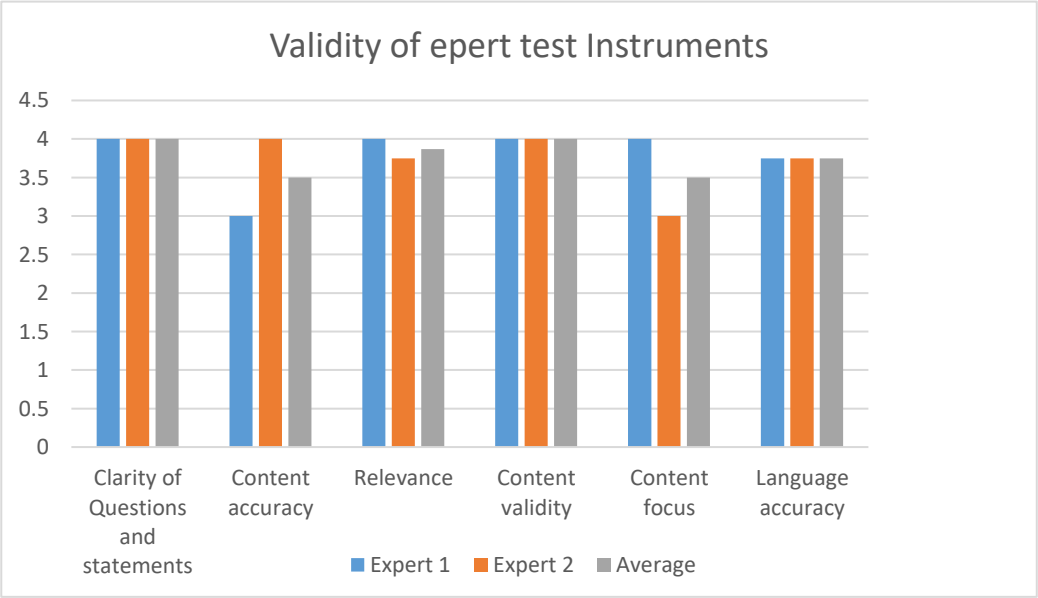
4) the validity of the contents of the questionnaire, the first expert = 3, the second expert = 4, so the average is 3.5 (very valid category);

5) focus on the content of the questionnaire, the first expert = 4, the second expert = 4, so the average is 4 (very valid category); and

6) Language accuracy in the questionnaire, first expert = 3.5, second expert = 3.5, average = 3.5 (very valid category). In general, the expert assessment of the questionnaire instruments used in this study can be seen in the following Figure 5:

Figure 5.

Figure 5. Validity of questionnaire instruments



Overall, based on the data above, expert assessment of the questionnaire instrument used by researchers in collecting data on student needs analysis of module development and learning videos for statistics courses, if averaged, has an overall value of 3.76 or falls into the 'very valid' category, so it is very feasible to use.

Validity of expert test instruments

The results of the instrument validity test used by the research to obtain an assessment of the product developed by the designated expert are:

1) the clarity of questions and statements in the expert test sheet; the first expert gives a value of 4, and the second expert gives a value of 4, so the average is 4 (very valid category);

2) the accuracy of the content of the expert test sheet, the first expert = 3, the second expert = 4, so the average is 3.5 (very valid category);

3) the relevance of the content of the expert test sheet to the research objective, the first expert = 4, the second expert = 3.75, so the average is 3.87 (very valid category);

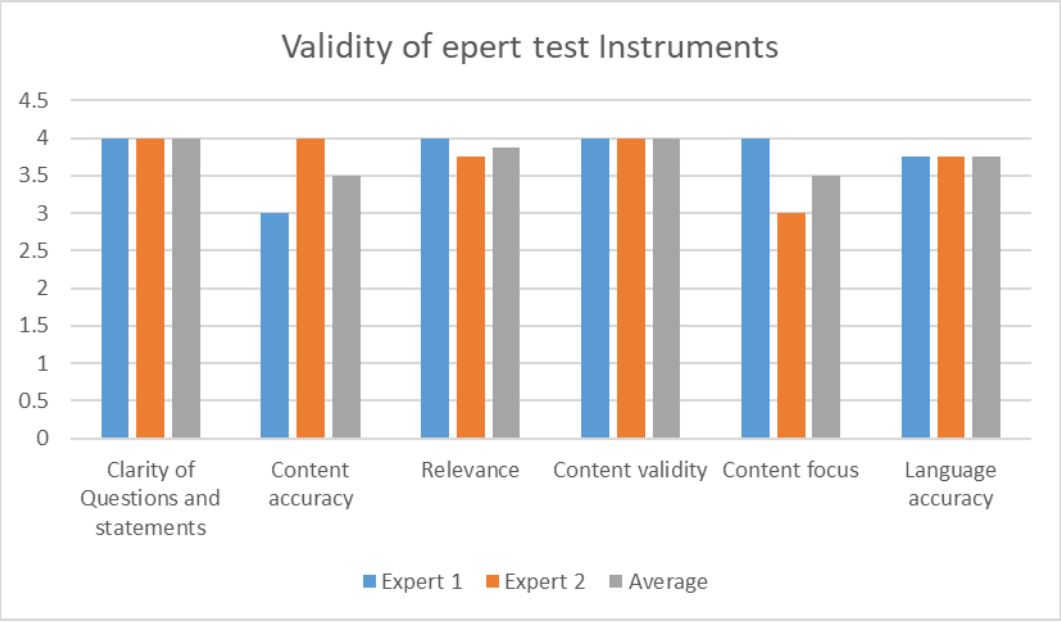
4) the validity of the content of the expert test sheet, the first expert = 4, the second expert = 4, so the average is 4 (very valid category);

5) focus on the content of the expert test sheet, the first expert = 4, the second expert = 3 so that the average is 3.5 (very valid category); and 6) the accuracy of the language in the expert test sheet, the

first expert = 3.75, the second expert = 3.75, so the average is 3.75 (very valid category). In general, the expert assessment of the expert test sheet instruments used in this study can be seen through the following Figure 6:

Figure 6.

Figure 6. Validity of expert test instruments



Overall, based on the data above, expert assessment of expert test sheet instruments used by researchers in collecting valid data on the products developed, namely modules and learning videos for statistics courses, if average, the overall value of expert assessment indicators is 3.77 or is included in the 'very valid' category, so that it is very feasible to use.

Validity of modules and learning videos

To measure the feasibility of products developed in the form of modules and learning videos, researchers also ask for expert assessments to measure the validity of the product so that it is suitable for use in learning statistics courses, both by lecturers who teach courses and by students.

In addition, the expert validation process is intended for researchers to get input from experts to be used as evaluation material for the products developed (Fatmawati, 2019). In this section, the researcher divides the description of the expert assessment into two components, namely, the media component of the product and the material component.

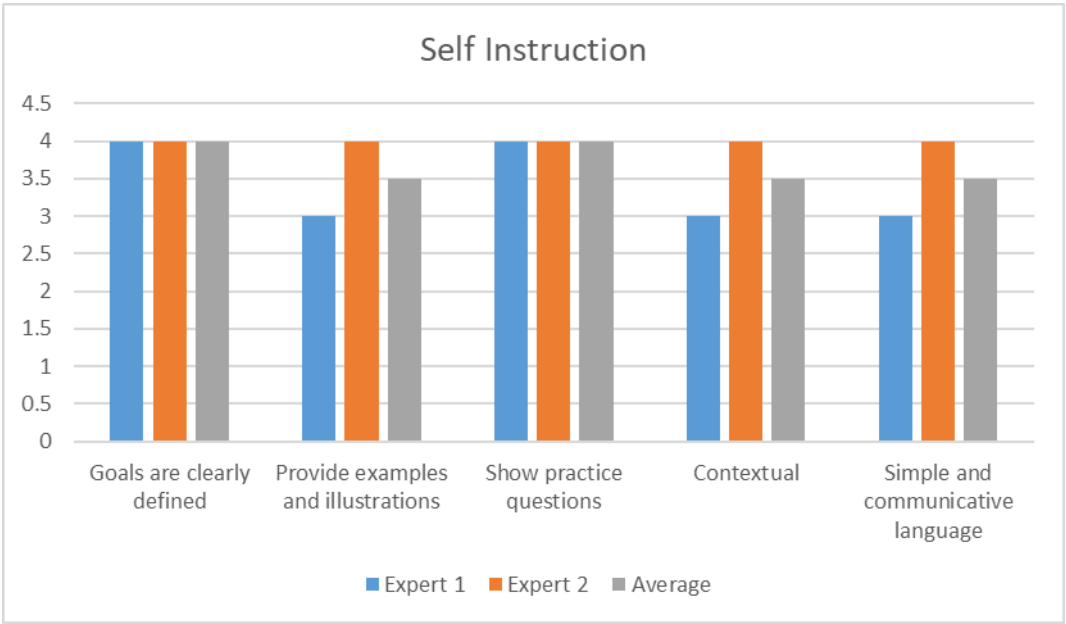
a. Media components

In the media component, five aspects are assessed with each indicator. The five aspects are:

1. Self-instruction aspects

Figure 7

Figure 7. Validity of self-instruction aspects

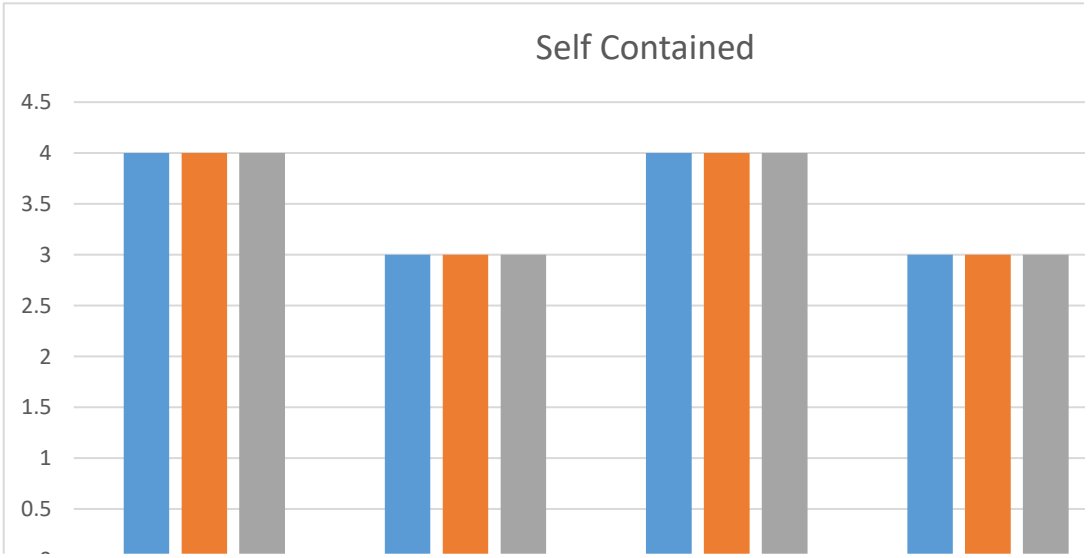


Overall, based on the data above, expert assessment of the self-instruction aspects of the product media components developed, namely modules and learning videos for statistics courses, if average, the overall value of expert assessment indicators is 3.7 or included in the valid category.

2. Self-contained aspect

Figure 8

Figure 8. Validity of self-contained aspects

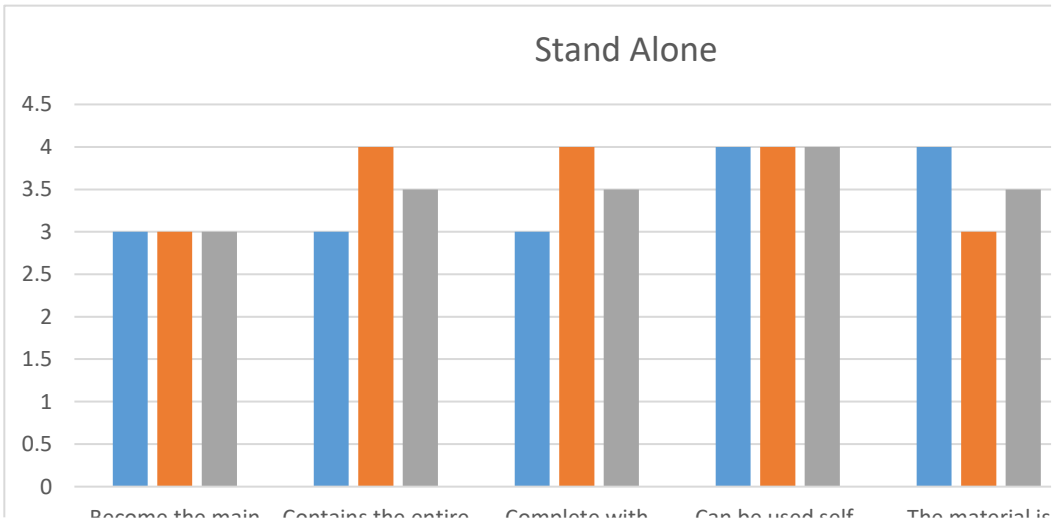


Overall, based on the data above, the expert assessment of the self-contained aspects of the product media components developed, namely modules and learning videos for statistics courses, if average, the overall value of the expert assessment indicator is 3.5 or falls into the valid category.

3. Stand-alone aspect

Figure 9

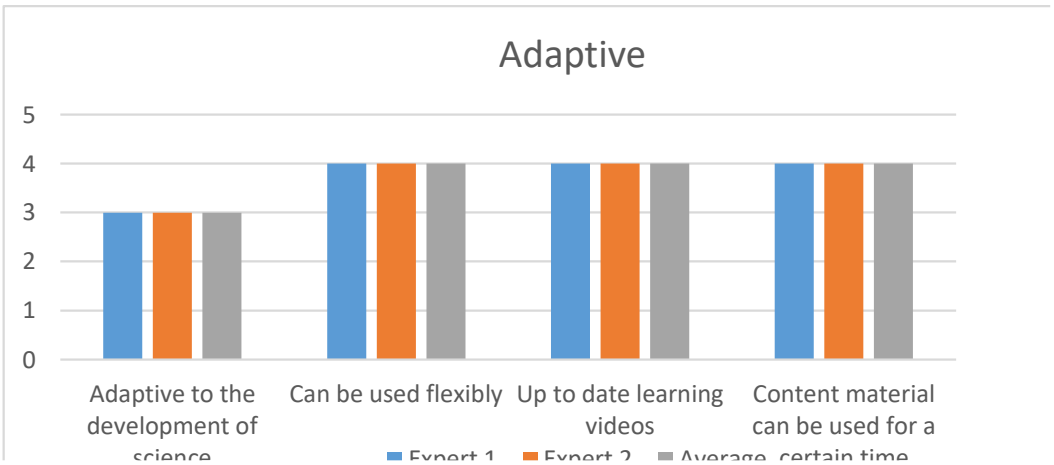
Figure 9. Validity of stand-alone aspects



Overall, based on the data above, expert assessment of the stand-alone aspects of the product media component developed, namely modules and learning videos for statistics courses, if average, the overall value of the expert assessment indicator is 3.5 or included in the valid category.

4. Adaptive aspects

Figure 10. Validity of adaptive aspects

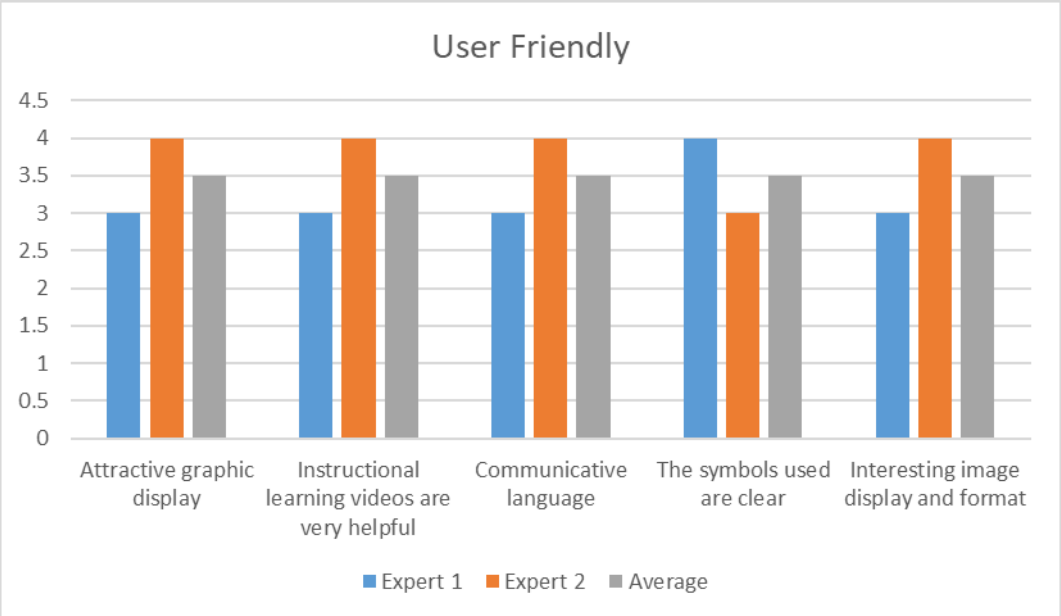


Overall, based on the data above, the expert assessment of the adaptive aspects of the product media component developed, namely modules and learning videos for statistics courses, if average, the overall value of the expert assessment indicator is 3.75 or is included in the valid category.

5. User-friendly aspects

Figure 11.

Figure 11. Validity of user-friendly aspects



Overall, based on the data above, expert assessment of the user-friendly aspects of the product media component developed, namely modules and learning videos for statistics courses, if average, the overall value of expert assessment indicators is 3.5 or included in the valid category.

b. Material components

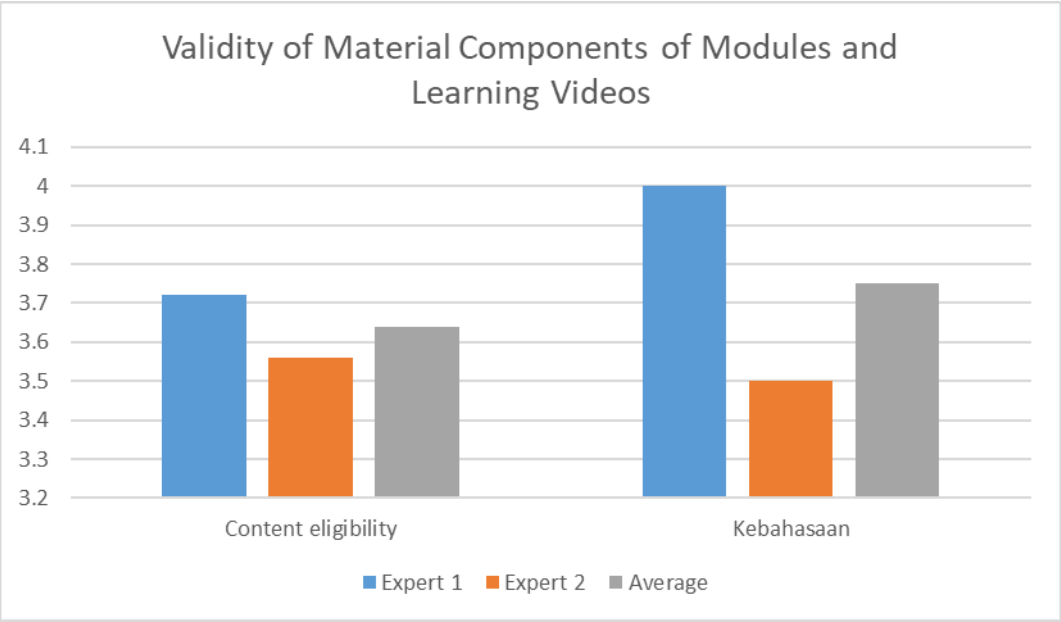
In the material component, two aspects are assessed: the feasibility aspect of the material content and the linguistic aspect of the product material developed. As for the description of the expert validation results, it can be seen through the following Figure 12:

Overall, based on the data above, the expert assessment of the material component of the product developed, namely modules and learning videos for statistics courses, if averaged, has an overall value of 3.69 or falls into the valid category.

The results of the expert assessment of learning modules and videos developed with two assessment components, namely the media component and product material, can be concluded that the products developed by researchers have met the category of being ‘very valid’ or ‘very feasible’ to be used by lecturers and students in learning statistics courses, which are expected to stimulate the improvement of student's creative thinking skills as the mission of 21st-century learning.

Figure 12

Figure 12. Validity of material components of modules and learning videos



4. Conclusion(s)

Based on the results of the analysis of student needs, it was found that the modules used by lecturers who teach statistics courses are still in the poor category because the instruction and exposure to information are still unable to facilitate students in developing their creative thinking skills so that 20 students from a total of 27 respondents feel the need to develop modules and learning videos to support their learning process in the statistics course class.

This is the basis for designing prototype modules and learning videos, which two experts then validate with two product components used as the basis for assessment: the media component of the product being developed and the material component of the module and learning video.

The results of expert validation of media components consist of 5 aspects, namely: 1) self-instruction aspects, with an average of 3.7 (valid categories); 2) self-contained aspects, with an average of 3.5 (valid categories); 3) stand-alone aspects, with an average of 3.5 (valid categories); 4) adaptive aspects, with an average of 3.75 (valid categories); 5) user-friendly aspects, with an average of 3.5 (valid categories), while for material components, the overall average aspect is 3.69 (valid category).

5. Recommendations/Future directions

It is recommended for researchers in the field of Education to be able to develop learning modules and videos, which are really needed in the new normal era of Covid-19 to support the learning process and make it easier for students to better understand the material, and by using these learning modules and videos students are able to learn independently.

Acknowledgments

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