Jurnal Inovasi Teknologi Pendidikan
Volume 13, No. 1, March 2026 (26-43)
Online: http://journal.uny.ac.id/index.php/jitp

An OBE-based e-module integrated with prophetic values: Enhancing statistical understanding, engagement, and character development

Ira Vahlia*, **Sangidatus Sholiha, Siti Suprihatin, Wardhani Utami Dewi**
Universitas Muhammadiyah Metro, Indonesia.
* Corresponding Author. E-mail: iravahlia56@gmail.com

ARTICLE INFO

Article History
Received:
25 October 2025;
Revised:
31 March 2026;
Accepted:
31 March 2026;
Available online:
31 March 2026.

Keywords
E-module; Outcomes-based education; Prophetic values; Statistics

ABSTRACT

Many students struggle to understand abstract concepts in Statistics because of limited contextual and interactive learning resources that connect theory to practice. Moreover, there is a lack of e-modules integrating prophetic values to support the vision of Universitas Muhammadiyah Metro. However, existing studies have not sufficiently integrated OBE with prophetic values in digital learning media for statistics, indicating a clear research gap. This study aims to develop an OBE-based e-module integrated with prophetic values for Statistics courses. The research employed an R&D method using the ADDIE model (analysis, design, development, implementation, and evaluation). The subjects were students of the Economic Education Study Program. Data were collected through interviews, expert validation and student response questionnaires, and analysed using descriptive quantitative and qualitative techniques. The results show that the e-module is highly valid (91.6%) and very practical (mean score = 4.3/5). Learning outcomes improved from an average of 62.5 to 83.7 ($p < 0.05$), indicating positive learning gains. This study provides contextual and methodological contributions by integrating OBE principles with prophetic values in digital learning design, and theoretical contributions in linking cognitive and character development in statistics learning. Future research should involve larger samples and longer implementation periods to assess affective outcomes better.

How to cite:
Vahlia et al., (2026). An OBE-based e-module integrated with prophetic values: Enhancing statistical understanding, engagement, and character development. *Jurnal Inovasi Teknologi Pendidikan, 13*(1), 26-43. https://doi.org/10.21831/jitp.v13i1.90807

INTRODUCTION

Higher education has a great responsibility in producing graduates who are not only academically superior but also able to adapt quickly to global dynamics. Education is not only an academic learning activity but also a continuation of the learning process and preparing students for the world of work (Mishra et al., 2020; Umar et al., 2024). The development of industry, technology, and community needs requires universities to continue innovating in how they organise learning. In this context, the Outcome-Based Education (OBE) approach is one of the strategic solutions to answer these challenges. This approach emphasises achieving learning outcomes as the main benchmark, integrating them into the curriculum, learning process, and assessment. The implementation of OBE aligns with the National Higher Education Standards (SN-Dikti) and serves as a reference for national and international accreditation (Kamahun & Indadihayati, 2023).

The OBE approach emphasises achieving learning outcomes through experience during the educational process (Kamahun & Indadihayati, 2023; Rahmawati & Wahyuni, 2024). The implementation of OBE affects all aspects of education, from planning and implementation to evaluation. Planning is an important factor in achieving success, including preparing teaching materials. Based on the results of internal audits conducted every even semester, it was found that most lecturers did not have OBE-based teaching materials before the start of lectures. Lecturers at the Faculty of Teacher Training and Education have received assistance in developing OBE-based learning devices, but have difficulty compiling them. In addition, the preparation of these teaching materials does not take into account student characteristics and has not undergone expert validation. Various previous studies have shown that OBE implementation focuses on aligning learning outcomes, learning activities, and assessment. However, most of these studies still emphasise curriculum and evaluation, while the integration of context- and student-needs-based teaching materials has not been studied in depth. Therefore, it can be concluded that the success of OBE is determined not only by curriculum design, but also by the quality and relevance of the teaching materials used in the learning process.

Statistics is one of the courses that plays an important role in developing data analysis skills and interpreting research results in the field of Education (Alem, 2020; Bromage et al., 2022; Henderson & Corry, 2021). All study programs at the Faculty of Teacher Training and Education include statistics courses taught to all students. Mastery of statistics enables students to understand, manage, and interpret data relevant to the learning process and various educational phenomena (Ediansyah et al., 2019; Romero & Ventura, 2020; Susbiyanto et al., 2019). However, in practice, many students struggle to understand the abstract concepts in educational statistics. This is due to the lack of contextual, interactive learning resources that link theory with practical applications in everyday life. Students' statistical problem-solving abilities are low and need improvement (Sriwahyuni & Maryati, 2022). Based on observations by Lecturers in Mathematics Education and Economics Education, many students arrive late to lectures because, at the Faculty of Teacher Training and Education (FKIP), lectures start at 07.30 this academic year. In addition, some students are less able to communicate, particularly in language style, and lack independence in completing assigned tasks.

The application of the OBE approach is one solution to overcome these problems. The OBE approach emphasises determining learning outcomes or achievements first, then designing learning methods and assessments to suit these outcomes (Davis & Knight, 2023; Weng & Chiu, 2023). This approach differs from the traditional method, in which lecturers first determine the topics to be taught and then identify the outputs. OBE focuses on improving students' learning experiences by ensuring learning outcomes are achieved through structured curriculum design (Kabeakan et al., 2024; Tenedero & Pacadaljen, 2021). OBE is strongly supportive of developing holistic student competencies, including technical, interpersonal, and work ethic skills. This approach is an important tool for improving the quality of education, institutions, and programs, and for supporting the development of students' work skills (Bandaranaike, 2018; Sun & Lee, 2020; Väisänen & Hirsto, 2020). Although numerous studies have examined the effectiveness of PjBL and e-modules in improving learning outcomes, there are still limitations in systematically integrating the OBE approach with statistical learning. Furthermore, most research still focuses on improving cognitive aspects, while values-based character development has not been a primary focus. Therefore, there is a significant research gap in the development of teaching materials that are not only oriented towards learning outcomes but also integrate spiritual values and character holistically.

An OBE-based curriculum focused on achieving outcomes can be implemented through the Project-Based Learning (PjBL) model. PjBL is considered an appropriate model to achieve educational goals in the 21st century because it integrates the 4C principles, namely critical thinking, communication, collaboration, and creativity (Marwa et al., 2024; Aliftika et al., 2019). Research conducted by Insyasiska and colleagues shows that PjBL encourages students to learn independently and seek information from various sources, such as experts, the surrounding environment, the media, and the internet. In addition, students are encouraged to collaborate in

teams to develop creative ideas, which are then realised as products (Insyasiska et al., 2017). According to Fitrianingtyas et al., (2023) and Herlina & Mugara (2021), project learning can change a person's disciplined character. Instilling character values is the goal of PjBL, which includes the planning and implementation process (Rifmasari et al., 2022). PjBL emphasises students' active involvement in completing real projects related to the material being studied. Through this approach, students not only gain theoretical understanding but also develop practical skills, such as data analysis, problem solving, and teamwork. PjBL can also increase independence (Ariyanto et al., 2022; Novalia et al., 2025). Interactive e-modules have been proven to improve students' cognitive abilities through pretest–posttest (Zakiyah & Dwiningsih, 2022). From various previous studies, there appears to be a gap, namely that there has not been much development of e-modules that integrate the OBE approach with prophetic values, statistics learning tends to be conventional, minimal contextualization, and has not utilized technology optimally and research related to the development of PjBL-based teaching materials in Statistics courses in the Institute for Teacher Training environment is still limited, especially those that combine aspects of Islamic character.

The development of prophecy-based e-modules is a strategic step in integrating Islamic values into the learning process and achieving the vision of Universitas Muhammadiyah Metro. Prophetic education is based on the concept of monotheism, morals, and social awareness. Monotheism teaches that God is the basis for all actions (Arman et al., 2025; Hamdi, 2023). The combination of PjBL with prophecy-based e-modules is expected to create holistic, meaningful, and relevant educational statistics learning aligned with the needs of the times. Through this research, it is hoped that learning products can be developed that not only improve students' understanding of educational statistics but also shape students with strong Islamic values in every aspect of their academic and professional lives. This research is based on a constructivist theoretical framework that emphasises that students actively construct knowledge through meaningful learning experiences. Furthermore, this approach is supported by self-regulated learning theory, which emphasises the importance of student independence in managing their learning, and by digital pedagogy theory, which emphasises the use of technology to create interactive and adaptive learning. The integration of these three perspectives provides the basis for developing an OBE-based e-module to enhance student engagement and learning experiences.

The development of an e-module based on OBE learning with prophetic values in Statistics courses is an important innovation that will improve learning quality. This approach focuses on specific, measurable, and relevant learning outcomes while integrating prophetic values, such as humanisation, liberation, and transcendence. This module is designed to address various challenges, including the lack of engaging digital teaching materials, insufficient integration of theory and practical application, and limited incorporation of prophetic values into learning. The development process begins with an analysis of student needs and a curriculum review, followed by the design of an interactive module, expert validation, and testing on small groups of students. Incorporating prophetic values into e-modules can promote ethical reasoning and moral decision-making among students, enriching the educational experience (Juliana et al., 2023).

This module is designed with interactive digital features, such as simulations, quizzes, and learning videos, and optimised for digital devices for easy student access. This e-module is expected not only to improve students' academic competence but also to foster prophetic values, making it a model for developing teaching materials in other courses. The use of a digital platform for e-modules can also increase social presence and interaction among students, further supporting a collaborative learning environment (Delıta et al., 2022; Lah et al., 2024; Kumar et al., 2023). The state of the art of this research includes interactive multimedia-based e-modules that are effective in improving student learning outcomes in elementary schools, especially in spatial geometry, with positive student responses that are strongly related to learning success (Alyusfitri et al., 2024). Problem-Based Learning (PBL)-based e-modules are effective in improving student learning outcomes by facilitating problem-solving skills and in-depth understanding of the material. These findings are similar to the research conducted, because both use e-modules as innovative learning media to improve the quality of learning outcomes (Ali et al., 2023). Development of electronic modules (e-modules) based on problem-based learning to improve critical thinking skills (Leny et

al., 2024). Developing e-modules on socio-scientific issues, integrated with verses of the Qur'an, to build a profile of Pancasila students, emphasising the strengthening of moral and social values in learning (Zarkasih et al., 2023). Development of e-modules based on project-based learning to improve the quality of learning in vocational schools. The findings show that this e-module can help students be more active and involved in the learning process with a more practical and applicable approach (Hanif & Santosa, 2023; Rahmatika et al., 2021). Based on the description above, the novelty of this study lies in the simultaneous integration of three approaches: the OBE learning approach, the PjBL model, and prophetic values expressed through Statistics e-modules. This study also uses a development approach grounded in the contextual needs of FKIP students, especially in shaping a graduate profile with an Islamic character, academic competence, and readiness to face the challenges of the times.

Based on the background, the formulation of the problem in this study is how the students' needs for OBE-based Statistics teaching materials, accompanied by prophetic values, are met, how the process of developing OBE-based Statistics e-modules and prophetic values using the PjB model is conducted, and what the level of validity, practicality, and effectiveness of OBE-based Statistics e-modules accompanied by prophetic values is. Therefore, this study aims to analyse students' needs for OBE-based Statistics teaching materials that incorporate prophetic values. Moreover, develop OBE-based Statistics e-modules and prophetic values using the PjBL model, and measure the validity, practicality, and effectiveness of these e-modules accompanied by prophetic values. This research is also expected to help lecturers design learning that is oriented towards outcomes and integrated with values, as well as to support the holistic development of student competencies, including cognitive, affective, and ethical aspects, in higher education. This research also has the potential to support the transformation of higher education toward more contextual, meaningful, and student-centred learning. Furthermore, the results are expected to serve as a reference for policymakers in developing an OBE-based curriculum that aligns with Islamic values and encourages increased digital literacy among students and lecturers.

This research contributes to the development of an OBE-based teaching material model integrated with prophetic values through the Project-Based Learning (PjBL) approach. The main contribution of this research lies not only in the development of an e-module product but also in the conceptual integration between the OBE approach, project-based learning model, and prophetic values within a single learning framework. Thus, this research enriches the study of innovative learning design that is not only oriented towards learning outcomes, but also towards character and value formation.

METHOD

This research was conducted in 2025 at the Faculty of Teacher Training and Education (FKIP) of Universitas Muhammadiyah Metro, with implementation spanning several stages from product development to evaluation, from January to March 2025. This study uses the Research and Development (R&D) methodology with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) as explained by Isnaini et al., (2024), which was chosen because of its ability to provide a systematic, structured, and iterative framework in developing new products or improving existing products. This approach is designed to produce a statistics e-module that integrates learning content, Project-Based Learning (PBL) -based pedagogical strategies, and prophetic values. This study used a development research design with a quasi-experimental approach during the implementation phase to test the product's effectiveness. This design was chosen because it not only produced a learning product but also empirically tested its impact on student learning outcomes in a real-world context.

Furthermore, this study ensures methodological rigour by incorporating both formative and summative evaluation processes throughout the ADDIE stages. Formative evaluation was conducted during the analysis, design, and development phases through expert validation and small-group trials to identify initial weaknesses in the product and make necessary revisions. Meanwhile, a summative evaluation was conducted during the implementation phase using a quasi-experimental design to assess the effectiveness of the developed e-module. This combination of

iterative development and empirical testing enhances the validity of the research findings, ensuring that the resulting product is not only theoretically sound but also practically applicable in real learning environments.

An overview of the steps in developing the modified ADDIE model for this study is presented in Figure 1.

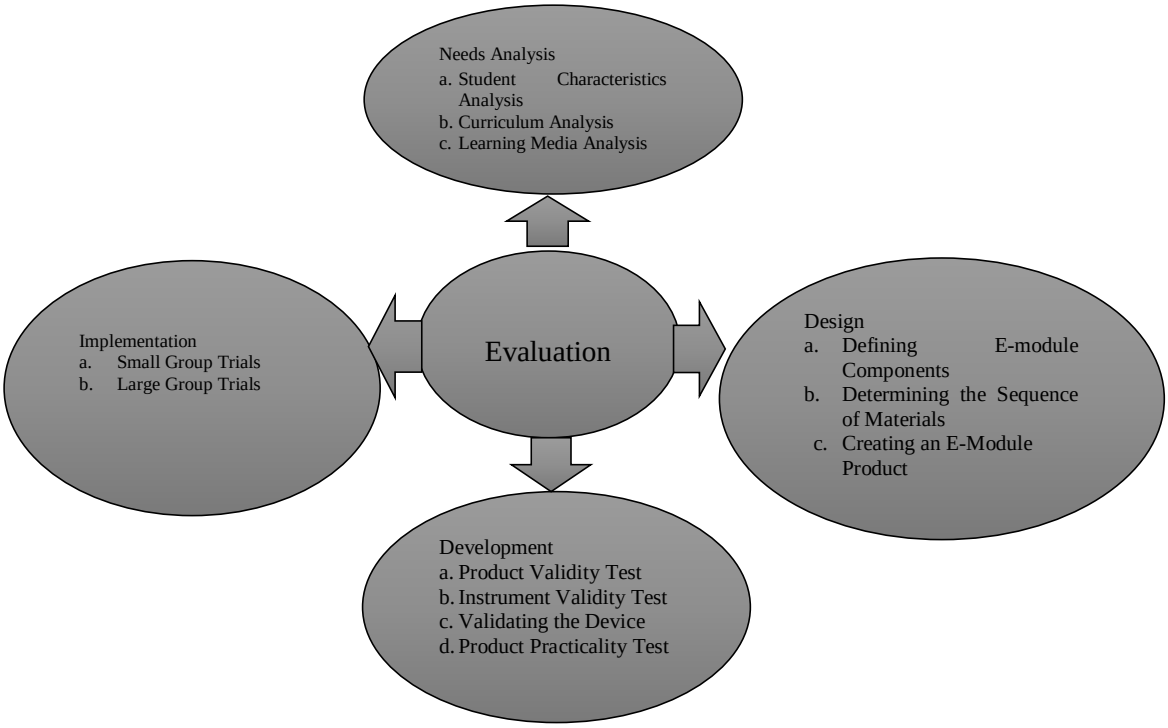

Figure 1. Steps in Developing the ADDIE Model

The ADDIE development model consists of five interrelated stages, namely Analysis, Design, Development, Implementation, and Evaluation. In the Analysis stage, needs identification is carried out, including determining problems and evaluating existing teaching materials to ensure the accuracy and relevance of the information. Next, the Design stage involves comprehensive planning, from conceptualisation to finalisation of the product design, accompanied by continuous revision to improve quality. At the Development stage, the product is developed and tested for validity through student trials and formative evaluations to assess its practicality and feasibility. After that, the Implementation stage involves applying the validated product to the real learning process. Finally, the Evaluation stage is carried out continuously at each stage of development to ensure the resulting product meets the established quality standards.

Data Collection Instruments

The research data collection instruments include interview guidelines, expert validation questionnaires, and student practicality questionnaires for product quality evaluation. Validation uses modified criteria adjusted to the characteristics and objectives of the research to produce valid and reliable data, and testing is conducted by material experts, media experts, and practicality questionnaires listed in Table 1.

Table 1. Data Collection Instruments

No.	Dimensions		
	Content	**Media**	**Practicality**
1	Content Quality	General Quality	Scheme
2	Language Quality	Special Quality	Content and Materials
3	Integration of OBE Models	Media View	OBE Model Usage Format

This study uses interviews and questionnaires to assess the validity, practicality, and feasibility of the product. Interviews explore the needs of related parties, while questionnaires measure user perceptions of the ease, relevance, and efficiency of the product. Small-group trials with 15 students from the Mathematics Education Study Program: if the product meets the practical criteria, it is considered suitable for use in learning. The next stage is the effectiveness test involving 80 students, consisting of 10 students each, taken by random sampling in the Mathematics, Biology, Economics, Physics, Primary School Teacher Education, History, English, and Guidance and Counselling Study Programs to identify product deficiencies, with the results used as a basis for improvement so that the product supports learning optimally. The sample size for the small-group trial was determined by the principle of formative evaluation in development research, which generally involves a small number of participants to identify initial product issues. Meanwhile, the sample size in the effectiveness test (n = 80) was considered sufficient for parametric statistical analysis, as previous research indicates that a large enough sample is necessary to achieve sufficient statistical power to detect significant differences between groups (Besekar et al., 2024).

This study uses data analysis to evaluate the validity, practicality, and effectiveness of the OBE-based E-module accompanied by prophetic values. Data analysis begins with normality and homogeneity tests to ensure normal distribution and homogeneous variance (Zaitun et al., 2025). Before conducting the hypothesis test, the statistical assumptions were tested, including normality with the Shapiro-Wilk test and homogeneity with the Levene test. The test results showed that the data were normally distributed and had homogeneous variance, meeting the requirements for parametric analysis. Then continues with t-tests, including paired t-tests to compare pretests and posttests within groups, and independent t-tests to compare posttest results between the two groups (Sukarelawan et al., 2024). This approach provides empirical evidence regarding the effectiveness of learning media. All data analysis was carried out at the 0.05 significance level using statistical software, ensuring results could be interpreted objectively and quantitatively.

RESULTS AND DISCUSSION

Results

Theoretically, these findings strengthen the integration between the Outcome-Based Education (OBE) approach and constructivist theory in learning. OBE emphasises the achievement of measurable learning outcomes, while constructivism emphasises the process of knowledge construction through experience. The integration of the two in this e-module demonstrates that outcome-oriented learning is more effective when supported by meaningful, contextual learning activities. Furthermore, these findings are also relevant to the theory of self-regulated learning, which emphasises the importance of student independence in managing the learning process.

This study aims to develop an OBE-based e-module combined with prophetic values in statistics courses at the FKIP of Muhammadiyah Metro University. At the analysis stage, students' needs for relevant and meaningful Statistics teaching materials were identified. The results of interviews and observations showed that many students had difficulty understanding abstract concepts in Statistics because the teaching materials used were not contextual, OBE-based, or aligned with prophetic values.

In addition, most lecturers at FKIP lacked validated OBE-based teaching tools, even after receiving training. The mismatch between student characteristics and conventional learning approaches was also a problem. The main finding at this stage was the unavailability of statistics teaching materials that aligned with the OBE approach and prophetic values. This was exacerbated by the lack of support for digital learning resources that could bridge theory and practice. The contributing factors included the limitations of the teaching tools used by lecturers, students' suboptimal technological literacy, and the lack of teaching materials designed around learning outcomes. A comprehensive needs analysis approach based on field data, the scope of analysis is

still limited to one institution. These results align with research by Qomaria & Wulandari (2022), which found that statistics learning requires support from context-based learning resources.

At the design stage, the e-module is developed systematically, with the OBE principle guiding the compilation of content based on learning outcomes. The module is designed with measurable outcomes, interactive visual planning, and the involvement of lecturers and expert teams since the design stage. Compiling the cover design and layout of the e-module to be created. The module's learning activities combine individual assignments, group discussions, and value reflections. The module's design is adaptive to the user's context and integrates cognitive and affective dimensions.

The results of the e-module development show that the product design and testing stages successfully integrated OBE principles and prophetic values into statistical learning materials. Based on data from the initial trial, most students found this e-module very helpful in clarifying their understanding of statistical concepts. The validation results conducted by material and media experts showed that the product met the quality standards set for OBE-based e-modules, as presented in Table 2. The Results of the OBE and Prophetic-Based E-Module Trials are shown in Table 2 as follows:

Table 2. Results of the OBE and Prophetic-Based E-Module Trial

No.	Rated aspect	Average Score
1	Content Quality	4.5
2	OBE Model Integration	4.7
3	Prophetic Value	4.6
4	Ease of Use of E-Modules	4.3

Based on the data in Table 2, the developed e-module has successfully fulfilled all the desired aspects, including academic content, OBE models, and the integration of prophetic values into statistical materials. The results of developing OBE-based e-modules that incorporate prophetic values indicate a positive response from students. This finding aligns with previous studies that indicate that the use of outcome-based learning models, such as OBE, can improve students' understanding in technical and theoretical courses (Hanafiah et al., 2024). In addition, the application of prophetic values has a positive impact on the formation of student character, consistent with the goal of Universitas Muhammadiyah Metro to produce individuals who are academically intelligent and have strong moral values.

After the module was declared valid and practical, the implementation stage was carried out on students from various study programs at the University. The learning process was divided into four sessions, each involving real, context-based tasks and the integration of prophetic values. Students were active in discussions, data analysis, and reflection on values in each meeting. The main finding at this stage was that implementing the e-module increased student engagement and encouraged more meaningful independent learning.

These results strengthen the findings of Himmah et al., (2024) and Rahayu et al., (2023) which show that the e-module is effective in encouraging active participation. The main difference is the integration of the prophetic value dimension, which has not been widely carried out in previous studies. The practicality test was measured using a questionnaire administered to 15 students who participated in the module trial. The questionnaire results showed that the majority of students found this e-module very practical and easy to use. The average score for the practicality aspect was 4.3, as shown in Table 3. This indicates that the developed e-module is very suitable for use in statistics learning activities.

Table 3. E-Module Practicality Questionnaire Results

No.	Rated aspect	Average Score
1	Ease of Access to E-Modules	4.4
2	Clarity of Instructions for Use	4.2
3	Use of E-Module Features	4.3
4	Ease of Application of Prophetic Values	4.1

Based on Table 3, the practicality test of this e-module is the primary factor in determining its success in the learning process. The results of this study are in consistent with findings from various studies, which show that e-modules designed with attention to user needs and convenience are more accepted and effective in supporting the learning process (Ombili at al., 2024). Ease of access to materials and understanding of instructions are important factors that ensure optimal use of this module by students.

The evaluation stage was carried out by testing effectiveness using a pretest and posttest with 80 students. The test results showed a significant increase in student scores (the average increased from 62.5 to 83.7; $p < 0.05$). In addition, the t-test results showed a significant difference between the pretest and posttest scores ($p < 0.05$), indicating that this OBE-based e-module is effective in improving students' understanding of the statistical material. The significant increase in pretest-to-posttest scores indicates that the OBE-based e-module is effective in improving students' understanding of statistics courses. This finding is consistent with research by Hidayat et al., (2024) and Probowati et al., (2023), which show that e-modules designed with an outcome-based approach can improve students' understanding and skills, especially in courses that require in-depth data analysis and interpretation.

The significant improvement in scores not only demonstrates differences in learning outcomes but also indicates that OBE-based e-modules provide a more structured, outcome-oriented learning experience. Conceptually, this can be explained through constructivist theory, which holds that students construct understanding through active engagement in project-based activities and reflective practice. Thus, the improvement in learning outcomes is not simply a result of media use, but rather the result of the interaction among instructional design, learning activities, and student engagement. In addition to significance testing, the magnitude of the e-module's impact can also be assessed through its effect size. Based on Cohen's d calculations, the effect sizes were in the moderate to high range, indicating that the improvement in learning outcomes was not only statistically significant but also practically meaningful. This indicates that the e-module had a significant impact on improving student understanding.

The learning activities in this study are organised into four main sessions, each ending with a quiz to evaluate students' learning. Each session is designed to refer to the OBE principle and synergistically combined with prophetic values, namely humanisation, liberation, and transcendence, to shape character and deepen students' understanding of statistical concepts. In the first session, students are introduced to the basic concepts of statistics and types of data. Learning begins with an introduction to the e-module and OBE-based learning structure. Students participate in group discussions to analyse simple data. The value of humanisation is emphasised by understanding that data represents diverse social realities.

The main goal of this meeting is for students to recognise and explain data types and their roles in statistical studies. The second session focuses on understanding measures of data centralisation, such as mean, median, and mode. Students practice calculations both manually and using technology, in the context of case studies. The value of liberation is instilled by providing students with space to express their opinions and analyse freely. At the end of the session, students are given individual assignments using real data to strengthen their understanding of data centralisation. In the third session, students begin exploring data distribution measures such as range, variance, and standard deviation. Learning is carried out through real-life case-based exercises, such as social and economic inequality.

In this activity, the value of transcendence is emphasised by inviting students to link statistical calculations to a broader social context, enabling them to interpret data not only technically but also ethically and morally. The fourth session focuses on students' ability to interpret and visualise data, including making graphs and compiling simple statistical reports. Activities are carried out in groups, and each group presents the results of its analysis to the class. In this session, the values of integrity and cooperation are key, emphasising honesty in data processing and collaboration in report compilation. In closing, students take an evaluation quiz in the form of a description that aims to measure conceptual understanding, critical thinking skills, and the application of prophetic values in solving statistical problems. This quiz is also a form of

formative assessment to measure achievement of OBE-based learning outcomes. The design of the learning process is shown in Table 4 as follows:

Table 4. Learning Process Design

No.	Learning Topics	Learning Activities	Integrated Prophetic Values	Learning Outcomes (OBE)
1	Basic Concepts of Statistics & Data Types	Introduction to e-modules- Exploration of data types- Small group discussions	Humanisation (respecting differences in data and respondent backgrounds)	Understanding the basics of statistics and data classification
2	Measures of Central Tendency (Mean, Median, Mode)	Manual & digital calculation simulation- Case-based individual assignments	Liberation (freedom to think and analyse based on the context of real cases)	Using measures of central tendency in simple statistical analysis
3	Measure of Data Spread, Standard Deviation	Data analysis through e-modules-Group reflection & Q&A	Transcendence (linking analysis to social impact).	Interpreting data distribution in the context of social problems
4	Data Interpretation & Visualisation	Preparation of simple statistical reports - Group presentation	Collaboration and integrity (working together on data truth and honesty)	Presenting data in graphical form and summarising the analysis results
5	Understanding Evaluation	Individual quiz based on descriptive questions- Final reflection on the use of e-modules	-	Measuring the achievement of students' cognitive competencies and critical attitudes

Table 4 shows that OBE-based learning achievements were implemented. However, several students had difficulty accessing technology to use the e-module optimally due to limited internet connectivity, and they needed time to get used to the interactive OBE e-module. In addition, not all students can think critically about statistical data analysis and the integration of Prophetic Values; some remain confused about interpreting Prophetic Values in the context of statistical analysis. Lecturers began to focus on conducting short training on how to use e-modules optimally at the beginning of the lecture, providing a guide to using the module in the form of videos or PDFs that are easily accessible, and providing technical support during the learning process. Students are not focused solely on final learning outcomes; they are also directed to develop measurable competencies. With OBE-based E-modules, active and independent learning can be encouraged, where students are trained to learn through real cases and value reflections. The OBE model is easy to adjust to the Graduate Profile: Because it is achievement-based, materials and approaches can be aligned with moral and intellectual competencies. The following table of contents displays the OBE-based e-module, accompanied by the prophetic values presented in Figure 2.

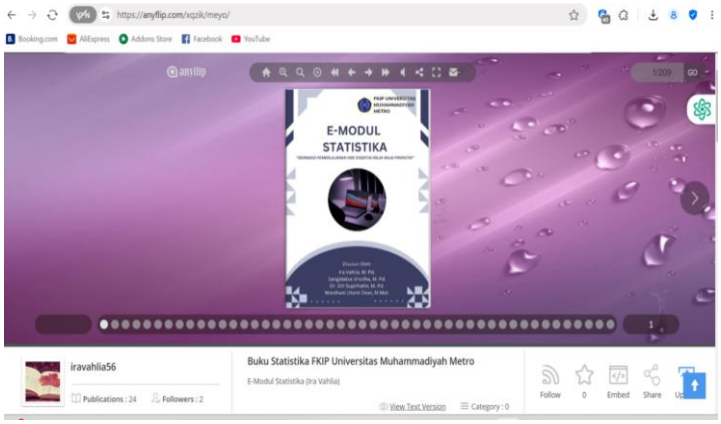

Figure 2. Table of Contents View

Based on Figure 2, the table of contents of the Statistics book closely matches the principles of Outcome-Based Education (OBE) learning. The OBE approach emphasises the achievement of clear, measurable, and relevant learning outcomes to real-world needs. This is reflected in the sequence of chapters in the book, which begins with an introduction to basic statistical concepts, such as definitions, types of data, and population-samples (Chapter I), followed by material on measurement scales (Chapter II), which are an important foundation in data analysis. This stage aligns with the OBE process, which begins by determining initial achievements, such as understanding basic concepts.

Furthermore, this book presents advanced topics in a gradual, systematic manner, such as central symptom analysis and deviation measures (Chapters III and IV), which indicate the direction of learning towards mastering descriptive analysis competencies. The progressiveness of this material aligns with the OBE principle, which encourages tiered learning based on skill complexity. Not only that, topics such as multiple correlation (Chapter V) and simple linear regression (Chapter VI) are application-oriented, requiring students not only to understand the theory but also to process and interpret data in a practical context.

Each chapter ends with a section of practice questions, indicating that this book has also implemented the principle of continuous evaluation, as emphasised in the OBE approach. This evaluation plays an important role in measuring the achievement of learning outcomes, both formatively and summatively. The existence of these practice questions allows students to gauge their mastery of the material being studied and provides lecturers with feedback to adjust learning strategies. With this structure, this book as a whole can be said to support the OBE-based learning approach. Each chapter is arranged in a logical, pedagogical sequence that allows students to develop knowledge, skills, and attitudes in measurable ways. The content of the material related to prophetic values is presented in Figure 3.

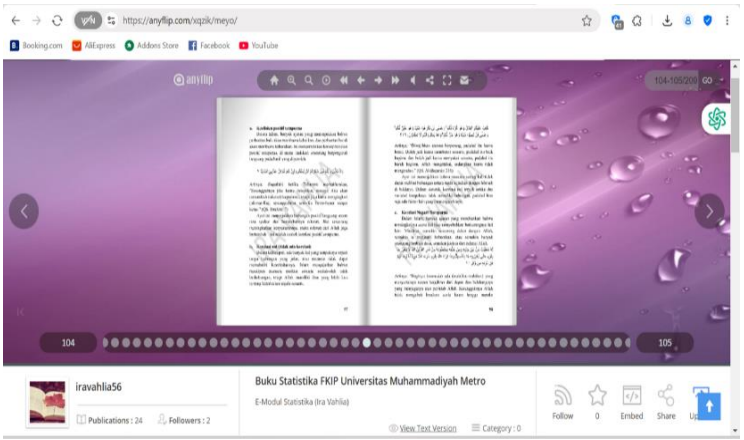

Figure 3. Display of Module Integration with Prophetic Values

In Figure 3, the module content links the concept of recording good deeds in the Qur'an with the principles of statistics, thereby explicitly integrating prophetic values into learning. The quoted verses emphasise that all human deeds, no matter how small, are carefully and systematically recorded. This aligns with the basic principles of statistics, which demand precision, honesty, and accuracy in recording and processing data. The value of transcendence is reflected in the awareness that scientific activities, such as data collection and analysis, are basically a form of moral responsibility that also has spiritual value. Students are directed to view statistical activities not merely as technical, but as a form of scientific mandate that reflects integrity and accountability before God. Thus, integrating prophetic values into statistics learning, as shown in this section, not only adds a religious dimension to higher education but also instils important character values in students. Statistics is taught not only as an analytical tool but also as a vehicle for forming academically intelligent, morally honest, and sensitive human beings who understand and value human and social values. This approach strengthens the role of higher education in producing graduates who are not only competent but also have integrity and moral values.

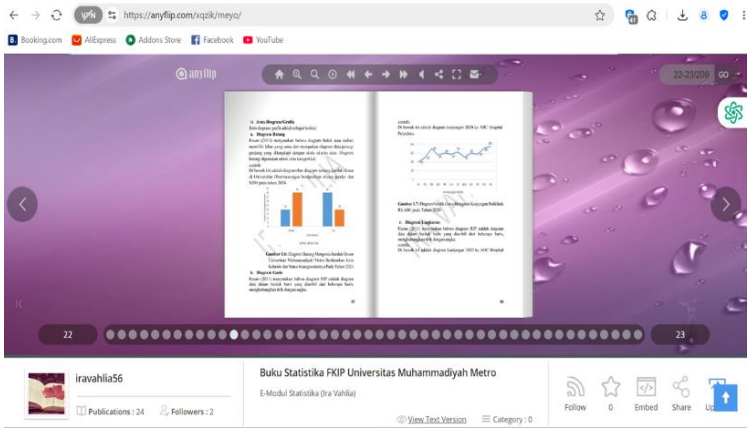

Figure 4. Worksheet View

Based on Figure 4, the displayed assignment sheet demonstrates the practical application of statistical analysis concepts, particularly ANOVA and post hoc follow-up tests, in educational research to examine the influence of various learning media on student learning outcomes. When aligned with the principles of Outcome-Based Education (OBE), this assignment is highly relevant because it encourages students to achieve concrete, measurable, and context-specific learning outcomes. This assignment is not only oriented toward mastering theory but also toward direct application to educational problems. First, in terms of task formulation, students are directed to calculate the average and variance, conduct ANOVA tests, and interpret the results of group differences. This activity encourages high-level thinking skills such as analysing and evaluating data. Thus, this assignment accommodates high learning outcomes according to Bloom's taxonomy, especially at the analysis and evaluation levels. This aligns with the OBE principle, which emphasises that learning must be oriented towards specific and meaningful final achievements.

After three meetings, the effectiveness test continued using a paired-samples t-test, showing a significant increase in students' pretest-to-posttest scores after using the E-Module. The significance value (Sig. 2-tailed) of 0.000, which is smaller than 0.05, indicates that the use of the OBE-based E-Module integrated with prophetic values has been statistically proven effective in improving student learning outcomes in the Statistics course. The average pretest score, previously 51.2, increased to 85.2 during the posttest. These results indicate that a learning approach that combines achievement orientation with strengthening of prophetic values can encourage greater understanding of the material while forming student character in an integrated manner.

The assignments in the E-module invite students to work with real data. Students are not only asked to perform statistical calculations, but also to draw conclusions and provide recommendations regarding the most effective learning methods. This approach shows that learning is not only focused on academic results, but also on data-based decision-making, which is very much needed in professional practice in education. The use of software such as SPSS, Excel, or Minitab, as suggested in the assignment instructions, emphasises the importance of mastering technology as part of 21st-century skills. This strengthens the assignment's alignment with the OBE principle, which encourages students to master relevant and applicable skills in the world of work. The ability to use digital statistical tools shows students' readiness to face challenges outside the academic world.

This study has a limited sample of only one college, so generalisation is still limited. Short Implementation Time: Four meetings are insufficient to assess the long-term impact of integrating prophetic value. In addition, the instruments used are limited because not all affective aspects (prophetic character) can be measured quantitatively. Although the results show significant improvements, generalising these findings should be approached with caution, as the study was conducted at a single institution with specific student characteristics. Therefore, these results are best interpreted in a similar context and require further testing on a broader population. The validity and practicality aspects of the module are shown in Table 5.

Table 5. Validity and Practicality Aspects

No.	Rated Aspect	Result	Category
1	E-Module Validity	91.6%	Very Valid
2	Practicality of E-Module	4.3	Very Practical

Based on Table 5, the developed e-module demonstrated high feasibility for implementation in learning activities. A validity score of 91.6% indicates that the content, design, and integration of OBE principles with prophetic values met the expected quality standards. This indicates that the e-module is appropriate in terms of material accuracy, instructional design, and relevance to learning outcomes. Meanwhile, a practicality score of 4.3 (out of 5) reflects that the e-module is easy to use, accessible, and supports the learning process from a student perspective.

Furthermore, the findings indicate that students have begun to internalise prophetic humanisation values, as evidenced by their reflections and responses to the final assignment. Although not all affective aspects can be measured quantitatively, qualitative indicators indicate positive character development. Furthermore, the use of this e-module increased student engagement and responsibility, particularly in discussions and assignments grounded in real-world contexts. This indicates that this learning approach not only enhances cognitive understanding but also supports the development of students' affective and ethical competencies.

Discussion

The results of the study show that the OBE-based e-module, which integrates prophetic values, has high validity and practicality and is effective in improving student learning outcomes. This finding aligns with the research by Zakiyah & Dwiningsih (2022), which showed that the use of interactive e-modules significantly improved student learning outcomes, as evidenced by pretest and posttest scores. This reinforces the belief that interactive digital learning media can help students understand abstract concepts more conceptually. Theoretically, this finding is supported by the OBE approach, which places learning outcomes at the centre of learning design, and by constructivism, which emphasises that knowledge is built through meaningful learning experiences. In this context, the developed e-modules not only present material but also provide real-life case-based activities that enable students to construct understanding actively. The integration of prophetic values, emphasising the human dimension, freedom of thought, and spiritual awareness, strengthens the learning process by offering meaning beyond mere cognitive aspects.

The success of this research can be explained through a logical cause-and-effect relationship. When students are provided with contextual learning experiences through project-based e-modules, they no longer accept concepts abstractly but relate them to reality. This leads to increased learning engagement. High engagement then fosters independence and responsibility in completing assignments. Ultimately, this leads to improved learning outcomes and a deeper understanding. Thus, the e-module serves not only as a medium but also as a facilitator of students' learning styles.

The gradual implementation of the learning process over four sessions also reinforces these findings. In the first session, students began to understand basic statistical concepts through simple data-based discussions, fostering an awareness that data represent social reality. At this stage, engagement began to develop, although it was still in the adaptation phase. The second session demonstrated improved analytical skills through calculation activities and case studies, which allowed students to think critically. In the third session, students began to interpret data more deeply and relate it to the social context, making learning more meaningful. Ultimately, in the fourth session, through an effectiveness test, a significant improvement in learning outcomes was observed, demonstrating that the systematically designed learning process had a tangible impact on student achievement.

The findings of this study align with several studies demonstrating the effectiveness of digital-based e-modules in improving learning outcomes (Deotare et al., 2026; Yang et al., 2026). Research by Muhali & Asy'ari (2026) and Lee et al., (2025) found that a project-based approach can improve critical thinking and problem-solving skills. In addition, research by Gayatri & Karman, (2026) and Luber et al., (2026) confirms that technology integration in learning, including digital-based learning, can improve analytical skills. Other research by Cheng & Weatherly (2025)

and Osiesi & Blignaut (2025) also shows that the use of digital technology in education improves learning outcomes and 21st-century skills. However, this study has the advantage of integrating prophetic values that have not been widely studied in the context of digital-based learning.

Analytically, the improvement in learning outcomes in this study occurred due to the integration of the OBE approach, experiential activities, and the use of digital media. This aligns with other research suggesting that e-modules equipped with interactive elements, such as simulations and visualisations, can increase student engagement and conceptual understanding. Furthermore, research on the development of ADDIE-based e-modules also shows that valid, practical, and effective media can significantly improve learning outcomes, with statistical test results indicating a pretest-posttest difference (sig < 0.05) (Pratamadita & Dwiningsih, 2022). Compared with previous research, this study's results have the advantage of integrating prophetic values into e-modules. While previous research generally focused solely on cognitive aspects and improving learning outcomes, this study integrates character aspects into the learning process. This finding is supported by research showing that the use of digital-based e-modules not only improves conceptual understanding but also encourages student engagement and collaboration in the learning process.

Furthermore, the use of interactive digital media has also been shown to improve critical thinking skills and student engagement in learning, especially when combined with a problem-based or project-based approach (Purwaningsih et al., 2025). This explains why in this study, students demonstrated increased responsibility and active participation during the learning process. In terms of media development, this study's results align with other research showing that e-modules developed with a systematic, technology-based approach have high validity and effectiveness and can improve learning quality. Thus, the results of this study not only confirm previous findings but also extend them by adding a value dimension to learning.

In terms of implementation, this e-module has the potential for wider adoption. However, several challenges need to be addressed, including the readiness of the technological infrastructure, students' digital literacy, and lecturers' readiness to integrate prophetic values into learning. Furthermore, the continued use of this e-module also requires institutional support, including training, ongoing content development, and integration into the curriculum. Therefore, the implementation of this e-module depends not only on the quality of the product but also on the readiness of the overall learning system.

CONCLUSION

Overall, this study shows that e-modules designed using the OBE approach and infused with prophetic values are effective in improving students' understanding, ease of use, and the quality of materials delivered in statistics courses at FKIP Universitas Muhammadiyah Metro. The development of this e-module not only helps achieve OBE-based learning objectives but also helps instil moral and ethical values relevant to prophetic principles. In addition, the success in integrating prophetic values into e-modules underscores the importance of a comprehensive learning approach that does not focus solely on academic aspects but also on students' moral and spiritual development. Suggestions for further development include testing the OBE-based e-module developed in other study programs to assess its effectiveness across different courses, especially those involving quantitative materials. In addition, to make the e-module more engaging and easier for students to understand, it is recommended to include interactive features such as quizzes, online discussion forums, or explanatory videos to strengthen student involvement in the learning process.

ACKNOWLEDGEMENT

Deep gratitude to Universitas Muhammadiyah Metro and the Institute for Research and Community Service (LPPM) of Universitas Muhammadiyah Metro for their support and assistance throughout this research. This research would not have been carried out properly without the support of both institutions. We greatly appreciate the opportunity given to conduct this research

and hope that the results can provide significant benefits in the development of education at Universitas Muhammadiyah Metro, especially in the field of OBE-based statistics learning combined with prophetic values.

REFERENCES

Alem, D. D. (2020). An overview of data analysis and interpretations in research. *International Journal of Academic Research in Education and Review*, *8*(1), 1–27. https://doi.org/10.14662/IJARER2020.015

Ali, F. H., Suyatna, A., Viyanti, V., & Diawati, C. (2023). Effectiveness of e-modules based on problem-based learning to improve student learning outcomes. *JETISH: Journal of Education Technology Information Social Sciences and Health*, *2*(2), 891–898. https://doi.org/10.57235/jetish.v2i2.775

Aliftika, O., Purwanto, P., & Utari, S. (2019). Profil keterampilan abad 21 siswa SMA pada pembelajaran project based learning (PjBL) materi gerak lurus. *Wahana Fisika Indonesia*, *4*(2), 141–147. https://doi.org/10.17509/wapfi.v4i2.20178

Alyusfitri, R., Gistituati, N., & Fauzan, A. (2024). The effectiveness and relationship of student responses toward learning outcomes using interactive multimedia-based e-modules in elementary schools. *International Electronic Journal of Elementary Education*, *16*(5), 573–584. https://doi.org/10.26822/iejee.2024.354

Ariyanto, A., Sutama., & Markhamah (2022). Pembelajaran project based learning (PjBL) untuk penguatan karakter kemandirian. *Jurnal Mitra Swara Ganesha: Penelitian Pendidikan dan Pengajaran*, *9*(2), 101–116. https://ejournal.utp.ac.id/index.php/JMSG/article/view/2155

Arman, M. Y. A., Chowdhury, A., Rafi, A. H., & Nahar, K. (2025). One god, many perspectives: A comparative study of monotheism in abrahamic religions from an Islamic viewpoint. *International Journal of Cultural and Religious Studies*, *5*(1), 49–58. https://doi.org/10.32996/ijcrs.2025.5.1.5

Bandaranaike, S. (2018). From research skill development to work skill development. *Journal of University Teaching and Learning Practice*, *15*(4), 1–20. https://doi.org/10.53761/1.15.4.7

Besekar, S., Jogdand, S., & Naqvi, W. (2024). Navigating sample size determination in educational research: A rapid review unveiling strategies, challenges, and recommendations. *F1000Research*, *12*(1291), 1-14. https://doi.org/10.12688/f1000research.141173.2

Bromage, A., Pierce, S., Reader, T., & Compton, L. (2022). Teaching statistics to non-specialists: Challenges and strategies for success. *Journal of Further and Higher Education*, *46*(1), 46–61. https://doi.org/10.1080/0309877X.2021.1879744

Cheng, C., & Weatherly, K. I. C. H. (2025). Navigating the double-edged sword: A meta-analysis of the effect of digital games on 21st century skills. *Educational Research Review*, *48* 100710. https://doi.org/10.1016/j.edurev.2025.100710

Davis, K. A., & Knight, D. B. (2023). Assessing learning processes rather than outcomes: Using critical incidents to explore student learning abroad. *Higher Education*, *85*(2), 341–357. https://doi.org/10.1007/s10734-022-00836-6

Deotare, V. V., Wankhade, M. P., Chavan, G. T., Shepal, Y., Chavan, S., & Kokane, C. (2026). Effectiveness of e-learning modules in community-based tuberculosis awareness programs. *Indian Journal of Tuberculosis*, 1-15. https://doi.org/10.1016/j.ijtb.2026.02.007

Delıta, F., Berutu, N., & Nofrıon, N. (2022). Online learning: The effects of using e-modules on self-efficacy, motivation and learning outcomes. *Turkish Online Journal of Distance Education*, *23*(4), 93–107. https://doi.org/10.17718/tojde.1182760

Ediansyah, E., Kurniawan, D. A., Perdana, R., & Salamah, S. (2019). Using problem-based learning in college: Mastery concepts subject statistical research and motivation. *International Journal of Evaluation and Research in Education*, *8*(3), 446–454. https://doi.org/10.11591/ijere.v8i3.20243

Fitrianingtyas, A., Rasmani, U. E. E., Wahyuningsih, S., Jumiatmoko, J., Zuhro, N. S., Winarji, B., & Nurjanah, N. E. (2023). Mengembangkan pendidikan karakter melalui pembelajaran berbasis proyek di PAUD. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *7*(5), 5675–5686. https://doi.org/10.31004/obsesi.v7i5.4970

Gayatri, G., & Karman, K. (2026). Equity and power in Indonesia's digital skills training: A critical analysis using CIPP and Foucault's theory. *Education + Training*, 1-15. https://doi.org/10.1108/ET-03-2025-0165

Hamdi, L. H. L. (2023). The concept of tawhid-based curriculum in the perspective of Islamic education philosophy according to Al-qur'an and Hadith. *Jurnal Al-Murabbi*, *9*(1), 167–182. https://doi.org/10.35891/amb.v9i1.4665

Hanafiah, H., Arinindyah, O., Nurhayati, W., Nurhidayah, N., & Zawirrahmi, Z. (2024). Outcome-based education sebagai pendekatan transformasi dalam pengajaran kewirausahaan: Studi kasus di perguruan tinggi. *Jurnal Educatio FKIP UNMA*, *10*(4), 11-21. https://doi.org/10.31949/educatio.v10i4.10776

Hanif, M. A., & Santosa, B. (2023). Development of e-modules based on project learning in vocational high schools. *Journal of Vocational Education Studies*, *6*(2), 264–276. https://doi.org/10.12928/joves.v6i2.9304

Henderson, J., & Corry, M. (2021). Data literacy training and use for educational professionals. *Journal of Research in Innovative Teaching & Learning*, *14*(2), 232–244. https://doi.org/10.1108/JRIT-11-2019-0074

Herlina, I. P., & Mugara, R. (2021). Implementasi penanaman karakter disiplin siswa melalui membaca dengan metode project based learning (PjBL) di kelas II sekolah dasar. *COLLASE (Creative of Learning Students Elementary Education)*, *4*(2), 222–230. https://journal.ikipsiliwangi.ac.id/index.php/collase/article/view/5037/2294

Hidayat, W. N., Sari, R. K., Patmanthara, S., Soraya, D. U., Arsyillah, N. T., Kurniawan, R. A., & Ilmam, T. (2024). Efektivitas modul pembelajaran komunikasi data dan jaringan komputer berbasis PBL untuk meningkatkan pemahaman jaringan komputer mahasiswa PTI. *Jurnal Ilmiah Edutic: Pendidikan dan Informatika*, *10*(2), 160–170. https://doi.org/10.21107/edutic.v10i2.26813

Himmah, U., Yusuf, M., & Drajati, N. A. (2024). Pemanfaatan e-modul berbasis multimodal sebagai media pembelajaran menulis berita. *JIIP-Jurnal Ilmiah Ilmu Pendidikan*, *7*(2), 1241–1248. https://doi.org/10.54371/jiip.v7i2.3342

Insyasiska, D., Zubaidah, S., & Susilo, H. (2017). Pengaruh project based learning terhadap motivasi belajar, kreativitas, kemampuan berpikir kritis, dan kemampuan kognitif siswa pada pembelajaran biologi. *Jurnal Pendidikan Biologi Universitas Negeri Malang*, *7*(1), 9-21. http://dx.doi.org/10.17977/um052v7i1p9-21

Isnaini, V., Ishak, F., & Marwiyah, S. (2024). Pengembangan e-modul berbantuan Canva pada materi asmaul husna. *Indonesia Journal of Islamic Educational Review*, *1*(1), 57-64. https://doi.org/10.58230/ijier.v1i1.67

Juliana, M., Fitraini, D., & Susanty, E. (2023). Integration of Islam in application-based e-modules (a development study in facilitating problem-solving capability). *Jurnal Prinsip Pendidikan Matematika*, *6*(2), 127–137. https://doi.org/10.33578/prinsipv6i2.210

Kabeakan, N., Sebayang, D. S. B., Tambunan, I. S. B., Angkat, P., Srimiati, S., & Budiman, B. (2024). Peran filsafat bahasa terhadap pengembangan kurikulum bahasa indonesia berbasis

outcome based education. *Jurnal Pendidikan Tambusai*, *8*(1), 15668–15679. https://doi.org/10.31004/jptam.v8i1.14609

Kamahun, A. I., & Indadihayati, W. (2023). Tinjauan pustaka: Hasil implementasi pendidikan berbasis hasil (outcome-based education) dalam kajian pendidikan agama Islam. *MODELING: Jurnal Program Studi PGMI*, *10*(4), 893–908. https://doi.org/10.69896/modeling.v10i4.2607

Kumar, A. P., Omprakash, A., Chokkalingam Mani, P. K., Kuppusamy, M., Wael, D., Sathiyasekaran, B. W. C., Vijayaraghavan, P. V, & Ramasamy, P. (2023). E-learning and e-modules in medical education—a SOAR analysis using perception of undergraduate students. *Plos One*, *18*(5), 1-14. https://doi.org/10.1371/journal.pone.0284882

Lah, N. H. C., Hashim, M., Harun, J., & Abdullah, Y. (2024). The evaluation of problem-solving oriented e-module in learning computer-based subject. *Int J Eval & Res Educ*, *13*(1), 547–558. https://doi.org/10.11591/ijere.v13i1.25486

Lee, P.-J., Hung, J.-F., Liau, P.-H., & Tsai, C.-Y. (2025). A dual mediation model linking design thinking mindset to creative problem-solving skills through creative self-efficacy and critical thinking disposition. *Thinking Skills and Creativity*, 102055. https://doi.org/https://doi.org/10.1016/j.tsc.2025.102055

Leny, L., Wahidah, W., Mahdian, M., & Kusasi, M. (2024). Development of e-modules of basic laws of chemistry based on problem-based learning to improve critical thinking skills. *Jurnal Inovasi Teknologi Pendidikan*, *11*(4), 367-376. https://doi.org/https://doi.org/10.21831/jitp.v11i4.72576

Luber, M., Wittmann, L., & Schilp, J. (2026). Software infrastructure for ready-to-use, data analytics-based digital twins utilising the asset administration shell. *Procedia Computer Science*, *277*, 3113-3122. https://doi.org/10.1016/j.procs.2026.02.347

Marwa, M., Nurfaisal, N., Muliardi, M., Awal, R., Ifwandi, M., Irawan, H., Ardiya, A., Herlinawati, H., Bastian, A., & Supeno, B. (2024). Training on the use of 21 century-4c skill assessment on critical thinking, creativity, communication, collaboration in project-based learning for teachers. *Symbiosis Civicus*, *1*(1), 34–41. https://journal.unilak.ac.id/index.php/Symbiosis/article/view/20990

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, *1*, 1-8. https://doi.org/10.1016/j.ijedro.2020.100012

Muhali., & Asy'ari, M. (2026). Conceptual problem-based learning model: Promising intervention to enhance prospective science teachers' critical thinking skills. *Social Sciences & Humanities Open*, *13*, 102509. https://doi.org/10.1016/j.ssaho.2026.102509

Novalia, R., Marini, A., Bintoro, T., & Muawanah, U. (2025). Project-based learning: For higher education students' learning independence. *Social Sciences & Humanities Open*, *11*, 1-15. https://doi.org/10.1016/j.ssaho.2025.101530

Ombili, I., Buhungo, T., & Supartin. (2024). Pengembangan e-modul interaktif materi gelombang bunyi di SMA Negeri 6 Gorontalo Utara: Efektivitas, Kepraktisan, dan Validitas. *Khazanah Akademia*, *8*(02), 112–122. https://doi.org/10.52434/jurnalkhazanahakademia.v8i02.402

Osiesi, M. P., & Blignaut, S. (2025). Impact of the teacher education curriculum on the development of 21st-century skills: Pre-service teachers' perceptions. *Social Sciences & Humanities Open*, *11*, 1-8. https://doi.org/10.1016/j.ssaho.2025.101317

Pratamadita, A., & Dwiningsih, K. (2022). Development of interactive e-modules as a learning media to train visual-spatial intelligence on intermolecular force materials. *Jurnal*

Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran, dan Pembelajaran, *8*(1), 31-42. https://doi.org/10.21831/jitp.v9i1.46561

Probowati, D., Apriani, R., & Indreswari, H. (2023). Pengembangan e-modul berbasis case method pada mata kuliah praktikum konseling psikodinamik. *Buletin Konseling Inovatif*, *3*(1), 71–80. https://doi.org/10.17977/um059v3i12023p71-80

Purwaningsih, S., Falah, H. S., & Pujaningsih, F. B. (2025). The use of e-modules to improve critical thinking skills of physics education students. *Jurnal Penelitian Pendidikan IPA*, *11*(1), 257-264. https://doi.org/10.29303/jppipa.v11i1.9553

Qomaria, N., & Wulandari, A. Y. R. (2022). Pengembangan keterampilan kolaboratif siswa melalui pembelajaran dengan pendekatan ethno-STEAM project konteks pesapean. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(2), 1306-1318. https://doi.org/10.24127/ajpm.v11i2.4586

Rahayu, S., Firman, F., & Yunus, M. R. K. (2023). Peningkatan hasil belajar mahasiswa melalui penerapan project based learning (PjBL) berbantuan e-modul. *Indonesian Journal of Educational Science (IJES)*, *6*(1), 31–37. https://doi.org/10.31605/ijes.v6i1.3065

Rahmatika, H., Lestari, S. R., & Sari, M. S. (2021). Preliminary study of PBL-based e-module development based on research results to improve students' critical thinking skills and cognitive learning outcomes. *AIP Conference Proceedings*, *2330*, 1-8. https://doi.org/10.1063/5.0043319

Rahmawati, Z. D., & Wahyuni, S. (2024). Pengembangan kurikulum pendidikan Islam multikultural berbasis outcome based education (OBE). *TA'LIM: Jurnal Studi Pendidikan Islam*, *7*(2), 218–236. https://doi.org/10.52166/talim.v7i2.6895

Rifmasari, Y., Sukandar, W., & Sisrian, E. R. (2022). Implementasi project based learning dalam menanamkan nilai karakter anak usia dini di TK Fadhilah Amal 5 Kota Padang. *Jurnal Usia Dini*, *8*(1), 45-57. https://doi.org/10.24114/jud.v8i1.36262

Romero, C., & Ventura, S. (2020). Educational data mining and learning analytics: An updated survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, *10*(3), 1-21. https://doi.org/10.1002/widm.1355

Sriwahyuni, K., & Maryati, I. (2022). Kemampuan pemecahan masalah matematis siswa pada materi statistika. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2), 335-344. https://doi.org/10.31980/plusminus.v2i2.1830

Sukarelawan, M. I., Indratno, T. K., & Ayu, S. M. (2024). *N-gain vs stacking*. Suryacahya.

Sun, P. H., & Lee, S. Y. (2020). The importance and challenges of outcome-based education â€“a case study in a private higher education institution. *Malaysian Journal of Learning and Instruction*, *17*(2), 253–278. https://doi.org/10.32890/mjli2020.17.2.9

Susbiyanto, S., Kurniawan, D. A., Perdana, R., & Riantoni, C. (2019). Identifying the mastery of research statistical concept by using problem-based learning. *International Journal of Evaluation and Research in Education*, *8*(3), 461–469. https://doi.org/10.11591/ijere.v8i3.20252

Tenedero, E. Q., & Pacadaljen, L. M. (2021). Learning experiences in the emerging outcomes-based education (OBE) curriculum of higher education institutions (HEI'S) on the scope of Hammond's evaluation cube. *Psychology and Education Journal*, *58*(2), 10325-10332. https://doi.org/10.17762/pae.v58i2.4003

Umar, U., Yamin, A., Rahayu, S. R., Zulkifliemansyah, Z., & Putri, Y. E. (2024). Pelaksanaan orientasi mahasiswa baru prodi manajemen inovasi tahun akademik 2024/2025. *Jurnal Pengabdian Kepada Masyarakat Nusantara*, *5*(4), 6374–6378. http://doi.org/10.55338/jpkmn.v5i4.4648

Väisänen, S., & Hirsto, L. (2020). How can flipped classroom approach support the development of university students' working life skills?—university teachers' viewpoint. *Education Sciences*, *10*(12), 1-15. https://doi.org/10.3390/educsci10120366

Weng, X., & Chiu, T. K. F. (2023). Instructional design and learning outcomes of intelligent computer assisted language learning: Systematic review in the field. *Computers and Education: Artificial Intelligence*, *4*, 1-12. https://doi.org/10.1016/j.caeai.2022.100117

Yang, H., Shu, H., Wang, L.-h., Li, P., Li, Y.-l., Li, Q.-f., Han, X.-p., Tian, J., Chang, J., Qian, H., Chen, J. P., Ding, X. Q., Wu, P. Q., Dou, L. M., Luo, Z., Li, W., Lin, Y. Y., Li, L., Yue, S. Z., Gu, Y., Yang, L., Sun, X. H., Luo, X. Y., Ma, L., & Wang, H. (2026). Smartphone-based digital eczema education program for atopic dermatitis in children aged 0 to 6 years: Multicenter, randomized, parallel controlled clinical study. *Journal of Medical Internet Research*, *28*, 1-13. https://doi.org/10.2196/79559

Zaitun, I., Zulkifli, M., & Arifin, Z. (2025). Pengaruh metode probing-prompting terhadap hasil belajar pendidikan agama islam siswa Kelas VII SMPN Satap 1 Sembalun. *Maulana Atsani: Jurnal Pendidikan Multidisipliner*, *1*(3), 111–116. https://doi.org/10.51806/v992ax86

Zakiyah, W. I., & Dwiningsih, K. (2022). The effectivity of interactive e-module to increase the students' visual-spatial intelligence on ionic. *Jurnal Inovasi Teknologi Pendidikan*, *9*(1), 91-100. https://doi.org/10.21831/jitp.v9i1.46561

Zarkasih, Z., Diniya, D., Permana, N. D., & Kirana, I. (2023). Development of science e-modules based on socio-scientific issues integrated with the Quran verses to establish Pancasila student profiles. *Journal of Natural Science and Integration*, *6*(1), 63–79. https://doi.org/10.24014/jnsi.v6i1.21855