Development of the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Using the 4-D Model in the Context of Modern Education

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ABSTRACT

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| This research is motivated by the importance of the Automated Short Essay Scoring (ASES) digital evaluation tool and the formation of honesty character in the context of modern education at the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara. Traditional evaluation tools are still used, which are time-consuming and fail to address the issue of student honesty. This study aims to: (1) develop the ASES digital evaluation tool and form honesty character using the 4-D Model in the context of modern education, and (2) examine the advantages of the ASES digital evaluation tool in forming honesty character in modern education. This Research and Development (R&D) study uses the 4D Model stages: Define, Design, Develop, and Disseminate. The research subjects numbered 121 people. The results at the Define Stage show that the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara, does not yet have a digital evaluation tool, thus necessitating the ASES digital evaluation tool to help students develop honesty character. In the Design Stage, a prototype of the ASES digital evaluation tool was designed. In the Develop stage, the ASES digital evaluation tool was developed and tested for feasibility by evaluation experts, limited trials, and product revisions with an average feasibility of 83.68% (very feasible). Subsequently, revisions were made based on suggestions from questionnaires given to research subjects. In the Disseminate stage, large group trials were conducted, and the ASES digital evaluation tool was deemed effective by the majority of respondents with an average score above 3.5. This indicates that the ASES digital evaluation tool is a solution to the limitations of traditional evaluation tools in supporting modern education at the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara. |

*Keywords:* ASES, Honesty, 4-D Model, Modern Education

1. INTRODUCTION

Modern education is faced with the demand to integrate digital technology into the process up to the learning evaluation stage. The need to integrate digital technology into learning and evaluation processes is due to societal and technological advancements. The development of digital technology has enabled broader and more flexible access to educational resources, learning materials, and evaluation tools from anywhere and at any time. With the advancement of digital technology, digital evaluation tools that provide quick and accurate feedback to students are essential (Shrivastava & Kalra, 2024; Dimla Sumaway Torres Dela Cruz, 2024). Through quick and accurate feedback, digital evaluation enables a more transparent assessment process, encouraging honesty from both lecturers and students (Boud & Molloy, 2017; Ruiperez & Gorospe Jose Miguel, 2024). Digital evaluation can help lecturers conduct remote supervision (Hinon Nilsook & Loetchantharangkun, 2024; Dai, 2024). Digital technology can monitor student activities, thus helping to form honesty character (Henderson, Ryan & Phillips, 2019). The use of digital evaluation tools allows for quicker feedback, promoting self-reflection and honesty in the learning process (Schildkamp et al., 2020; Plekhanov, Henrik & Netland, 2023). The use of digital evaluation tools can reduce lecturer bias, enhance fairness, and honesty in evaluation (Mellar & Kivunja, 2020). Digital records facilitate tracking and verification of evaluation results, promoting accountability, and can serve as a means to educate lecturers on the importance of academic honesty (Kamalakannan, 2024).

Given the many benefits of digital evaluation tools in the current era of digital technology advancement, ideally, the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara, should already have a digital evaluation tool. The problem in the implementation of evaluation so far is that traditional learning evaluation tools are still used, which are often time-consuming, labor-intensive, and lack consistency and objectivity in assessment. Traditional learning evaluation tools have not been able to address the issue of plagiarism. Additionally, academic knowledge and character development are important focuses in modern education. Plagiarism, as a reflection of honesty character, is a crucial moral foundation for forming good character and integrity in student life.

In the context of modern education, digitalization has become an integral part of daily life, making its use in education increasingly important to prepare students with honest character. Modern education does not only prioritize academic results but also the ability to adapt, innovate, and have strong character in facing global challenges. One interesting innovation to address these issues is the development of the Automated Short Essay Scoring (ASES) digital evaluation tool. ASES is an evaluation tool that utilizes technology to automatically assess essays (Susilawati, Lubis, Kesuma & Pratama, 2022; Susilawati & Khaira, 2022). On the other hand, current education increasingly emphasizes the importance of student character development, including honesty character as an integral part of the education process. The ASES digital evaluation tool allows for the use of adaptive digital learning evaluation tools using technologies such as Natural Language Processing (NLP), which have the advantage of assessing student answers objectively and consistently. In this digital technology era, the ASES digital evaluation tool is essential as it helps lecturers provide quicker and more accurate feedback to students and provides a digital record, thus ensuring accountability in student academic honesty assessment (Susilawati, Lubis, Kesuma, Pratama & Khaira, 2022; Susilawati, Lubis, Kesuma, Pratama & Khaira, 2023).

Various studies on ASES have been conducted. The results indicate that the Automated Essay Scoring assessment tool performs excellently in consistently assessing student answers (Malik et al., 2023; Zhu, 2019). Other studies show that the Automated Essay Scoring assessment tool also performs well in providing transparency and validity (Stornaiuolo et al., 2023; Gombert, Giorgashvili, Jivet, Di Mitri, Yau, Frey & Drachsler, 2024). Further studies indicate that the Automated Essay Scoring assessment tool can better capture context and provide more accurate scores compared to previous models (Wang, Wang, Li, Lin, 2022). Studies also show that the Automated Essay Scoring assessment tool has excellent technological accuracy in providing digital assessments (Richter & Jung, 2023; Mizumotoa & Eguchi, 2023).

Understanding the background and previous studies, it is important to conduct research on the development of the ASES digital evaluation tool and the formation of student honesty character. The development of the ASES digital evaluation tool and the formation of student honesty character is carried out using the 4-D Model (Define, Design, Develop, Disseminate). The use of the 4-D Model is expected to make a significant contribution to optimizing the learning evaluation process and developing student honesty character in the dynamic and ever-changing context of modern education. The 4-D Model offers a systematic approach in the development of evaluation tools like ASES and strategies for developing honesty character. Therefore, the research questions proposed are: (1) How to develop the ASES digital evaluation tool and form honesty character using the 4-D Model in the context of modern education? and (2) What are the advantages of the ASES digital evaluation tool in forming honesty character in the context of modern education?

2. material and methods

1. ***Research Design***

This study uses qualitative and quantitative approaches with Research and Development (R&D) (Creswell & Creswell, 2017; Graham & Hofer, 2019). The study uses the 4D model from Thiagarajan, Semmel & Semmel, which includes: Define, Design, Develop, and Disseminate (Thiagarajan & Semmel, 1974). The research design is shown in the following diagram:

A diagram of research process

Description automatically generated

Fig 1. Research Design for Developing the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Effectiveness of Using the 4-D Model in the Context of Modern Education

Research and Development (R&D) research design for developing the ASES evaluation tool and forming honesty character using the 4-D Model in the context of modern education in the above figure are interconnected and support the achievement of the final objectives of this research.

1. ***Research Target/Subject***

The subjects in this study totaled 121 people. These were divided into three groups: (1) 49 lecturers from the Faculty of Teacher Training and Education, selected based on representation from 7 Study Programs; (2) 70 students from the Faculty of Teacher Training and Education, selected based on academic performance rankings; (3) two learning evaluation experts selected based on their disciplinary expertise. The procedure for selecting research subjects is shown in the following figure:

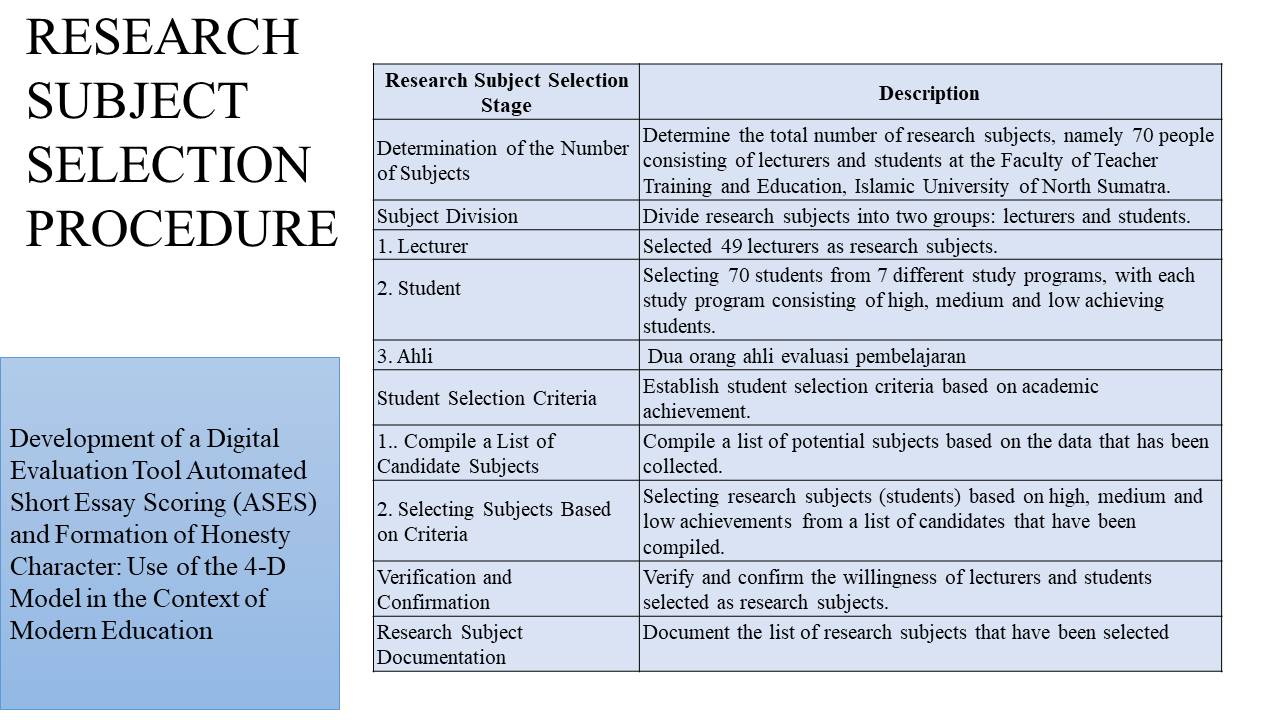


Fig 2. Selection of Research Subjects for Developing the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Effectiveness of Using the 4-D Model in the Context of Modern Education

1. ***Instruments, and Data Collection Techniques***

The instruments and data collection techniques in this study used questionnaires, interviews, and classroom observations related to the use of the ASES digital evaluation tool and student honesty character. The assessment criteria for the research instruments were: (a) < 60% = Poor; (b) 60-69% = Fair; (c) 70-79% = Good; (d) ≥ 80% = Very Good. Data analysis in this study used both quantitative and qualitative data. The research instruments are shown in the following figure:

A close-up of a research report

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Fig 3. Research Instruments for Developing the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Effectiveness of Using the 4-D Model in the Context of Modern Education

3. results and discussion

1. ***Result***

The results of this research were obtained based on findings during the development process of the ASES digital evaluation tool and the formation of honesty character using the Four-D (4-D) model. The research results also focused on describing the steps in the 4-D model and their use in developing the ASES digital evaluation tool and forming honesty character in the context of modern education.

**1.** **Define Stage**

The Define Stage aims to identify and determine the needs in developing the ASES digital evaluation tool and forming honesty character. Based on the needs analysis, it was found that the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara, does not yet have a technology-based digital evaluation tool, making it necessary to develop the ASES digital evaluation tool. The results of the needs analysis regarding the existence and necessity of the ASES digital evaluation tool at the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara, are shown in the following figure:

A screenshot of a computer

Description automatically generated

Figure 4. Define Stage Needs Analysis for Developing the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Effectiveness of Using the 4-D Model in the Context of Modern Education

The above figure presents the needs analysis from the results of interviews, observations, and questionnaires, including findings on the absence of the ASES digital evaluation tool and support for its development. Overall, there is strong potential and support for the development and implementation of the ASES digital evaluation tool at the Faculty of Teacher Training and Education, Universitas Islam Sumatera Utara. The Define Stage of the 4-D Model, related to the analysis of student characteristics, can be seen in the following figure:

A screenshot of a computer

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Figure 5. Define Stage Analysis of Student Characteristics for Developing the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Effectiveness of Using the 4-D Model in the Context of Modern Education

The analysis of student characteristics presented in the above figure, based on the results of interviews, observations, and questionnaires, shows that diverse student characteristics influence how students learn and develop. One important aspect of this research is character formation, particularly the character of honesty. The next stage of research in the Define Stage related to task and concept analysis to be evaluated is shown in the following figure:

A screenshot of a computer

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Figure 6. Define Stage Analysis of Tasks and Concepts for Developing the Automated Short Essay Scoring (ASES) Digital Evaluation Tool and Formation of Honesty Character: Effectiveness of Using the 4-D Model in the Context of Modern Education

The task and concept analysis shown in the above figure indicates that the concept analysis conducted was able to identify key concepts that students and lecturers need to master. Subsequently, important tasks that will be designed for students to master in the development of the digital evaluation tool and formation of honesty character need to be analyzed and well-designed.

**2.** **Design**

A diagram of a course Description automatically generated design of ASES digital evaluation tool prototype. The design of the prototype at the Design stage illustrates the flow that must be followed to produce the ASES digital evaluation tool. The prototype of the ASES digital technology-based assessment tool is seen in the image below:

A diagram of a course

Description automatically generated

Figure 7. ASES Digital Assessment Tool Development Prototype

The prototype of the development of the ASES digital assessment tool in the figure above is described as follows: (1) The development of the ASES digital assessment tool can be seen in the student data load and lecturer data load which is used to be more flexible in the ASES digital assessment model system using *the Google Spread Sheet service.* (2) In the prototype *of this ASES system*, there are 3 processes, namely: (a) *Cosine Similarity,* which uses 2 vectors or 2 texts that have been transformed by calculating the *cosine* value of the angle between two vectors. The vector used in this calculation is a vector representing the existing text; (b) *Text Similarity* aims to convert text into a form that is easy for machines to understand, namely vectors (an arrangement of integer numbers), and ultimately can be done whether the vectors are the same or not; (3) *Bag of Word (BoW)* is one of the text vectorization techniques that builds vectors based on the number of unique words contained in the sentence

**3. Develop**

The Develop stage aims to develop an ASES digital assessment tool based on a design that has been prepared, feasibility tests from evaluation experts, limited trials, and product revisions. This ASES digital assessment tool developed for students and lecturers has been developed according to the prototype that has been designed. The development of the ASES digital evaluation tool for students is seen in the following figure:

A diagram of a software

Description automatically generated

Figure 8. Development of ASES Digital Assessment Tool for Students

The development of the ASES digital assessment tool for students in the image above can be done through the following steps: (1) students access the ASES assessment webpage (2) students can fill in Google From by entering the student's identity and answers; (2) Students send answers and do tonol clicks and send answers. The development of the ASES digital learning tool for lecturers is seen in the following figure:

Several screenshots of a website

Description automatically generated

Figure 9. Development of ASES Digital Assessment Tool for Lecturers

The development of the ASES digital assessment tool for lecturers in the figure above can be done through the following steps: (1) lecturers can access the ASES assessment web page, (2) lecturers can input answers from questions on the answer input page and answers. In this application, you can download from Google Form to make it easier to back up data. Details from Google Form for input of lecturer answers from short essay questions, (3) lecturers can input student answers. Furthermore, this ASES digital learning tool needs to be carried out a feasibility test conducted by a learning evaluation expert. From the validation from the learning evaluation expert, improvements are made and according to the direction of the expert. The results of the feasibility test of the validation of learning evaluation experts are presented in the following figure:

A close-up of a table

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Figure 10. Results of the Feasibility Test of Learning Evaluation Experts for the Development of ASES Digital Assessment Tool to Measure Honesty Character

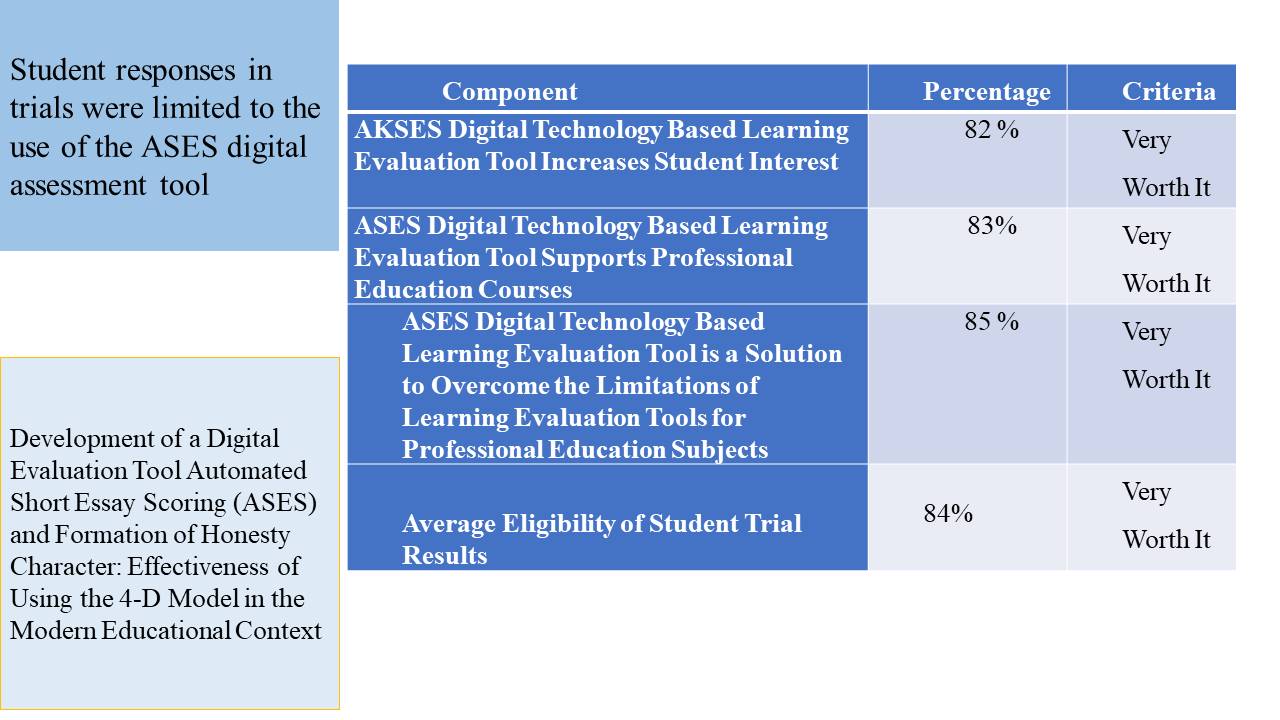


Figure 11. Results of a Limited Trial of Students on the Development of ASES Digital Assessment Tool to Measure Honesty Character

Referring to the figure above, it can be seen that the results of the evaluation expert feasibility test were obtained on average by 83% with the category "very feasible", this can be interpreted that the validation of the evaluation expert on the ASES digital assessment tool has met the eligibility criteria because it obtained a percentage of ≥81%. Furthermore, a limited trial was carried out for student users and lecturers. The results of the trial on 21 students on the use of the ASES digital assessment tool reached 84% with the category "very feasible" which can be seen in the following figure:

Looking at the images of the results of the questionnaire on the results of the student trial, it can be seen that the ASES digital technology-based learning evaluation tool meets the criteria very feasible with a percentage of 85%. Then, the trial of 49 lecturers on the use of ASES digital assessment tools reached 83% with the category of "very feasible" which can be seen in the following figure:

A table with text on it

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Figure 12. Results of Lecturers' Limited Trial on the Development of ASES Digital Assessment Tool to Measure Honesty Character

When averaged based on the feasibility test of evaluation experts, the results of the trial on lecturers and students and the results of the lecturer trial can meet the criteria of very feasible with an average percentage of 83.68%. The average percentage is seen in the following figure:

A table of test results

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Figure 13. Average Results of the Feasibility Test of Learning Evaluation Experts, Results of Limited Trials of Students and Lecturers on the Development of ASES Digital Assessment Tool to Measure Honesty Character

Based on the average results of the material expert feasibility test and limited tests by students and lecturers, the researcher has made appropriate revisions. Furthermore, the ASES digital evaluation tool that is feasible for that, this research is continued at the Dessimate stage.

**4. Dessiminate**

This dessiminate stage aims to conduct a trial in a larger scope on the development of the ASES digital assessment tool. The test in a larger scope on the development of the ASES digital assessment tool was carried out on 10 students each, where there are 7 Study Programs at the Faculty of Teacher Training and Education, Islamic University of North Sumatra. Thus, this trial in a larger scope involves 70 students. The average gain of large group trials is seen in the following figure:

A screenshot of a report

Description automatically generated

Figure 14. Average Dessiminate Stage of Large Group Student Trial Results on the Development of ASES Digital Assessment Tool to Measure Honesty Character

The average calculation for each indicator based on the results of the large group trial In the figure above, it can be seen: (1) access to digital technology based learning evaluation tool increases of students interest related to the character of honesty where a genuine interest in answering subject matter exam questions can encourage students to answer honestly and reflect the academic integrity of students. This can be seen from 20 respondents rated it very good (28.57%), 30 respondents rated it good (42.86%), 10 respondents rated it as sufficient (14.29%), 8 respondents rated it as less (11.43%), and 2 respondents rated it very less (2.86%), then an average of 3.83 was obtained; (2) ASES digital technology based Learning evaluation tool supports professional education courses where 18 respondents rated it very good (25.71%), 32 respondents rated it good (45.71%), 12 respondents rated it as sufficient (17.14%), 6 respondents rated it as poor (8.57%), and 2 respondents rated it very poor (2.86%), then an average of 3.82 was obtained; (3) ASES digital technology based learning evaluation tool is a solution to overcome the limitations of learning evaluation tools where 22 respondents rated it very good (31.43%), 28 respondents rated it as good (40.00%), 10 respondents rated it as sufficient (14.29%), 7 respondents rated it as less (10.00%), and 3 respondents rated it very less (4.29%), then an average of 3.83 was obtained. Based on data and data analysis, the development of the ASES digital assessment tool was considered effective by the majority of respondents with an average score above 3.5 for all three indicators. This shows that the tool is very helpful in increasing students' interest in learning, and is a solution to the limitations of evaluation tools in professional and modern education.

1. ***Disscussion***

**Development of ASES Digital Evaluation Tool and Honesty Character Formation Using 4-D Models in the Context of Modern Education**

The development of the ASES digital evaluation tool and the formation of honesty character in the context of modern education demands an integrated and sustainable approach to support the comprehensive development of students in terms of academic knowledge and moral values. Modern education refers to a learning approach that integrates digital technology, innovative teaching methods, and a focus on 21st-century skills. In the modern education era, the development of ASES digital evaluation tools has an important role in shaping the character of student honesty. ASES' digital evaluation tools provide real-time feedback, and data analysis that allows for greater transparency in the learning evaluation process and outcomes. The development of ASES digital evaluation tools using 4D models, in modern education like today, can create a learning environment that supports the development of honesty and academic integrity. The 4D model provides a framework for designing effective learning, while modern education and digital evaluation toolsASES provides evaluation tools and technology to personalize and improve the learning process. Thus, students are more motivated to engage in learning with character and integrity, which is an important foundation in modern education. Based on the findings of this study, it can be seen that access to ASES digital technology-based learning evaluation tools increases student interest related to the character of honesty where a sincere interest in answering subject matter exam questions can encourage students to answer honestly and reflect the academic integrity of students, obtaining an average score of 3.83 with very feasible criteria. The findings of this study are in line with the opinions of Eaton, Pethrick, & Turner, (2023) who stated that the use of digital technology in learning evaluation has been shown to increase student engagement and interest in learning, including character aspects such as academic honesty. The findings of this study show that the use of ASES digital evaluation tools can increase awareness and practice of academic integrity among students. This ASES digital evaluation tool helps create an environment where students are more aware of the importance of honesty in completing student assignments. The findings of this study also show that the ASES digital evaluation tool has offered significant benefits in increasing student interest and promoting the values of honesty and academic integrity, provided that it is implemented with the right strategies and supported by the professional development of lecturers.

Furthermore, the development of digital evaluation tools such as ASES using 4D Models in modern education can create a dynamic, responsive, and personalized learning ecosystem. This approach not only increases the effectiveness of learning but also encourages the development of skills relevant to professional needs in the digital age. Through structured processes and the right use of technology, professional education can be significantly improved, preparing students to learn with a diversity of talents and not just focus on traditional academic abilities so as to be able to face the challenges of the ever-evolving digital age. The findings of this study show that the ASES digital evaluation tool supports professional education learning on average 3.82 with very feasible criteria. The findings of this study support research that suggests that the education system must encourage talent diversity and overact barriers to learning and traditional assessment tools (Tang, 2023; Garcia, et al, 2021; Isa, 2023). Furthermore, the findings of this study also support research that emphasizes the importance of student-centered education and sustainable student professional development in the modern education system (Vasilyeva, & Sinagatullin, 2023; Strielkowski, 2023; Sandrasegaran, & Norimah @ Ramli. 2024). The findings of this study imply that the development of ASES digital assessment tools that utilize digital platforms to distribute materials and collect adaptive and responsive feedback that is student-centered and sustainable student professional development has helped solve the problem of using traditional assessment tools and shaping them in the Faculty of Teacher Training and Education at the Islamic University of North Sumatra.

The ASES digital evaluation tool, which was developed using the 4D Model, provides a comprehensive and effective solution to the implementation of modern education. With adaptive assessment, ASES' digital evaluation tool ensures that each student is evaluated based on their own abilities, reducing bias and improving assessment accuracy. Real-time feedback in ASES' digital evaluation tool can increase student engagement in the evaluation process. ASES' digital evaluation tool can reduce the chances of cheating through different assessments for each student and automated supervision, encouraging academic honesty and integrity. Furthermore, by combining the systematic approach of the 4D Model, the innovative learning technologies and methods of modern education, and the adaptive and real-time capabilities of ASES, professional education can be significantly improved. This not only increases the effectiveness of learning but also promotes important values such as honesty and academic integrity. The findings of this study can be seen from the results of the study showing that the ASES digital technology-based learning evaluation tool is a solution to overcome the limitations of the learning evaluation tool with an average of 3.83 with very feasible criteria. The findings of this study support the results of the study that technology-based evaluation tools, such as ASES, are able to provide more accurate and personalized assessments by providing real-time feedback that helps students understand and correct their mistakes quickly (Dignum, 2021; Eaton, Pethrick, & Turner, 2023). They also highlight the importance of academic integrity that can be supported by adaptive assessments that reduce the chances of cheating. Technology in learning evaluation can increase student motivation and engagement through interactive and responsive assessments. Tools like ASES allow for fairer and more accurate assessments, adjust difficulty levels based on students' abilities, and provide constructive feedback. Regarding ASES digital technology as a solution to overcome the limitations of learning evaluation tools, the findings of this study support research that states that digital evaluation tools can overcome the limitations of traditional evaluation by providing in-depth and real-time data analysis (Mustafa, Nguyen, & Gao 2024; Peristeras, & Magnisalis, 2023). The findings of this study allow lecturers to adapt their teaching strategies based on student performance data, which ultimately improves learning effectiveness and student outcomes. These research findings are also the latest research innovations, especially in terms of the use of digitalization in the use of learning evaluation tools at the Faculty of Joking and Education, Islamic University of North Sumatra. The development of ASES' digital evaluation tool brings many benefits including increased accuracy, efficiency, and fast and specific feedback. The development of ASES's digital evaluation tool enables more adaptive and interactive assessments, which not only measure student achievement more accurately but also encourage their engagement and motivation in the learning process. By combining 4D models, and digital evaluation tools such as ASES, we can overcome many limitations of various traditional evaluation tools and create a more responsive, fair, and effective education system towards modern education as it is today.

**Advantages of ASES Digital Evaluation Tool and Honesty Character Formation in the Context of Modern Education**

The use of ASES digital evaluation tools in modern education brings many advantages, including efficiency, accuracy, accessibility, and support for environmental sustainability. In addition, the integration of honesty values in the curriculum, the use of technology as a supervisory tool, collaborative learning methods, and the creation of a supportive school culture can shape the character of students who are honest and have integrity. In modern education, it not only produces academically intelligent students but also has a strong moral character. By utilizing the advantages of ASES digital evaluation tools and implementing honesty character building strategies, modern education can produce students who are not only academically intelligent but also have high integrity. Modern education requires learning that is able to overcome the barriers of traditional learning evaluation. The ASES digital evaluation tool, has shown great potential in overcoming the limitations of traditional evaluation methods in the context of modern education (Gros, & García, 2016). The key advantages of ASES include adaptive assessment, real-time feedback, and in-depth data analysis, all of which contribute to a more personalized and effective learning experience (Nguyen, & Nguyen, 2020). ASES' digital assessment tool allows for assessments tailored to students' abilities, providing hands-on feedback that helps students to understand and correct their mistakes quickly. This not only improves assessment accuracy but also encourages student engagement in a more interactive and responsive way (Eaton, Pethrick, & Turner, 2023). In the context of modern education, which is increasingly dependent on digital technology, ASES plays an important role in supporting more flexible and dynamic learning. Modern education emphasizes student-centered learning, where technology is used to create a more inclusive and adaptive learning environment ( Wang, Chen & Hwang, 2022). ASES supports this approach by providing customizable evaluation tools and data analytics that allow lecturers to make decisions providing data-driven assessments. ASES' digital assessment tool contributes significantly to the formation of character, honesty, and academic integrity. By providing adaptive and differentiated assessments for each student, ASES' digital assessment tool reduces the chances of cheating and encourages students to answer honestly. The feedback provided in real-time also ensures that students understand the importance of honesty in their learning process, which ultimately helps in building an honest and responsible character (Barak, 2022; Adiguzel, Kaya, & Cansu, 2023). Overall, the integration of ASES in modern education not only improves the quality and accuracy of assessments but also plays an important role in the development of students' honesty character. This makes ASES an effective solution to overcome the limitations of traditional learning evaluation tools and support more holistic educational goals. The use of ASES digital evaluation tools in modern education brings many advantages, including efficiency, accuracy, accessibility, and support for environmental sustainability. Thus, modern education not only produces academically intelligent students but also has a strong moral character. By utilizing the advantages of ASES digital evaluation tools and implementing honesty character building strategies, modern education can produce students who are not only academically intelligent but also have high integrity.

CONCLUTION

Based on the results of the research that has been carried out, the following conclusions can be given: (1) The development of the ASES digital assessment tool using the 4-D Model at the Faculty of Teacher Training and Education, Islamic University of North Sumatra allows a systematic approach in creating a digital evaluation tool that is not only efficient in assessment, but also effective in shaping the character of honesty. This process blends modern technology with character education values, creating relevant solutions for today's educational context. Successful implementation depends on a balance between technological accuracy and an emphasis on academic integrity; (2) The ASES digital evaluation tool shows significant potential in modernizing the assessment process while strengthening ethical values in the Faculty of Teacher Training and Education, Islamic University of North Sumatra. Its excellence lies in its ability to integrate technological efficiency with character building, creating a learning environment that is not only academically intelligent but also has integrity. In the context of modern education, ASES offers solutions that bridge the need for effective assessment and strong character building.

The development of ASES digital learning tools using the 4-D Model has far-reaching implications that not only change the way assessments are conducted, but also have the potential to change the overall educational landscape. It encompasses pedagogical, technological, ethical, and social aspects, demanding adaptation and innovation from all stakeholders in the education system. ASES in modern education has far-reaching implications that go beyond the technical aspects of assessment. This has the potential to fundamentally change the educational landscape, affecting teaching methods, classroom dynamics, educational policies, and even core values in the learning process. While it promises many benefits, it also brings challenges that need to be addressed with careful care and a well-planned strategy.

Furthermore, this study has the following implications: (1) The development of the ASES digital learning model using the 4-D Model can produce an evaluation tool that is not only effective in assessment, but also plays a role in the formation of honesty character. This holistic approach will ensure that technology not only improves efficiency, but also supports broader educational goals in the modern context; (2) Students can make optimal use of ASES to improve the quality of their learning. This approach will not only help in achieving better academic results, but also develop the character of honesty and skills that are essential for success in the digital age; (3) leaders of the Faculty of Teacher Training and Education, Islamic University of North Sumatra can lead significant digital transformation in the evaluation and character building process. The implementation of ASES that is integrated with Islamic values and local contexts will strengthen the position of the faculty as an innovative and integrity educational institution in facing the challenges of modern education; (4) For other researchers who want to carry out research, they want to develop a comprehensive research project that has a significant impact in the field of digital evaluation and honesty character building. It is important to always consider the ethical and practical implications of research, as well as contribute to the development of more effective and integrity education in the digital age.

References

Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. Contemporary Educational Technology, 15(3), ep429. <https://doi.org/10.30935/cedtech/13152>

Barak, M. (2022). Flexible thinking in learning: An individual differences measure for learning in technology-enhanced environments. Computers & Education, 176, 104355. <http://dx.doi.org/10.1016/j.compedu.2016.04.003>

Boud, D., & Molloy, E. (2017). Feedback in higher and professional education: Understanding it and doing it well. Studies in Higher Education. London: Routledge. <https://doi.org/10.4324/9780203074336>

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. SAGE Publications.

Dai, J. (2024). Applied Mathematics and Nonlinear Sciences, 9(1), 1-21. <https://doi.org/10.2478/amns-2024-0147>

Dignum, V. (2021). The role and challenges of education for responsible AI. London Review of Education, 19(1). <https://doi.org/10.14324/lre.19.1.01>

Dimla, C. Y., Sumaway, M. D., Torres, J. M. T., & Dela Cruz, C. A. B. (2024). The role of artificial intelligence in personalized learning: Enhancing student engagement and academic performance. International Journal of Research Publication and Reviews, 5(5), 8495-8505. <http://www.ijrpr.com/>

Eaton, S. E., Pethrick, H., & Turner, K. L. (2023). Academic integrity and student mental well-being: A rapid review. Canadian Perspectives on Academic Integrity. <https://doi.org/10.11575/cpai.v5i2.73748>

Garcia, R., et al. (2020). 21st century soft skills in student-centered learning among first-year college students: A comparative study. International Journal of Recent Advances in Multidisciplinary Research, 7(10), 6338-6341. [www.ijramr.com](http://www.ijramr.com)

Gombert, S., Fink, A., Giorgashvili, T., Jivet, I., Di Mitri, D., Yau, J., Frey, A., & Drachsler, H. (2024). From the automated assessment of student essay content to highly informative feedback: A case study. International Journal of Artificial Intelligence in Education. <https://doi.org/10.1007/s40593-023-00387-6>

Gros, B., & García-Peñalvo, F. J. (2016). Future trends in the design strategies and technological affordances of e-learning. Computer Science, Education. <https://doi.org/10.1007/978-3-319-17727-4_67-1>

Henderson, M., Ryan, T., & Phillips, M. (2019). The challenges of feedback in higher education. Assessment & Evaluation in Higher Education, 44(8), 1237-1252. <https://doi.org/10.1080/02602938.2019.1599815>

Hinon, P. 1, Nilsook, K. 1, Loetchantharangkun, P., & Witsanu, P. 1. (2024). Competency-based online teaching supervision process for technical and vocational preservice teachers. TEM Journal, 13(2), 1028-1037. <https://doi.org/10.18421/TEM132-17>

Isa, N. K. M. (2023). Student motivation in learning through the use of the 21st-century learning activities. Kuram ve Uygulamada Eğitim Yönetimi Educational Administration: Theory and Practice, 29(2), 222-230. [www.kuey.net](http://www.kuey.net)

Kamalakannan, A. (2024). The role of digital transformation in education and teaching performance: A conceptual view. International Journal of Business and Management Invention (IJBMI), 13(4), 142-145. <https://doi.org/10.35629/8028-1304142145>

Kumar, V., Chawla, M., & Thakur, P. (2020). Automated essay scoring using machine learning algorithms. Journal of Educational Technology Systems, 49(1), 43-57. DOI: 10.1177/0047239520934018

Malik, A. R. (2023). Exploring artificial intelligence in academic essay: Higher education student's perspective. International Journal of Educational Research Open, 5, 100296. <https://doi.org/10.1016/j.ijedro.2023.100296>

Memarian, B., & Doleck, T. (2023). Fairness, accountability, transparency, and ethics (FATE) in artificial intelligence (AI) and higher education: A systematic review. Computers and Education: Artificial Intelligence, 5, 100152. <https://doi.org/10.1016/j.caeai.2023.100152>

Mustafa, F., Nguyen, H. T. M., & Gao, X. (A.). (2024). The challenges and solutions of technology integration in rural schools: A systematic literature review. International Journal of Educational Research, 126, 102380. <https://doi.org/10.1016/j.ijer.2024.102380>

Plekhanov, D., Henrik, F., & Netland, T. H. (2023). Digital transformation: A review and research agenda. European Management Journal, 41(6), 821-844. <https://doi.org/10.1016/j.emj.2022.09.007>

Richter, O. Z., & Jung, I. (2023). Handbook of Open, Distance and Digital Education. <https://doi.org/10.1007/978-981-19-2080-6_59>. <https://doi.org/10.1016/j.rmal.2023.100050>

Ruiperez, B. O., & Gorospe, J. M. C. (2024). Peer assessment to promote self-regulated learning with technology in higher education: Systematic review for improving course design. Front. Educ., 9, 1376505. <https://doi.org/10.3389/feduc.2024.1376505>

Sandrasegaran, K., & Rambeli @ Ramli, N. (2024). Globalization and higher education in Malaysia. International Business Education Journal, 17(2), 1–11. <https://doi.org/10.37134/ibej.Vol17.2.1.2024>

Schildkamp, K. (2020). Formative assessment: A systematic review of critical teacher prerequisites for classroom practice. International Journal of Educational Research, 103, 101602. <https://doi.org/10.1016/j.ijer.2020.101602>

Shrivastava, N. K., & Kalra, K. (2024). The new order of web-based assessment system in higher education: A study of an Indian B-school. Educational Administration: Theory and Practice, 30(5), 2799-2810. <https://doi.org/10.53555/kuey.v30i5.2088>

Strielkowski, W., et al. (2023). Relationship between globalization and internationalization of higher education. E3S Web of Conferences, 301, 03006. <https://doi.org/10.1051/e3sconf/202130103006>

Susilawati, E., Khaira, I. (2022). Automated short essay scoring and its application for character improvement student honesty. International Seminar of Islamic Studies, 3, 1107-1113. <https://jurnal.umsu.ac.id/index.php/insis/article/>

Susilawati, E., Lubis, H., Kesuma, S., & Pratama, I. (2022). Antecedents of student character in higher education: The role of the automated short essay scoring (ASES) digital technology-based assessment model. Eurasian Journal of Educational Research, 98, 203-220. <https://ejer.com.tr/antecedents-of-student-character>.

Susilawati, E., Lubis, H., Kesuma, S., & Pratama, I. (2023). Antecedents of student character in higher education: The role of the automated short essay scoring (ASES) digital technology-based assessment model. Operational Research in Engineering, 6(1), 252-273. <https://oresta.org/menu-script/index.php/oresta/article>.

Susilawati, E., Lubis, H., Kesuma, S., Pratama, K., & Khaira, I. (2022). The mediating role of moral self-regulations between automated essay scoring adoption, students' character and academic integrity among Indonesian higher education sector. Eurasian Journal of Educational Research, 102, 54-71. <https://ejer.com.tr/manuscript/index.php/journal>.

Tang, K. H. D. (2023). Student-centered approach in teaching and learning: What does it really mean? Acta Pedagogia Asiana, 2(2), 72-83. <https://doi.org/10.53623/apga.v2i2.218>

Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). Instructional development for training teachers of exceptional children: A sourcebook. Indiana University, Bloomington, IN: Center for Innovation on Teaching the Handicapped.

Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). Instructional development for training teachers of exceptional children: A sourcebook. Journal of School Psychology, 14(1), 75. <https://doi.org/10.1016/0022-4405(76)90066-2>

Vasilyeva, E. R., & Sinagatullin, I. M. (2023). Influence of globalization on modern education. Advances in Economics, Business and Management Research, 113, 1-12.

Wang, L. H., Chen, B., Hwang, G. J., et al. (2022). Effects of digital game-based STEM education on students’ learning achievement: A meta-analysis. IJ STEM Ed, 9, 26. <https://doi.org/10.1186/s40594-022-00344-0>

Wang, Y., Wang, C., Li, R., & Lin, H. (2022). On the use of Bert for automated essay scoring: Joint learning of multi-scale essay representation. In Proceedings of the 2022 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, 3416–3425. Seattle, United States: Association for Computational Linguistics.

Zhu, W. (2019). A study on the application of automated essay scoring in college English writing based on Pigai. Advances in Social Science, Education and Humanities Research, 336. International Conference on Social Science and Higher Education (ICSSHE 19).