A valid and practical electronic digital security module for educational technology study program students

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Abstract: This research is a development research (R&D) using the Rowntree model, which aims to produce digital safety e-modules for digital literacy study program students of Educational Technology Study Program FIP UNM. Data collection techniques include questionnaires, observations, assessment questionnaires, and documentation. Data analysis techniques used qualitative descriptive analysis techniques and quantitative descriptive analysis. The results of expert validation show that the Digital Safety e-Module that has been developed has obtained valid criteria with a percentage of 100% in the content aspect, a rate of 100% in the language aspect, and a percentage of 98% in the media design aspect. The practicality test of the product is seen from the average score of the questionnaire at the one-to-one evaluation stage and the field trial stage. The average assessment score was 95% at the one-to-one evaluation stage, with a very practical category. The average assessment score at the field trial stage was 92.5%, with a very practical category. Thus, the Digital Safety e-Module product for Digital Literacy Study Program Students, Department of Educational Technology FIP UNM, has been developed with validity and practicality.

Keywords: E-modules, digital safety, students

Abstrak: Penelitian ini merupakan *research and development* (R&D) dengan menggunakan model Rowntree yang bertujuan untuk menghasilkan e-modul *digital safety* pada mahasiswa program mata kuliah literasi digital Prodi Teknologi Pendidikan FIP UNM. Teknik pengumpulan data berupa angket (kuisioner), observasi, angket penilaian, dan dokumentasi. Teknik analisis data menggunakan teknik analisis deskriptif kualitatif dan analisis deskriptif kuantitatif. Hasil validasi ahli menunjukkan bahwa e-modul *digital safety* yang telah dikembangkan memperoleh kriteria valid dengan presentase 100% pada aspek isi, presentase 100% pada aspek kebahasaan, dan presentase 98% pada aspek desain media. Adapun uji coba kepraktisan produk dilihat dari skor rata-rata angket pada tahap *one-to-one* evaluation dan tahap *field trials*. Pada tahap *one-to-one evaluation* diperoleh rata-rata skor penilaian 95% dengan kategori sangat praktis, dan pada tahap *field trials* diperoleh rata-rata skor penilaian 92,5% dengan kategori sangat praktis. Dengan demikian, produk e-modul *digital safety* pada mahasiswa program mata kuliah literasi digital Jurusan Teknologi Pendidikan FIP UNM telah dikembangkan dengan sangat valid dan praktis.

Kata kunci: : E-modul, digital safety, mahasiswa

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INTRODUCTION

Indonesia is a country that is quite active in accessing digital spaces. This activity cannot be avoided because personal and academic activities are carried out in the digital space. These activities leave various digital traces that we do not realize can cause user privacy data to leak to the public (Gilang et al., 2021). The Indonesian Internet Service Providers Association (APJII) reports survey data related to the level of internet penetration in the country reaching 79.5%, with the number of people connected to the Internet reaching 221,563,479 people out of a total population of 278,696,200 people in 2023 (APJII, 2024). The research data above shows that Indonesia is actively using the internet. Actively using the internet also has positive and negative sides. The positive side is that it can birth

new digital talents in technology. The negative side is the emergence of cybercrime as a new category of crime that is difficult to overcome because students today live side by side with the Internet. Students cannot be separated from the internet as academic and personal activities are carried out (Shahibi & Rusli, 2017). These activities need to be balanced with safe internet skills so that technology becomes a positive, creative space for students (Sujana & Rachmatin, 2019). The Central Bureau of Statistics supports this because it has recorded 13.74% of internet users based on the age of 19-24 (BPS, 2023). Other research shows that internet users in the 15-19 age group were recorded at 8.2%, where the data shows that teenage users, including students, are the largest internet users (Kemp, 2024).

Therefore, students are expected to be able to leave a suitable digital footprint on the Internet. Maintaining the security of their digital footprints to avoid various types of cybercrime is very important. Safeguarding the digital information we have properly can protect sensitive data, maintain privacy, comply with regulations, and maintain student reputation (Farid et al., 2023). Maintaining the security of digital footprints is part of digital literacy initiated by President Jokowi through the national digital literacy movement (Monggilo et al., 2021). KOMINFO's digital literacy curriculum includes skills, ethics, culture, and digital safety, where digital traces are the main topic in digital safety. Hence, this education requires the right media to convey the message to students quickly. Research currently being carried out focuses on digital safety and creating a special guide to build awareness of safe internet use for students. In this case, e-modules can be the right media to guide students in doing activities in the digital space.

A module is a unit of learning material that students can study independently. Modules contain components and clear instructions so students can follow the lessons well. Modules can be studied independently by anyone, and an independent learning package opens opportunities for readers to develop themselves optimally (Dita et al., 2023; Setyantoko et al., 2023). Digital modules are devices or learning tools that contain material, methods, problem limits, and assessment methods that are systematically and interestingly designed to achieve the expected competencies according to the level of complexity (Lastri, 2023). Based on the above understanding, researchers can conclude that e-modules are a series of teaching materials that are systematically designed and attractive in electronic form that can be accessed offline or online so that the learning process becomes efficient.

Digital modules provide many benefits for lecturers and students, such as stimulating creativity and critical thinking skills, solving problems in learning, developing new skills for students, and helping support blended learning. The initial survey results stated that 96.2% of students prefer to use e-modules as learning media; the reasons students prefer to use e-modules include more practical use by 80.8%, more efficient and effective by 11.5%, and easier to understand by 7.7%. Based on the data above, researchers can conclude that students are interested and find it easy to use in lectures, so e-modules are more appropriate for delivering information than other media. The weakness of e-modules lies in the availability of learning devices that are inadequate in their use and can only be accessed through digital devices such as smartphones and laptops/computers (Fitriyani et al., 2022; Pratiwi et al., 2024). However, this can be overcome because almost all students have smartphones.

In observations, researchers found respondents that e-module teaching materials are urgently needed in digital literacy courses because no new teaching materials specifically

discuss the security of digital traces used in the learning process. Digital literacy e-modules are very helpful for educational technology students who apply blended learning in the classroom. The preliminary results of this research are the reason for choosing digital modules as a medium for digital footprint security education for students. So researchers designed this digital safety e-module product to overcome one of the problems in the learning process, especially in learning resources or e-modules, so that students are more active and enthusiastic in learning both independently and collaboratively because this e-module product displays the material at each meeting that will be discussed and taught by the lecturer in charge of the course. Realizing a valid and practical e-module can assist the learning process of educational technology students in the digital literacy program. Then, the developed e-module has the following advantages: (1) it is easy to operate using PDF applications, (2) there are learning videos that can be accessed through YouTube links as support, (3) it is simple and easy to carry anywhere, and can be studied independently by students (Dita et al., 2024; Puspitasari, 2019; Rahmadhani & Efronia, 2021)

The disadvantages of this e-module product are the same as those of other e-modules, which can only be accessed using digital devices such as mobile phones and laptops/PCs. However, these shortcomings have been resolved because, based on the results of the initial needs identification, all educational technology students in the digital literacy course program already have digital devices. In addition, researchers encountered many obstacles in developing this e-module product that could finally be overcome. This resulted in a non-print-based e-module (pdf) for digital literacy courses that fell into the very valid and very practical. The importance of this research is that students must also build a positive digital footprint because surfing the internet is unavoidable, so adequate education is needed. Reference searches show that there is still a lack of current research explaining digital footprint security, so students find it challenging to realize this. With this in mind, researchers developed the Digital Safety e-module as a solution or guide in maintaining online reputation and building awareness of safe internet use for students as a preventive protection measure to protect information, maintain privacy, comply with regulations, and maintain student reputation education.

METHOD

The research method used by researchers is the Research and Development development method. The type of research in this study is empirical. This research was conducted by involving elements of data collection and implementation of virtual and digital research by developing electronic modules. The design of this research uses the Rowntree development model. Rowntree's research and development model includes 3 stages, namely, planning, writing preparation, writing, and editing (Rowntree, 1994); adaptations made are evaluation of face-to-face trials in small groups and field trials in large groups and expert reviews from experts based on the consideration that this model is suitable for developing digital safety e-modules. The object of this research is the development of a digital safety module to build awareness of safe internet use through students' digital footprints. The subject of this research is students of the educational technology study program FIP UNM digital literacy course. The product feasibility test was carried out at the expert review stage through 3 aspects of assessment, namely content/material aspects,

linguistic, and media design. The validation sheet and practicum are on a Likert scale with five categories.

This study's subjects were educational technology students at the Faculty of Education, Makassar State University, who took digital literacy courses and used digital safety e-modules. The provisions are used in the questionnaires to give meaning to the decision-making: student needs analysis questionnaires, media expert questionnaires, content/material expert questionnaires, small group trial questionnaires, and extensive group trial questionnaires. Researchers used the reference below to interpret the quantitative data obtained into qualitative data based on the criteria scores obtained.

$$\text{Percentage} = \frac{\sum x}{\text{SMI} \times 100\%} \tag{1}$$

Description:
$\sum x$ = Total score
SMI = Ideal Maximum Value
100% = Constant

Table 1 shows the determination of validation conclusions based on the media and material validation assessment percentage, while Table 2 shows practicality.

Table 1. Criteria for validity score

Category	Score Range
Very Valid	81 – 100
Legal	61 – 80
Less Valid	41 – 60
Not valid	21 – 40
Very Invalid	0 – 20

Source: (Adapted from Wandani & Nasution, 2017)

The validity results can be determined if the validation test results are at the 61%-100% achievement level or are invalid for very valid qualifications. In this case, the e-module media is declared valid and does not need revision. If the percentage is at 60%-0%, the e-module media is quite valid and needs revision.

Table 2. Practicality level criteria score

Category	Score Range
Very Practical	81 – 100
Practical	61 – 80
Less Practical	41 – 60
Not Practical	21 – 40
Not Very Practical	0 – 20

Source: (Adapted from Wandani & Nasution, 2017)

Practicality results can be known if the results of the practicality test are at the level of achievement 61% - 100% or are in practical to very practical qualifications. It is declared practical and does not need revision. If the percentage is at the level of 60% - 0%, then the e-module media is quite practical and needs revision.

RESULTS AND DISCUSSION

The research results presented in Chapter IV have several stages or topics related to the digital safety e-module development model in digital literacy courses. The digital safety e-module research and development model, which is an elaboration of the model (Rowntree, 1994), produces the following stages: (1) Planning Stage, (2) Writing Preparation Stage, (3) Writing and Editing Stage. The results obtained at the stages of the process above can be described as follows:

Planning stage

The initial stage is to analyze students' characteristics through needs identification. The results of identifying these needs need to be observed so that they can be the basis for developing this e-module product and determining general objectives and specific objectives. At the identification stage, researchers can identify student characteristics at the planning stage, then distribute a needs identification questionnaire filled out by 26 students and t. The questionnaire is given to the lecturer teaching the course.

At this stage, after conducting a needs analysis through distributing questionnaires to students who have taken digital literacy courses, totaling 26 respondents who are FIP UNM Educational Technology students, then document analysis and literature study are carried out to collect materials related to digital safety e-modules, in this case, researchers use the KOMINFO digital safety module as the main reference in product development. Furthermore, researchers conducted discussions or brainstorming with lecturers teaching digital literacy courses to formulate general objectives and specific learning objectives, then compiled digital trail security teaching materials as an outline of content by analyzing the subject matter and sub-subject matter to achieve the competencies to be achieved by students.

E-module products are developed based on student needs. The overall design of the material in the brainstorming session includes the decision that the e-module product will later be developed in non-print form (pdf) so that the use of e-modules will be adjusted to these needs.

Writing preparation stage

The next stage is designing prototype 1, namely topic development and drafting, which is then used to produce prototype 1 of the digital safety e-module. The e-module the researcher developed was designed using the Canva application, which ha. It has been designed according to the flow of learning objectives, materials, and product results explored in PDF form, and the barcode available on the e-module allows access.
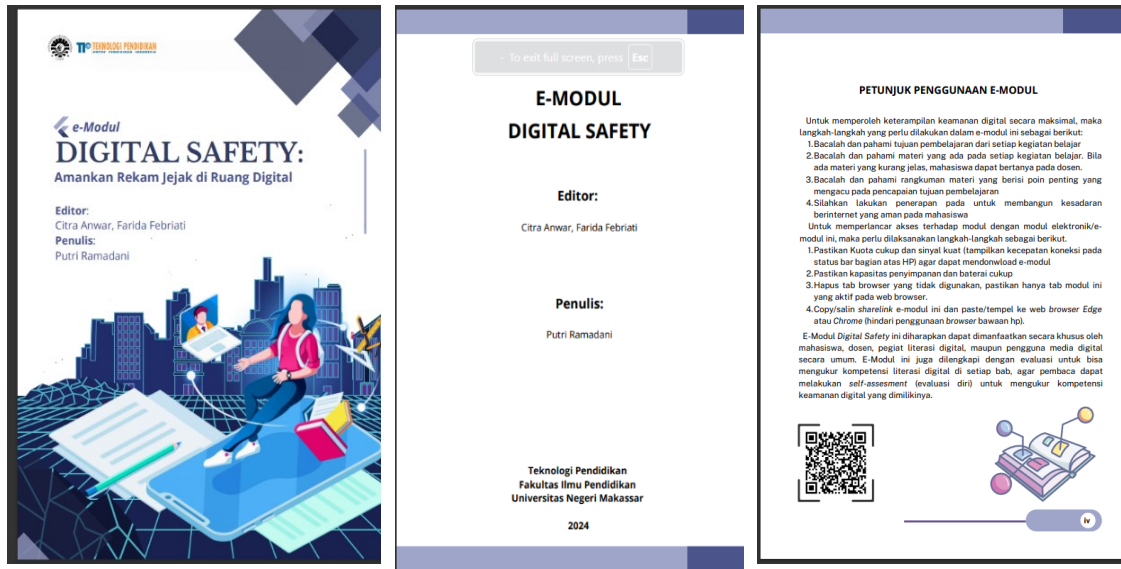
a. Cover of the e-module   b. e-module identity   c. Instruction use

d. Learning Video Display   e. Case of Learning Materials

Fig. 1. View of digital safety e-module

A team of experts and students will later validate this media through content Validation, language, media, and practicality tests to obtain input or ideas for improving the resulting media

Writing and editing stage

After product development, the next step is to validate the the e-module with experts covering material, language, and design. The experts' feasibility study results are shown in the Table 3.

Expert validity test

Table 3. Results of content/material data analysis

Indicators	Percentage	Category
Suitability of learning objectives with the material presented	100	Very Valid
The order in which the material is Presented	100	Very Valid
The material presented in writing is easy to understand	100	Very Valid
The sequence of experimental steps are presented	100	Very Valid
Compliance with requirements electronic module	100	Very Valid
Average	100	Very Valid

Table 3 shows the results of the data analysis on the content/material aspect, which obtained a 100% percentage and was included in the very valid category.

Table 4. Results of language data analysis

Indicators	Percentage	Category
Readibility	100	Very Valid
Clarity of Information	100	Very Valid
Correct use of Indonesian Language	100	Very Valid
Word choice or editorial decision	100	Very Valid
Effectiveness of the language used in the media	100	Very Valid
Average	100	Very Valid

Table 4 shows the results of data analysis of language aspects, which obtained a percentage of 100% and were included in the very valid category.

Table 5. Media data analysis results

Indicators	Percentage	Category
Order of presentation	100	Very Valid
E-module cover design	100	Very Valid
Font usage (type and siza)	100	Very Valid
Illustrations, graphics, images	100	Very Valid
Layout	98	Very Valid
Completeness of Information	100	Very Valid
Average	98	Very Valid

Table 5 shows the result of the data analysis of the design aspect, which aspect obtained a percentage of 98% and was included in the very valid category. The table of expert team trial results above shows that the e-module prototype in terms of content, language, and design is very valid and feasible. It has a category that can be tested at the next evaluation stage, and improvements can be made according to the revision of each aspect.

Product practicality test
One-on-one evaluation test

The one-to-one Evaluation stage was carried out to know the practicality of the e-module. Prototype 1 was tested on 3 students who had taken digital literacy courses in the Department of Educational Technology as representatives to provide and assess. The three students had previously attended digital literacy lectures with digital safety material, so it was easier for them to understand the contents of the e-module.

Table 6. One-on-one evaluation analysis results

No	Question	Total Score
1	Digital safety media is getting more interesting with the presence of e-module media	98
2	The digital safety e-module helped us raise awareness of safe internet use	94
3	The material in the e-module media is presented systematically	95
4	The language used in this e-module media is easy for us to understand	95
5	We are interested in seeing the appearance of this e-module media	95
6	The description of the instructions for each experiment contained the e-module of our media is clear	94
7	E-module media can be used without an internet connection	100
8	E-module media can be managed easily	95
9	We would like this e-module to be used more often in the learning process	94
	Average	95.5

Table 6 shows the results of data assessment analysis at the face-to-face trial stage. The calculation 3 students obtained a percentage of 95.5%, so it can be concluded that prototype 1 of the digital safety e-module is in the very practical category.

Field trial

Table 7. Results of field test stage assessment analysis

No	Question	Total Score
1	Digital safety media is getting more interesting with the presence of e-module media	95
2	The digital safety e-module helped us raise awareness of safe internet use	94
3	The material in the e-module media is presented systematically	90
4	The language used in this e-module media is easy for us to understand	92
5	We are interested in seeing the appearance of this e-module media	93
6	The description of the instructions for each experiment contained the e-module of our media is clear	92
7	E-module media can be used without an internet connection	92
8	E-module media can be managed easily	92
9	I would like this e-module to be used more often in the learning process	93
	Average	92.5

This study describes the process researchers have used to develop digital module products (e-modules) for digital safety students to answer the problem formulation in Chapter I, namely the need for digital modules, digital module design, and validity and practicality of digital safety modules. The distribution of questionnaires to identify student requirements was performed in order to determine the extent of the need for the digital module to be developed in the learning process. The needs analysis was carried out based on the problems researchers found during initial observations at Makassar State University, faculty of education, department of educational technology for students who were programming digital literacy courses. During the observation, it turned out that students and lecturers did not have special teaching materials to guide students in t. It was still a new course, so there was still a lack of teaching materials that supported the learning process. Therefore, lecturers must prepare special teaching materials with a constructivist approach through e-modules, where learning is student-centered (Pribadi, 2021). Thus, presenting e-modules learning media can help lecturers and students in the learning process. The e-module designed using Canva fulfills the criteria for effectively acquiring knowledge for X MIA students (Hadawang et al., 2025).

Furthermore, the preparation of general and specific objectives, material, and e-module design has been prepared based on the characteristics and needs of students who have previously been analyzed through questionnaires that have been distributed where students do not know how dangerous cybercrime is to their digital footprint and still do not understand digital security. Supporting factors behind the development of e-module products have been collected through student needs analysis questionnaires and material/content needs analysis, as well as brainstorming with lecturers teaching digital literacy courses. The e-module product development process involves the help of performance tools such as Canva, which is used to design e-modules, and Microsoft Word, which is used to compile materials. The components of this e-module consist of text, graphics, and tables. The output of this product is to produce textbook products in the form of non-printed teaching materials (pdf). The development of Canva-based e-modules can maintain student learning independence, making this media suitable for learning (Khulaifiyah et al., 2022). Supported by an attractive appearance that attracts student interest (Ahliana et al., 2025; Irkhamni et al., 2021).

In measuring the validity and practicality criteria of this non-print e-module product (pdf), validation and small group trials and individual trials have been carried out involving various parties, with the results achieved so far being that this digital work safety e-module product is a valid and practical product based on the research of a team of experts and students. The material/content expert validator obtained very good/sufficient validation qualification results, while the results of his comments and suggestions were: "fix the video link on page 33 Figure 2.1" (see Figure 1.d). The obtained scores determine the feasibility of the e-module product. Conversely, the digital safety e-modules that researchers have developed are revised based on the data contained in suggestions and comments. The e-module practice test stage is a one-on-one evaluation examination.

The qualified results were highly feasible and straightforward, necessitating no revision. The group consisted of three educational technology students who had developed digital literacy courses with high, medium, and low GPA qualifications. Based on the results of the trials that have been conducted, the e-module product has been achieved, and it is

highly valid (98%), as well as practical (92.5%), according to a variety of theories. Consequently, it is a means to assist in the learning evaluation process, thereby positive influencing students. The results of this digital safety e-module trial align with previous research conducted by Andani et al. (2024) on developing e-modules of respect and obedience to parents and teachers to strengthen students' digital literacy and help the student learning process. The evaluation results show that students' responses to the e-module learning media are very good, with a practicality percentage of 100%. 86.6% and improve learning abilities and affect students' digital literacy, meaning that this e-module can also meet students' needs for learning media that are easy to use in lectures. Then, the results of research conducted by Kurniawan and Kuswandi (2021) on developing e-modules as digital literacy media in 21st-century learning. The study results show that the development of this digital literacy e-module study results in students collaborating with peers and lecturers. In its implementation, this e-module is used as teaching material to support collaborative learning.

Therefore, the researchers developed this digital safety e-module product to address a challenge in the learning process, particularly in the area of learning resources or e-modules. This product enables students to be more engaged and enthusiastic in both independent and collaborative learning, as it displays the material that will be discussed and taught by the course lecturer at each meeting. The realization of a valid and practical e-module assisting the learning process of educational technology students in the digital literacy program. Then the developed e-module has the following advantages: (1) it is easy to operate using PDF applications, (2) there are learning videos that can be accessed through YouTube links as support, (3) it is easy to carry anywhere, and can be studied independently by students. This e-module product's disadvantages are the same as those of s other e-modules, which can only be accessed using digital devices such as mobile phones and laptops/PCs. However, these shortcomings have been resolved because, based on identifying the initial need, all educational technology students in the digital literacy course program already have digital devices. In addition, in developing this e-module product, researchers encountered many obstacles that could finally be overcome, resulting in a non-print-based e-module (pdf) for digital literacy courses that fell into the very valid and very practical category.

CONCLUSIONS

This research concludes that students need digital safety e-modules because respondents still do not understand digital safety material, especially securing student track records in digital spaces, and there is no special teaching material to guide them. Furthermore, the digital safety e-module media design has been. Developed by researchers using the Canva application, which is exported as a PDF file. The results of the development of digital safety e-module media have met the criteria of being a team of experts found it very valid and practical in 3 aspects: content, language, and design, so it is feasible to use in the learning process.

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