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# Development of Digital Electronics and Information Literacy Training Kit to Improve the Performance of Students Electrical Engineering Education

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**ABSTRACT**

**Objective:** The study aims to develop a digital electronics kit and information literacy to improve student performance in terms of validity and reliability in terms of language and materials. Analyze student responses to the digital electronics kit and information literacy. Analyze student performance results and the relationship between variables. **Method:** The method used in the study includes the research stage. The study was conducted to determine what competency standards and essential competencies are expected. **Novelty:** Kits and information literacy were developed to support skills in facing the demands of industrial technology 4.0. Connecting students with industry through the latest kits and learning modules, strengthening the relationship between academia and industry. **Research results**: Cronbach's alpha reliability test results are higher than its fundamental value, 0.820> 0.60. The results prove that all statements in the information literacy variable are reliable. The analysis of student responses to devices and information literacy obtained an average value of 90%, and student performance results from several criteria averaged 87.1; the kit has a significant and positive contribution (<0.10) and a path coefficient value of 0.102. The results of data analysis have proven that information literacy has a significant and positive contribution (<0.10), and the path coefficient value is 0.077.

## INTRODUCTION

In today's information age, digital technology has enormously contributed to the development of the human lifestyle. Since the introduction of transistor components in 1947, human civilization has moved due to technological developments ranging from vacuum tubes to semiconductor devices (Boylestad & Nashelsy, 2021). The presence of semiconductor technology continued to develop with the introduction of integrated circuits (ICs), which enabled automatic digital data processing in one integrated device.

Information literacy has supported the development of digital technology, which is increasingly complete and easy to access through the Internet. The binary information processing must also be done according to the principle of logic gates. Encoders and decoders are vital to converting analog signals humans can receive into digital signals that computers can process. Data processing will be easier to do digitally than using the principle of analog signals that are more susceptible to interference and are inefficient (Bednarkiewicz et al., 2023; De & Bazil Raj, 2023; Habich & Beutel, 2024; Safari & Pourrostam, 2024). Because of the importance of knowledge about digital electronics principles, the Digital Electronics course is one of the compulsory courses in all study programs at the Faculty of Engineering, State University of Surabaya. Bachelor of Electrical Engineering Education is the right study program to observe learning completion in the Digital Electronics course. Learning completion is a learning approach that focuses on students' mastery of something being studied (Bloom, 2000).

Law Number 12 of 2012 states that higher education in Indonesia is divided into Academic Education and Vocational Education. Academic education focuses on mastering knowledge, while vocational education emphasizes preparing graduates to apply their skills. Through undergraduate programs, graduates are expected to become skilled practitioners to enter the workforce, so many practical portions are given in preparing the curriculum. Based on the above background, the researcher proposes a study entitled Development of Digital Electronics Training Kits and Information Literacy to Improve the Performance of Electrical Engineering Education Undergraduate Students at Surabaya State University.

Information Literacy has many meanings, and the concept of information literacy does not show differences or strong disagreements. Then, ANZIL issued the meaning of information literacy (Australian and New Zealand Institute for Information Literacy) in 2005 that IFLA (Information Literacy and IT), UNESCO, and NFIL (National Forum for Information Literacy) towards negotiations at the Bibliotheca Alexandrina, Alexandria, Egypt. Information literacy can be explained by using a model. Thus, it can concentrate on what is obtained in a particular or whole model. Models of information literacy There are four famous ones, namely the Big Six, Seven Pillars, and Eight Empowerments, and one more, namely the Seven Faces of information literacy as proposed by Bruce (Bilgiler & Dergisi, 2022; Momanyi et al., 2021; Panos & Damico, 2021; Raman et al., 2024). The description includes: (a) describing tasks and definitions in describing information cases faced in identifying information used; (b) information searching steps in determining overall identity in possible references and determining expected references; (c) location and access, determining the location of origin intellectually and physically, finding news in sources; (d) utilizing information, doing something, such as: read, hear, touch, put the address and extract information that is worthy of use; (c) synthesizing, grouping from various sources, and presenting the information. (d) evaluating product results obtained from the effectiveness section, and assessing the efficiency level of the process. Information literacy has been discussed worldwide since the 1980s, such as in ALA writing. UNESCO, American Library Association (ALA)/ Association of College & Research Libraries (ACRL), CAUL, BIG BLUE, and Australia and New Zealand Institution for Information Literacy (ANZIL). Table 1 shows standardization in information literacy.

**Table 1**. Some standards in information literacy (Tirado & Muñoz, 2012).

| | | IFLA/UNESCOM LAU, J, CATTS, R | ALA/ACRI, 2000 | CAUL, 2001 | BIG BULE, 2002 | ANZIIL, 2004 |
|---|---|---|---|---|---|---|
| Elements-standard | Access | Definition and articulation of the information need/Recognize information needs | Determines the nature and extent of the information | Recognize the need for information and determine the nature and extent of the information needed. | Recognizes an information need | 1. The information-literate person recognizes the need for information and the extent of the information needed |
| | | Location of information/locate and evaluate the quality of information | Accesses needed information effectively and efficiently | 2. Accesses needed information effectively and efficiently | Addresses the information need. 3. Retrieves information | 2. The information-literate person finds needed information effectively and efficiently |
| | Evaluation | Assessment of information/locate and evaluate the quality of information | Evaluate information and its sources critically and incorporate | 3. Evaluate information and its sources critically and incorporate selected information | 4. Evaluate information critically | 3. The information-literate person critically evaluates information and the information-seeking |

| | IFLA/UNESCOM LAU, J, CATTS, R | ALA/ACRI, 2000 | CAUL, 2001 | BIG BULE, 2002 | ANZIIL, 2004 |
|---|---|---|---|---|---|
| | | selected information into his or her knowledge base and value system | into their knowledge base and value system | | process |
| | Organization of information/store and retrieval information | | 4. Claddifies, stores, manipulates and redrafts information collected or generated | 5. Organized information | 4. The information-literate person manages information collected or generated |
| Use | Use of information/make practical and ethical use of information | Uses information effectively to accomplish a specific purpose | 5. Expands, reframes, or creates new knowledge by integrating prior knowledge and new understandings individually or as a member group. 6. Recognized that lifelong learning and participation. | 6. Adapts information | 5. The information-literate person applies prior and new information to construct new concepts or create new understandings |
| | Communication and ethical use of information/make effective and ethical use of information | Understand many of the economic, legal, and social issues surrounding the use of information etically and legally | 7. Understand cultural, economic, legal, and social issues surrounding the use of information and access and use information ethically, legally, and respectfully. | 7. Communicates information | 6. The information-literate person uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the information |

To reduce the problems faced in developing Digital Electronics training kits and information literacy to improve the performance of Electrical Engineering Education Students, a holistic approach is needed that involves improving infrastructure, developing digital competencies, adjusting the curriculum, and providing adequate financial and policy support. Collaboration between educational institutions, government, and industry is also key in developing effective and relevant digital electronics training kits and information literacy to meet the needs of the times. The limitations of the practical equipment owned, which are not comparable to the number of students, result in a lack of effectiveness in the practical process. The number of groups is too large, so the practice is less than optimal. Students often have difficulty accessing valid and relevant sources of information, which are used for the development of information literacy. Information literacy based on AI and IoT is a solution to increase student knowledge and performance in completing several digital electronics training kit materials. The lack of ability to assess the credibility and relevance of information can lead to the use of inaccurate sources in learning, which can be overcome.

This article discusses the development of an electronic control training kit and the designing and making an electronic control training kit learning media. This study uses the Research and development method with the Borg & Gall model and shows the training kit's validity, practicality, and effectiveness results. The results show that the developed training kit is valid, practical, and effective in improving student learning outcomes. (Sulistriyono & Supriyadi, 2023). The development of an IoT learning trainer kit with the methodology used is the ADDIE model, and the test results show that the trainer kit developed is suitable for use with a feasibility percentage reaching 91.18%, the potential of the trainer kit as an innovative learning model (Schulte et al., 2023). Development of Electric Motor Control Training Kit This study shows that training kits can improve students' understanding of electric motor control practices, thus supporting a more effective teaching and learning process. (Lilian, 2022). The effectiveness of using this prototype in an educational setting was evaluated by surveying students and instructors at the Faculty of Engineering Technology (FTK) at Universiti Teknikal Malaysia Melaka (UTeM). The response was positive, with 60.00% of correspondence indicating positive feedback, indicating the usefulness of the prototype device.

Innovations made in developing Digital Electronics training kits by combining AI and IoT technology into training kits allow students to monitor and control devices in real time and analyze the resulting data to understand the behavior of electronic systems in more depth. Developing modules that can adjust the level of difficulty and content based on the progress and needs of individual students so that the learning process becomes more personal and practical. Designing devices that are easy to carry and use in various locations allows students to do practicums in the laboratory at home or other environments. The novelty of this research is the integration of AI and IoT technology in the training kit. Several things are needed for the training kit to be used in Digital Electronics learning, including the research objectives, analyzing validation results, responses, and the performance results of Electrical Engineering Education students.

## RESEARCH METHOD

The study used the following methods: (1) Analysis, identifying needs by assessing the learning needs of Electrical Engineering students related to digital electronics and information literacy. Literature Study, reviewing the latest research in the development of learning media and information literacy; (2) designing a training kit prototype that meets the latest learning and technology needs. Development of information literacy modules by compiling integrated learning materials using AI and IoT-based training kits. (3) Development, making prototypes to realize designs into actual products, including supporting hardware and software. Product validation involves involving experts to assess the suitability and quality of the products developed, (4) implementation, and field trials by applying training kits and modules to small groups of students to collect feedback. User training will be done by lecturers and students on how to use training kits and information literacy modules, as well as (5) evaluation, assessment from validators, student responses, and performance of Electrical Engineering Education students—revising the product by making improvements and perfecting the product based on the evaluation results and user feedback. The research method is explained in Figure 1.


**Figure 1**. Fishbone diagram research methods.

The completeness of implementing the development of the Digital Electronics training kit includes reviewing learning devices, designing a digital electronics training kit, simulation with software, compiling a manual, implementing the circuit, testing it on students, testing performance, and evaluating it. (Rizki et al., 2021, 2023; Saphira et al., 2022). As explained in Figure 2.

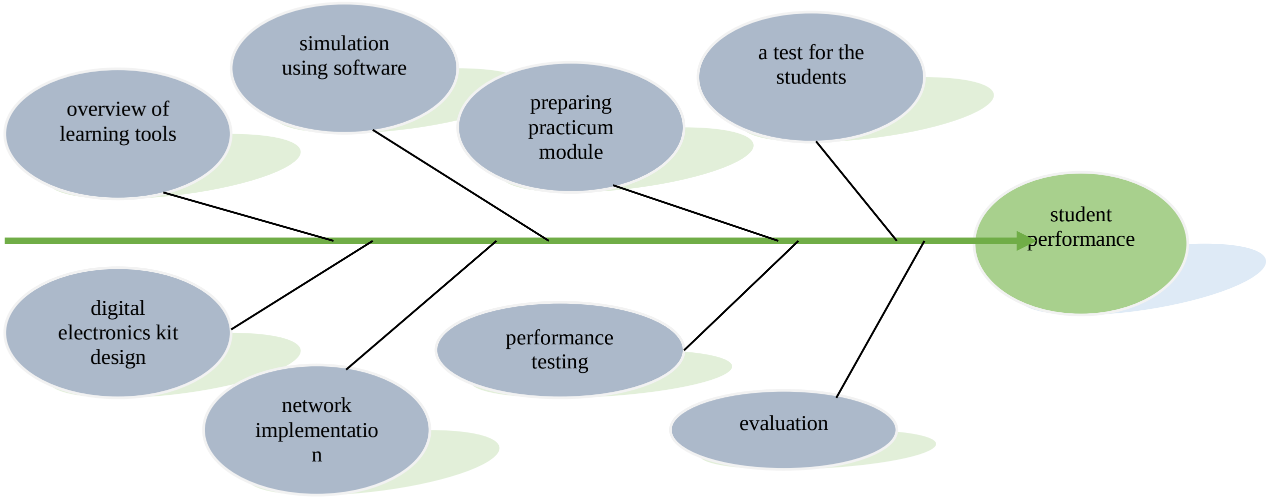


**Figure 2**. Implementation steps for developing a training kit.

## RESULTS AND DISCUSSION

### *Results*

This study produced an Electronic Circuit training kit consisting of several experiments, including: Basic and Additional Gates, Combination Gates, AND - OR Combination, NAND - XOR Combination, AND - XOR Combination, NAND - XOR Combination, OR - NAD Combination, Practical 3: Encoder 8 to 3 || Decoder 2 to 4, Decoder 3 to 8 || Decoder 4 to 16, BCD to 7-segment, lecture 6: Flip Flop, Set - Reset Flip Flop from NAND, Set - Reset Flip Flop with ENABLE, JK - FF with LED output, JK - FF with seven segment output, JK Flip Flop, Toggle Flip Flop, BCD/Decade Up/Down Counter, Binary Up/Down Counter, Parallel Input Parallel Output, Serial Input Parallel Output, Comparator, Parallel To serial Shift Register, Full Adder 4 bit with carry, Analog Multiplexer, and Digital Multiplexer. The physical form is shown in Figure 3.2. The trainer is designed as efficiently as possible so that it can be used to test student performance anywhere; it does not require ample space and can be protected from dust. So that the Digital Electronics training kit can be used or is feasible, a validity test is carried out by providing test instruments to the validators. The results of the validator are feasible to use. They can be used as a training kit to test students' performance in the Electrical Engineering Education study program at the State University of Surabaya. Other universities can also use them. Information literacy is the second independent variable, resulting in instrument validation from the perspective of material experts, as shown in Table 2.

**Table 2**. Validation results of information literacy instruments from the perspective of material experts.

| Var | Aspect Value | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X2.1 | X2.2 | X2.3 | X2.4 | X2.5 | X2.6 | X2.7 | X2.8 | X2.9 | X2.10 | TOTAL X2 |
| A | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 4 | 44 |
| B | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 38 |
| C | 3 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 43 |

The results of the validation of the information literacy instrument: validator A produced a total of 44, validator B (38), validator C (43), and an average total of 41.7. Based on the division of categories from the calculation results, 41.7 can be declared good. The score on the lowest instrument is worth one, and the highest score is worth 4, with details of 1 (less), 2 (sufficient), 3 (good), and 4 (very good). The highest value in information literacy is 4, the lowest is 1, and the number of assessment aspect items is 20. For a minimum score of 20, a maximum score of 80, and an interval length of 15 is obtained, so it can be described as follows.

!----------!----------!---------!---------!
20 35 50 65 80

The calculation results can be categorized as follows: 20-35 (less), 36-50 (sufficient), 51-65 (good), and 66-80 (very good). Table 3 shows the results of the instrument validation by language experts.

**Table 3**. Results of the validation of information literacy instruments from the perspective of language experts.

| Var | Aspect Value | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X2.1 | X2.2 | X2.3 | X2.4 | X2.5 | X2.6 | X2.7 | X2.8 | X2.9 | X2.10 | X2.11 |
| A | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| B | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 3 |
| C | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

| Var | Aspect Value | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | X2.12 | X2.13 | X2.14 | X2.15 | X2.16 | X2.17 | X2.18 | X2.19 | X2.20 | TOTAL X2 |
| A | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 76 |
| B | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 71 |
| C | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 76 |

Analyzing the validation results of the information literacy instrument, validator A produced a total of 76, validator B (71), validator C (76), and an average total of 74.30. Based on the division of categories from the calculation results, 74.30 is very good. The number of samples used (N) was 116 students, and the number of items was 15, based on the r-table on the sample used with a significance of

5% was 0.07. The results of the validity test of the digital literacy variable are shown in Table 4.

**Table 4**. Results of validity tests of several items in the information literacy variable.

| Item | R-Value | R-Tabel | Information |
|---|---|---|---|
| X2.1 | 0.39 | 0.07 | Valid |
| X2.2 | 0.48 | 0.07 | Valid |
| X2.3 | 0.46 | 0.07 | Valid |
| X2.4 | 0.53 | 0.07 | Valid |
| X2.5 | 0.44 | 0.07 | Valid |
| X2.6 | 0.48 | 0.07 | Valid |
| X2.7 | 0.5 | 0.07 | Valid |
| X2.8 | 0.62 | 0.07 | Valid |
| X2.9 | 0.62 | 0.07 | Valid |
| X2.10 | 0.59 | 0.07 | Valid |
| X2.11 | 0.60 | 0.07 | Valid |
| X2.12 | 0.59 | 0.07 | Valid |
| X2.13 | 0.51 | 0.07 | Valid |
| X2.14 | 0.52 | 0.07 | Valid |
| X2.15 | 0.55 | 0.07 | Valid |

The validity calculation result in the table above shows that all items produce r-count > r-table. The sign value (2-tailed) with a probability of 0.05 produces 0.00 < 0.05, and the Pearson correlation is positive (+) so that the items on X2_1 to X2_15 are declared valid. The reliability test results on the information literacy variable (X2) show that Cronbach's alpha (table 5) on this variable is higher than the fundamental value, which is 0.820> 0.60. These results prove that all statements in the information literacy variable questionnaire (X2) are reliable. The test results are shown in Table 5.

**Table 5**. Results of reliability testing of information literacy variables.

| | | N | % |
|---|---|---|---|
| Case | Valid | 116 | 100.00 |
| | Excluded | 0 | 0.00 |
| | Total | 116 | 100.00 |

a. Listwise deletion based on variables in the process

Reliability statistics

| Cronbach's Alpha | N of Item |
|---|---|
| .82 | 15 |

The results from student responses using ten assessment aspects obtained an average rating of 90.00%, with very practical criteria. The results of student responses obtained are shown in Figure 2.

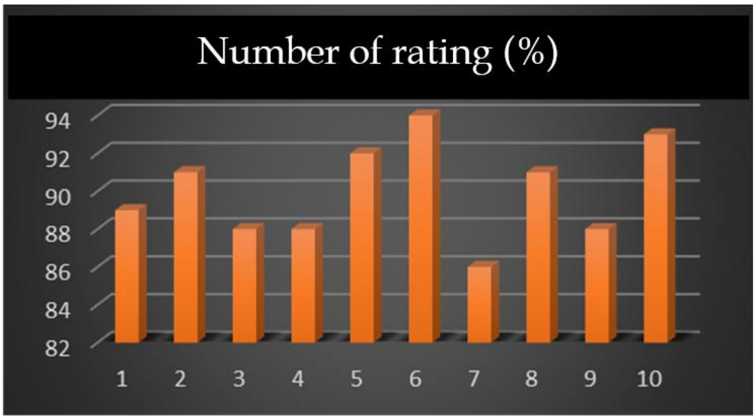


**Figure 2**. Results of student responses.

The vertical value is the number of ratings in percent, while the horizontal value is ten assessment aspects which include: (1) buttons, menus, and icons that are easy to understand 89.00% (2) there are easy to understand usage guidelines 91.00%, (3) selection of appropriate color size and font type 88.00%, (4) selection of appropriate colors in learning media 88.00%, (5) the language used is clear and easy to understand 92.00%, (6) the videos and images displayed are clear 94.00%, (7) the training kit presented makes the learning process easier 86.00%, (8) the media is straightforward to operate 91.00%, (9) the writing on the kit board is easy to read 88.00%, and (10) the material in the device media in the form of a training kit is easy to understand 93.00%.

The results of the analysis of student performance in the theoretical understanding aspect include: (1) understanding the basic concepts of digital electronics produces an average of 85.00%. (2) An explanation of the function and workings of digital electronic components produces an average result of 86.00%. In the practical skills aspect, it produces: (1) the ability to assemble simple digital electronic circuits produces 89.00%. (2) Conducting circuit testing and analysis produces 89.00%. The analysis and problem-solving aspect in (1) the ability to analyze problems in digital electronic circuits produces a result of 89.90%. (2) Proposing solutions to problems faced during practicum produces 88. The creativity and innovation aspect in (1) creating new circuits or modifying existing circuits produces a result of 85.00%. The results of the relationship between digital electronics training kits and information literacy on the performance of Electrical Engineering Education undergraduate students at Surabaya State University. Variables X1 (digital electronics training kits), X2 (information literacy), and Y (student performance) are shown. The relationship model between variables X1, X2, and Y is shown in Figure 3.

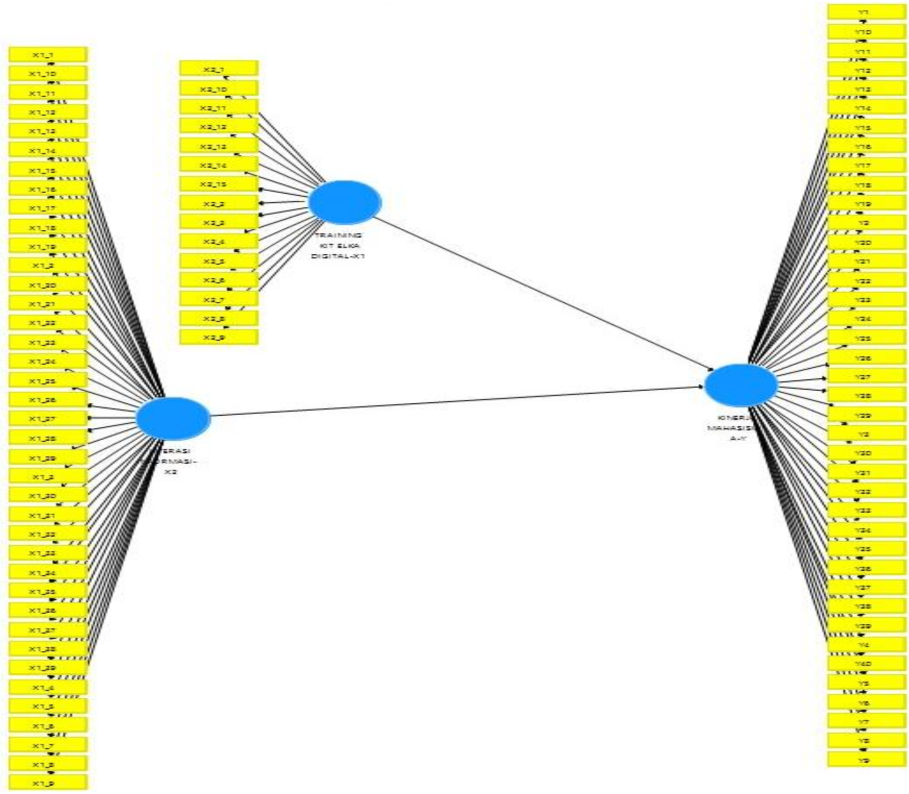

**Figure 3**. Relationship between variables X1, X2, and Y.

***Discussion***

The results of the data analysis prove that the digital electronics kit (X1) significantly and positively contributes to the performance of Electrical Engineering Education students (Y), as evidenced by the p-value of 0.00, which is smaller than 0.10, and the Path coefficient value of 0.10. Therefore, the first hypothesis of the relationship between the digital electronics kit variable and the student performance variable has a positive and significant contribution and can be accepted for its truth. The results of the data analysis have proven that information literacy significantly and positively contributes to student performance (Y), as evidenced by the p-value of 0.034, which is smaller than 0.10, and the Path coefficient value of 0.07. So, student performance can be improved by implementing information literacy. Therefore, the first hypothesis of the relationship between the information literacy variable and the student performance variable has a positive and significant contribution and can be accepted for its truth. The results can be analyzed to show a significant positive contribution to information literacy on student performance. This means that students have performance capabilities in applying information literacy, and the more they apply information literacy, the more their performance capabilities increase. Increasing student performance capabilities can be formed by increasing information literacy capabilities and skills. As seen in the performance, they must constantly keep trying despite experiencing declining conditions.

The findings show (1) produce digital electronics training kit (X1). The validation results of the language and material experts (X1) are suitable for use. They can be used as a training kit to test students' performance in the Electrical Engineering Education study program at Surabaya State University. Other universities can also use them. The results of the calculation of the validity of the information literacy variable (X2) show that all items produce 0.00 <0.05, and the Pearson correlation is positive (+), so items on

X2_1 to X2_15 are declared valid. While the results of the reliability test of Cronbach's alpha on this variable are higher than the fundamental value, namely 0.82 > 0.60, these results prove that all statements in the information literacy variable questionnaire (X2) are declared reliable, generating student response data on Digital Electronics training kits and information literacy for undergraduate Electrical Engineering Education students with the respective rating results producing: easy-to-understand buttons, menus, and icons 89.00%, there are easy-to-understand usage guidelines 91.00%, selection of appropriate color sizes and fonts 88.00%, selection of appropriate colors in learning media 88.00%, the language used is straightforward and easy to understand 92.00%, the videos and images displayed are explicit 94.00%, the training kit presented facilitates the learning process 86.00%, the media operation is very easy 91.00%, the writing on the kit board is read 88.00%, and the material in the media device in the form of a training kit is easy to understand 93.00%. So that the average rating result is 90.00%, (2) Generating and analyzing performance data of undergraduate Electrical Engineering Education students in the Digital Electronics Practice course, (a) understanding the basic concepts of digital electronics resulted in an average of 85.00%. (b) explanation of the functions and workings of digital electronic components resulted in an average of 86.00%. The practical skills aspect resulted in the ability to assemble simple digital electronic circuits, which resulted in 89.00%. Conducting circuit testing and analysis resulted in 89.00%.

The analysis and problem-solving aspects in (1) the ability to analyze problems in digital electronic circuits resulted in 89.90%. Proposing solutions to problems faced during practicum resulted in 88.00%. The creativity and innovation aspects in (1) being able to create new circuits or modify existing circuits resulted in 85.00%, and (3) the relationship between digital electronics training kit and information literacy on the performance results of undergraduate students of Electrical Engineering Education. (a) The digital electronics training kit/X1 has a significant and positive contribution to the performance of Electrical Engineering Education Unesa/Y undergraduate students, as proven by a p-value of 0.00 smaller than 0.10 and a Path coefficient value of 0.10. So, the first hypothesis of the relationship between the digital electronics training kit variable and the performance variable of undergraduate students of Electrical Engineering Education Unesa has a positive and significant contribution and can be accepted as its truth. (b) The results of the data analysis conducted have proven that information literacy/X2 has a significant and positive contribution to the performance of undergraduate students of Electrical Engineering Education Unesa/Y, as proven by a p-value of 0.034, which is smaller than 0.10, and a Path coefficient value of 0.07. From the results obtained, an analysis can be carried out that shows a significant positive contribution of information literacy to the performance of students of the Unesa Electrical Engineering Education Study Program. This means that the more performance and skills in implementing information literacy, the more students' performance ability in the Unesa Electrical Engineering Education Study Program will increase. Students' performance in the Unesa Electrical Engineering Education Study Program can be formed by increasing their ability and skills in information literacy. As seen in the performance, they always have to keep trying despite experiencing declining conditions.

The results explain that information literacy is an important capital that can develop competence, be more productive, and qualify to become a lifelong learner. The application of information literacy produces knowledge which is a prerequisite for knowledge management and a key theme in the training of 21st-century librarians towards knowledge management has contributed to the instructional process of information literacy (Hammoda & Foli, 2024; Kassim et al., 2022; Noerjanah & Sadiah Maulidah, 2021; Santos-Hermosa & Atenas, 2022; Sibiya, 2023). Implementing information literacy has significantly increased the impact on teaching, learning, research, and creativity. Using literacy as a subject in research produces knowledge and skills that can improve student performance with valid and significant results. Surabaya teenagers have increased competence, which is classified as high for internet searching, hypertextual navigation, and knowledge assembly.

However, the aspect of information content evaluation is classified as moderate. Contributions of this research include: (1) Increased Conceptual Understanding: Using digital electronics kits helps students understand abstract concepts through hands-on experimentation. Students more easily connect theory with practice, thereby improving their basic understanding of digital electronics (Alessandrini, 2023; Ariza, 2023; W. W. Chu et al., 2023; Gavrilas et al., 2025; O'Mahony et al., 2024); (2) Improvement of Practical Skills, students can directly apply the theory learned in the form of real projects. Improve digital circuit assembly, programming, and troubleshooting skills; (3) Increased problem-solving Skills and hands-on experimentation with kits allow students to develop analytical and problem-solving skills, (4) students are better prepared to face challenges in the world of work, especially in the field of digital system design (Goulart et al., 2021), (5) information literacy and learning independence, students learn to seek, assess, and use information more effectively in experiments and research (Chen et al., 2022; Feekery et al., 2021; Ishimura & Fitzgibbons, 2023; Tachie-Donkor & Ezema, 2023; Yu et al., 2022). With good information literacy, students can access various technical resources to develop their skills, (6) increase creativity and innovation, and digital electronics kits provide opportunities for students to explore new circuit designs and applications. Encourage innovation in research projects and final projects based on digital technology, (7) effectiveness of learning and Student Engagement, students are more active in the learning process because they can immediately see the results of their experiments (Al Shawabkeh & Arar, 2024; Aldhafeeri & Alotaibi, 2022; Hutain & Michinov, 2022; Yu et al., 2022; Zen et al., 2022), (8) practice-based learning increases motivation and engagement in related courses, and (9) preparation for the world of work and Industry, students are better prepared to face challenges in the industry with strong practical skills.

## CONCLUSION

**Fundamental Findings:** The relationship between information literacy and performance variables of Electrical Engineering Education students at Unesa has a significant positive and significant contribution. **Implications:** Digital electronics kits will facilitate adaptation to technological developments. When combined with increased information literacy, developing digital electronics kits will create electrical engineering students who are more competent, innovative, and ready to face technological developments in the industrial era 4.0. **Limitations:** limited resources, variations in student abilities, not all students have the same level of understanding and skills in digital electronics, and constraints in curriculum and teaching. Not all kits are compatible with all types of software or operating systems; some components are easily damaged or have limitations in durability. Incomplete documentation and user guides can make it difficult for students to understand. A lack of information analysis skills can lead to errors in understanding concepts and applications of technology. It is not easy to measure the quantitative effectiveness of using kits in improving student understanding. **Further research:** developing more innovative digital electronics kits with the support of the Internet of Things (IoT) and artificial intelligence (AI). Modularity and scalability can be adjusted to various levels of learning, from beginner to advanced. More durable materials and designs using more potent, lighter, and more easily reassembled kit materials and designs, optimizing the use of kits in project-based learning (PBL) or blended learning, using adaptive learning technology to customize experiments according to abilities and needs, and improving information literacy to improve skills in finding, assessing, and using relevant technical information and developing a digital-based learning platform that provides credible sources of information related to digital electronics. Implementation of Virtual and Augmented Reality technology using virtual simulations Electronics laboratories use Virtual Reality (VR) or Augmented Reality (AR) as an alternative that does not have direct access to physical kits.

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