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Basic Science Module as a Resource for Independent Learning for Elementary Teacher Education Students in the Pandemic Covid-19

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ABSTRAK

Kurangnya media pembelajaran dalam pembelajaran daring membuat mahasiswa kesulitan dalam belajar khususnya pada materi konsep dasar IPA. Alternatif solusi agar mahasiswa dapat belajar mandiri yaitu dengan mengembangkan modul dengan karakteristik modul yang baik. Penelitian ini bertujuan untuk menghasilkan produk berupa modul konsep dasar IPA yang valid sesuai dengan karakteristik modul yang baik. Jenis penelitian ini merupakan penelitian research and development dengan prosedur pengembangan Borg & Gall. Subyek penelitian ini adalah tiga orang ahli ilmu penilaian, satu orang ahli evaluasi. Populasi dalam penelitian ini adalah siswa prodi keguruan SD yang mengambil mata kuliah IPA, dan sampel penelitian ini adalah 9. Teknik pengumpulan data dalam penelitian ini dilakukan dengan menyebarkan angket dan lembar validasi produk. Teknik analisis data dilakukan dengan teknik analisis deskriptif kualitatif dan kuantitatif. Hasil penelitian ini menunjukkan bahwa modul IPA yang dikembangkan memiliki karakteristik have a clear instruction, self-contained, stand-alone, adaptive, user-friendly dengan kegrafian yang menarik. Hasil validasi modul diperoleh rata-rata 103 dengan kategori sangat baik. Berdasarkan hasil angket respon yang telah disebarkan kepada sepuluh mahasiswa diperoleh data bahwa sebanyak 80% mahasiswa menyampaikan sangat membantu memandirikan belajar selama masa pandemi, dan sebanyak 20% menyampaikan bahwa modul yang dikembangkan cukup membantu dalam pelaksanaan proses pembelajaran selama masa pandemi. Hal tersebut membuktikan bahwa modul yang dikembangkan ini layak untuk digunakan sebagai sumber belajar mandiri di masa pandemi.

ABSTRACT

The lack of learning media learning that dares make students find it challenging to learn, especially on the basic concepts of science. An alternative solution for students to learn independently is by developing modules with good module characteristics. This study aims to produce a product in the form of a valid science basic concept module according to the characteristics of a suitable module. This type of research is research and development research with Borg & Gall development procedures. The subjects of this study were three experts in assessment and one evaluation. The population in this study were elementary school teacher study students who took science courses, and the sample of this study was 9. The data collection technique in this study was carried out by distributing questionnaires and product validation sheets. The data analysis technique was carried out using qualitative and quantitative descriptive techniques. The results of this study indicate that the developed science module has clear, independent, independent, adaptive, user-friendly instructions with attractive graphics. The module validation results obtained an average of 103, with a very good category. The results of the response questionnaire distributed to ten students showed that as many as 80% of students added that they were accommodating in independent learning during the pandemic, and as many as 20%. Based on the modules developed were pretty helpful in implementing the learning process during the pandemic. It proves that the module developed is worthy of being used as a source of independent learning during the pandemic.

1. INTRODUCTION

The covid pandemic period forces education to adapt to existing conditions, as well as learning carried out in higher education. Educators must be able to facilitate the needs of the learning process during this covid period as much as possible so that the learning process continues to run effectively and efficiently. Elementary school teacher education is a study program that produces qualified and characterized prospective teachers. The quality of these prospective teachers also greatly affects the learning process that

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will be carried out in the future. (Julie A. Luft & Peter W. Hewson, 2014; Nixon et al., 2019) also explined that a teacher's science materials knowledge also impact on the teachers' career.

However, the result of observations especially in natural science class, showed that the learning process during pandemic occurred leaning loss which resulted in students not understanding the concept of the basic concept of science. Students do not master the content of the material being taught. It is very dangerous because the quality of these prospective educators will also determine the quality of education in elementary schools in the future (Boonroungrut et al., 2022; Diva et al., 2021; Haryati et al., 2021). According to that need analysis, one alternative that can be developed by educators is by developing a module as a resource for student independent learning. One of the subjects that need independent learning resources in the module form is the elementary science basic concepts course. Science is an important part of education that plays a role in preparing students to have a critical, creative, and solution thinking attitude in solving problems that exist in everyday life (Afni et al., 2018; Ouahi et al., 2022; Tika & Agustiana, 2021). The existence of science in elementary school is also used as a means to nurture students' curiosity scientifically (Kasse et al., 2022; Nehru & Irianti, 2019). The importance of science requires the role that prospective teachers have good quality mastery of the science concept. This must be prepared since the prospective teacher becomes a student.

Not all elementary teacher education students come from science majors at the high school level, some come from social studies, language, culinary majors and some even come from tourism vocational schools. This will make it difficult for them to explore science material, especially with material that has numerical characteristics. Consequently, an alternative learning resource is needed that can make it easier for them to study the material in the basic science concept course (Aufa et al., 2021; Kimianti & Prasetyo, 2019; Rahmatsyah & Dwiningsih, 2021). Hopefully, this module can also be used as a tool for students to study independently according to their respective abilities with different time requirements. The learning process during pandemic the Covid-19 forced the learning system to be carried out online. This situation requires the learning resources support that make students independent in the learning process. The results of learning evaluations in the basic science concept course also show that learning will run effectively if it is assisted by complete learning resources, one of which is in the module form (Erawati et al., 2021; Herlina & Hadiyanti, 2021). Modules developed based on scientific topics will be very interesting and can develop students' skills in science education (Levrini et al., 2021). This situation shows that a valid module is needed that can help the online learning process with the purpose of students can study independently because the module can make students study anywhere and anytime. With a module, the learning process also runs effectively and efficiently because the material has been provided coherently. Based on these problems, it is very important to develop a module for basic science concepts as a source of independent learning for elementary teacher education students.

The module is teaching materials that are arranged systematically in a language that is easily understood by students, according to their age and level of knowledge so that they can learn independently with minimal guidance from educators (Prastowo, 2013; Wulandari et al., 2021). This module needs to be developed because the module has the following advantages. First, the module can provide feedback with the aim of students knowing their shortcomings and immediately make improvements (Dewi et al., 2017; Utami et al., 2018). Second, the module set clear learning objectives with the aim of student learning performance is directed in achieving learning goals. Third, module that is designed to be attractive, easy to learn, and can answer needs will certainly motivate students to learn (Buchori & Rahmawati, 2017; Winatha et al., 2018). Fourth, module is flexible because the module material can be studied by students in different ways and at different speeds (Kimianti & Prasetyo, 2019; Raharjo et al., 2017). Fifth, collaboration can be established because with the competition module can be minimized and between learners and learners. Sixth, remedies can be done because the module provides sufficient opportunities for students to be able to find their weaknesses based on the evaluation given. A module can also be used as a way to reduce student academic stress. Furthermore, the module can also be used as an alternative to support learning, especially during the Covid-19 pandemic (Islami & Armiati, 2020).

A module is said to be good if it fulfills the five-module characteristics, namely *have clear instruction, self-contained, stand-alone, adaptive, and user-friendly*, specifically described as follows. First, have clear instruction, students are allowed to learn independently and not depend on other parties (Aufa et al., 2021; Herawati & Muhtadi, 2018). Self-instruction can be fulfilled if the module contains clear learning objectives; learning material is packaged in small or specific activity units; examples availability and illustrations that support the presentation clarity of learning materials; there are practice questions, assignments; contextual; the simple language and communicative; there is a summary of learning material; the existence of an independent assessment instrument. Second, Self Contained, all required learning materials are included in the module. These characteristics provide the opportunity for students to study the learning material thoroughly (Fonda & Sumargiyani, 2018; Subarkah et al., 2021). Third, stand Alone, the module

developed does not depend on other teaching materials or does not have to be used together with other teaching materials (Astalini et al., 2019; Buchori & Rahmawati, 2017). Students do not need other teaching materials to study or do assignments in the module. Fourth, Adaptive, the module can adapt to the development of science and technology, flexible or flexible to use in various hardware (hardware) (Asmi et al., 2018; Raharjo et al., 2017). An adaptive module is if the module can be used for a certain period. (e) User Friendly (friendly or familiar), the module has simple instructions and information exposure is easy to understand and uses commonly used terms (Aufa et al., 2021; Fisnani et al., 2020). In addition to these characteristics, the module must also be developed according to the needs of students based on the results of a preliminary analysis questionnaire and an analysis of student needs regarding basic science concepts (Purwanto et al., 2020).

The module is also defined as part of a planned learning unit designed to help individual students achieve their learning goals. Other research found that students can learn according to their ability and provide opportunities for individual differences in learning (Linda et al., 2021; Syahroni et al., 2016). Other research also found that students who have high speed in learning will master the material faster and more independently. Meanwhile, students who have a low learning speed can learn again by repeating parts that have not been understood until understood independently (Astra et al., 2020; Darmayasa et al., 2018). The involvement of students with learning modules allows them to be independent. The availability of modules as teaching materials will make it easier for teaching and learning process activities, increasing students' intrinsic motivation, and increasing extrinsic motivation with lots of feedback (Bela et al., 2021; Mamun et al., 2020; Sari et al., 2020). There is no specific study regarding the basic science module as a source of independent learning for elementary school teacher education students during the covid-19 pandemic. This study aims to develop a basic science module as a source of independent learning for elementary school teacher education students during the covid-19 pandemic. It is hoped that the developed science module can help students learn.

2. METHOD

This research type is a research and development study, with the Borg & Gall development procedure. The procedure for developing a learning model in this study refers to the Borg & Gall model with the following stages: research and information collecting; planning, develop a preliminary form of product; preliminary field testing; main product revision; main field testing, operational product revision; operational field testing, final product revision, dissemination and implementation (Aka, 2019). In this research, the research is still at the fifth stage, namely the main product revision. Further research will be continued with the trial phase. It can be seen in this fishbone Figure 1.

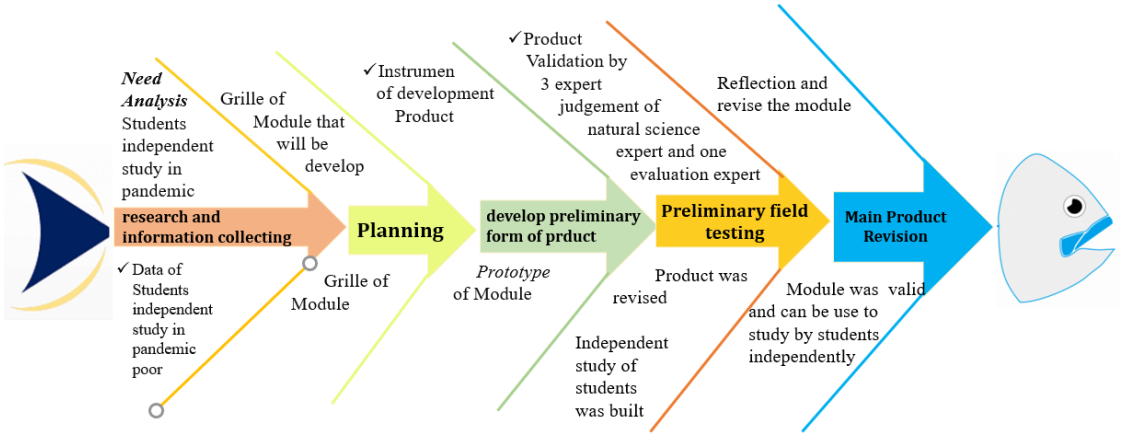

Figure 1. Stage of this research

The research subjects were three science experts of judgment, one evaluation expert, and students of the University of Sarjanawiyata Tamansiswa Yogyakarta. The population of this research is the student of elementary school teacher department who take the natural science class, and the sample of this research is 9 students of elementary school teacher department who take the natural science class. Data collection techniques in this study were carried out by distributing questionnaires and product validation sheets. The instrumen of validation sheet firstly validated by the evaluation expert and valid declared. The module development grid can be seen in the Table 1.

Table 1. The Module Development Grid

Aspects	Indicator
Material Aspect	1. Material truth
	2. Material accuracy
	3. The suitability of material with learning objectives
	4. The suitability of material sources theoretically and empirically
	5. Encouraging student learning independence
	6. Encouraging student innovation
	7. Able to motivate student self-development
	8. The material novelty
Layout Aspect	1. Have a clear instruction
	2. The module allows students to study independently
	3. The learning objectives are presented
	4. Material is packaged in small or specific activity units
	5. Availability of examples and illustrations that support the clarity of the presentation of learning materials
	6. There are practice questions, assignments, and the like contextually
	7. The language used is simple and communicative
	8. The module is equipped with a summary of the learning material
	9. Self-contained: learning material contained in a complete module
	10. *Stand alone:* the module developed does not depend on other teaching materials
	11. *Adaptive:* the module is integrated with science and technology and is flexible
	12. *User friendly: the module has simple instructions and information*
Graphics Aspect	1. Suitability of the module size with the level of student development and module material
	2. Unity or harmony of appearance, layout module skin elements
	3. The clarity and harmony of colors in the layout elements
	4. The suitability of using letters and font sizes with the level of student development
	5. The suitability of the illustrations used with the message conveyed

The data analysis techniques used in this development research were qualitative descriptive analysis techniques, quantitative descriptive analysis techniques, and inferential statistical analysis techniques. Qualitative descriptive describes the validation process of module involving three expert natural science experts and one evaluation expert. And quantitative descriptive describes the evaluation of four experts. This research was carried out in the elementary school education department of Sarjanawiyata Tamansiswa University.

3. RESULT AND DISCUSSION

Result

The result that has been achieved in this research is a product of the Basic Science Concept module consists of three themes, namely electricity and magnetism, natural resources, and the solar system. The developed module has characteristics, among others: *have a clear instruction, self-contained, stand-alone, adaptive, user-friendly, and interesting graphic aspects. The self-instruction* aspect is indicated by the function of the module which allows students to learn independently and not depend on other parties. This is evidenced by several indicators, including the developed module containing clear learning objectives. material packaging in the module is packaged in small or specific activity units. The module developed is also equipped with the availability of examples and illustrations that support the clarity of learning materials presentation. This is evidenced by the presence of pictures inserted in the module according to the material being studied. For example, when discussing static electricity, the module is given a picture explanation of the illustration of static electricity in everyday life. When discussing the sun, the solar system module is also equipped with a picture of the sun with a full-color display so that the explanation becomes easier to understand.

The module being developed is also equipped with practice questions, assignments, and the like suitable for the material being studied. This is used to measure student understanding in studying the module material. There are various types of evaluation questions, namely there are worksheets provided for each sub-chapter, and at the end of the module, there are questions that discuss the entire module. This

evaluation can be done individually anywhere and anytime because it is presented in the form of a soft file. Another characteristic of the developed module is *self-contained*. This aspect is evidenced by all the learning materials needed by students are contained in the developed module. This will make it easier for students to learn because they no longer need to look for other learning sources in studying the material. The third characteristic of this developed module is Stand Alone. This is evidenced by the module being developed that does not depend on other teaching materials or other teaching materials with the intention of students do not need other teaching materials to study or do assignments on the module.

The fourth characteristic of this developed module is *adaptive*. This adaptive aspect is realized by a module that is developed to adapt to developments in science and technology, being flexible or flexible to use in various hardware devices. The developed module is designed with two types, namely hard file and soft file, this makes it easier for students to study anywhere and anytime, the worksheet is also presented with the file by first downloading the file link that has been provided. The fifth characteristic of this developed module is *user friendly*; the developed module has simple instructions and information exposure is easy to understand, and uses commonly used terms. The sixth characteristic that this development has is its interesting graphic aspect. This aspect is evidenced by the developed module which is designed in full color, colorful and attractive covers, and various visualizations of images that follow the material discussed. The results of the development of the science module are presented in Figure 2.

Figure 2. Natural Science Module

Assessments given by experts on the material aspect get very good qualifications. In the aspect of layout get very good qualification. on the graphic aspect get very good qualifications. The module developed was then assessed by 3 science experts' judgments. The results of this assessment in the Table 3.

Table 3. The Results of the Three Experts' Assessment of the Developed Modules

Aspects		Experts		
Material Aspect		27	35	34
Layout Aspect		43	51	48
Graphics Aspect		25	24	22
	Total	**95**	**110**	**104**

After being validated, the developed module was also asked to respond to ten students who took the basic science concept cours. Based on the results of the response questionnaire that has been distributed to ten students, data shows that as many as 80% of students say that it is very helpful to learn independently during the pandemic, and as many as 20% say that the modules developed are quite helpful in implementing the learning process during the pandemi. The responses given by students include the modules developed can help students become independent because the developed modules present material clearly, concisely, densely and easily understood. the arrangement of the material is also structured, detailed and attractively designed so that it is also interesting to read.

Discussion

The module validity data above shows that the module developed is valid or feasible to be used as a source of independent learning for elementary school teacher education study program students during the pandemic. This module is also one of the solutions to achieve learning objectives in the basic science

concepts course. Furthermore, success in the process of learning basic science concepts also affects the quality of human resources of prospective elementary school teachers. One aspect that teachers need to pay attention in the future teachers is the mastery of knowledge, including knowledge of basic science concepts (Rowan et al., 2020; Sosibo, 2012). At the module validation stage, some of the input from the validator team, among others, was related to the layout of the worksheets and questions that were not yet HOTS. The questions were then made into HOTS with C4 ability, namely to analyze. The activity of analyzing has two levels, the first level is analyzing incoming information and arranging the information into smaller parts to identify patterns of relationships. Second, being able to recognize and differentiate complex cause and effect scenarios. Third, identifying or formulating questions. The second is the evaluation level. Analysis level indicators are: providing an assessment of solutions, ideas, and methodologies using appropriate criteria or existing standards to ascertain their effectiveness or usefulness; making hypotheses, criticizing, and testing; accepting or rejecting statements based on predetermined criteria. While the third is the level of creation. The level of creation indicators are: generalizing an idea or perspective about something; designing ways to solve problems; and arranging elements or parts into new structures that have never existed before (Mubarok & Anggraini, 2020).

Based on the six characteristics of the developed module in this research, it can help students learn the material in the basic science concepts course as well as a step to reduce academic stress and streamline learning during this pandemic. Its inline with the research which has been done by (Priantini & Widiastuti, 2021). Independence is very important and an attitude that must be owned by every individual. Independence is defined as the ability to manage everything one has, such as time, thinking skills accompanied by the ability to take risks and solve problems hand (Nurhasanah et al., 2020; Sugianto et al., 2020; Syelitiar & Putra, 2021). Independent, which is meant in this study, is a student's attitude that is manifested through activities of responsibility for the rights and obligations of being a student in the learning process of basic science concepts, not paying attention to dependence on others, being able to show great curiosity and having a confident attitude. This module can also be used as an alternative learning solution during a pandemic (Mazidah et al., 2020; Purnamasari et al., 2020).Various readiness technologies are very useful during this pandemic (Andarwulan et al., 2021; Gestiardi et al., 2021).

During the Covid pandemic like this time is the most appropriate time to foster an independent attitude in learning. This independent attitude needs to be built by each individual, one alternative that can be done in developing independence is through the learning process. The pandemic situation requires students to use emotional intelligence so that they can manage boredom and negative impacts. The module provides an opportunity for students to cultivate their emotional intelligence by self-regulating, more responsibility for learning outcomes. Active participation of students in the learning process, both in determining plans, strategies, goals, and controlling their learning by using the module as a learning resource (Chandra, 2021; Ratnawati, 2021). Modules are an alternative source of learning that can be used to foster student learning independence. This is in line with what was conveyed by Prastowo who stated that modules are teaching materials that are systematically arranged in language that is easily understood by students, according to their age and level of knowledge so that they can learn independently with minimal guidance from educators (Kuswanto, 2019; Prastowo, 2013). The related research about module development during this pandemic was also carried out whose research results show that the module is very effectively used as a learning resource during a pandemi and improves students' affective, cognitive and psychomotor abilities (Maksum & Purwanto, 2022; Mauliana et al., 2022). This research confirms that the use of the module can also increase student independence in learning during the pandemic.

The modules that have been developed can also be accessed easily and anytime. Other research said that the type of module must be selected according to the conditions of technological development and characteristics student (Mazrekaj & De Witte, 2020; Sugiani et al., 2019). The limitations of this study do not involve technology, such as electronic modules. Modules are only sent to students in Portable Document Format through the online learning system of the University of Sarjanawiyata Tamansiswa Yogyakarta. It turns out, from the results of the research, the use of electronic modules is better than using printed modules. Electronic modules are more practical and effective in increasing student motivation and learning outcomes. It can even improve student critical thinking (Andriani & Suparman, 2019; Syahrial et al., 2021). The implication of this research for students is that during this pandemic period students can carry out a quality learning process and learning objectives can be achieved properly with the help of this developed science basic concept module. it also has an impact on the readiness of these prospective teachers in preparing to teach in elementary schools, especially in mastering basic science concepts. so that it also has an impact on the readiness of prospective elementary school teachers in doing science learning in the future.

4. CONCLUSION

The conclusion of the research that has been done is to produce a module product with basic concepts of elementary science with characteristics having aspects of clear instruction, self-contained, stand-alone, adaptive, user-friendly, and interesting graphic aspects. The validation results obtained with a very good category. This proves that the developed module is feasible to be used as a source of independent learning for elementary school teacher candidates. Based on the results of the response questionnaire that has been distributed to ten students, data shows that students say that it is very helpful to learn independently during the pandemic, and the modules developed are quite helpful in implementing the learning process during the pandemic.

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