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PAPER

Fostering Lifelong Competency Development: A Digital Authentic Assessment Model for Vocational Internship Programs

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ABSTRACT

This study aims to develop a digital authentic assessment (DAA) model based on competency-based learning (CBL) in the field work practice program at vocational high schools. The background of this study is the need to improve the quality of assessment in vocational education, which often still uses less effective, traditional methods. The urgency of this study lies in the need for assessments that are more relevant to the world of work so that Vocational High school graduates can be better prepared to face challenges in the industry. The methods used in this study include the development of the ADDIE model, validation by experts, and implementation of the assessment model in several vocational high schools, followed by evaluation through surveys and interviews. The evaluation showed that the model successfully increased student engagement and competency achievement, with high average scores in ease of use, material relevance, and assessment quality. The implications of this study suggest that the DAA model can contribute to innovation in vocational education assessment in Indonesia and improve the readiness of vocational high school graduates in the job market, although challenges related to technology access need to be addressed to ensure the sustainability of implementation.

KEYWORDS

digital authentic assessment (DAA), competency-based learning (CBL), internship, vocational education, business and industry

1 INTRODUCTION

Information and communication technology development has brought significant changes in the world of education, especially in the assessment of learning outcomes. Authentic assessment is becoming increasingly crucial in competency-based education, especially in vocational high schools research shows that authentic assessment models can increase student motivation and engagement in the

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learning process [1], [2]. This aligns with the need to prepare students to have skills relevant to the demands of the world of work, where competency-based assessment assesses theoretical knowledge and practical skills required in fieldwork practices [3], [4].

In recent years, the focus on implementing competency-based learning (CBL) models in vocational high schools has increased. The implementation of this method aims to produce graduates who are competent in academics and ready to contribute to the industrial world [5], [6]. However, challenges remain in developing assessment instruments that reflect students' abilities thoroughly. Improper assessment can result in inaccuracies in grading the competencies achieved by students [7], [8]. Therefore, it is essential to develop a more appropriate and relevant assessment model that focuses on the theoretical aspects and the practical application in the field.

Although many studies address authentic assessment, there is a lack of effective implementation of digital models. Research shows an urgent need to integrate technology in authentic assessment in vocational schools [9]. The main problem with assessment in vocational schools is the inaccuracy in measuring students' competencies [10], [11]. As a solution, a competency-based approach integrated with digital technology can be an effective alternative. This model allows for more flexible and accessible assessment for students and provides faster and more accurate feedback [12], [13]. Previous research [14], [15] shows that the use of digital platforms in assessment can increase transparency and fairness in the evaluation process. Integrating technology in assessment can also help students better understand the skills being evaluated and increase their engagement in the learning process.

In recent years, the use of digital technologies in educational assessment has shown significant potential to improve the effectiveness and efficiency of the evaluation process [16], [17]. Research shows that digital platforms enable more transparent and fair assessment and provide faster feedback to students, which in turn can increase their motivation and engagement in the learning process, as stated by Mustapha et al. [21] and Cahyani et al. [18]. Several recent studies [19], [20] have suggested that using mobile-based applications in assessment allows students to better understand the skills being evaluated so that they are better prepared to face challenges in the world of work.

2 LITERATURE REVIEW

2.1 Authentic assessment

Authentic assessment is an evaluation method that reflects real-world tasks and challenges, allowing students to demonstrate their knowledge and skills in a practical context. This approach differs from traditional assessments that rely on standardized tests and memorization. Authentic assessment is designed to be more meaningful and relevant to students, especially in vocational education [21]. By encouraging critical thinking, problem-solving, and application of knowledge in real-life scenarios, authentic assessment becomes an effective tool to assess a student's readiness to enter the workforce.

In vocational education, authentic assessment is significant because it aligns with the competencies needed in various industries. By engaging students in tasks

that resemble actual work situations, educators can better prepare them for the demands of future professions. Moreover, these assessments increase student engagement and provide educators with a clearer picture of students' abilities and readiness to enter the workforce [22]. One example of authentic assessment is task-based projects, where students are expected to complete tasks that require them to apply the skills and knowledge they have learned. This helps students understand the material more deeply and increases their confidence in their ability to succeed in a professional environment [23]. Assessment based on this real-world context also allows students to get constructive feedback, which is crucial for continuous improvement.

However, the implementation of authentic assessment also faces challenges, such as the need for adequate teacher training and the development of appropriate assessment tools. Educators must have the necessary skills and knowledge to design and conduct practical assessments [24]. Authentic assessment can be an invaluable tool in vocational education if it is supported properly. Overall, authentic assessment provides a more realistic and relevant approach to evaluation in vocational education, allowing students to demonstrate their abilities in a more applicable context [25]. Through this assessment, students are not only assessed based on the result but also on the learning process they underwent.

2.2 Competency-based learning

Competency-based learning is an educational approach focusing on fulfilling specific skills and competencies necessary for students' professional success. This model emphasizes skill mastery compared to traditional time-based education, allowing students to continue learning at their own pace once they have demonstrated understanding and application of the material [26].

Competency-based learning is particularly effective in vocational high schools as it aligns educational outcomes with industry standards and expectations. This approach ensures that students have relevant skills employers seek, thus increasing their competitiveness in the job market [27], [28]. By implementing CBL in the curriculum, students can engage in practical activities and assessments that reflect their future job roles [29]. This learning model also supports personalized learning experiences, where students can develop their abilities through hands-on practice and projects. This creates a more dynamic and interactive learning environment, encouraging students to engage in the learning process actively. Thus, CBL prioritizes the content, how students interact with the material, and how they apply it in an authentic context.

However, the implementation of CBL also faces several challenges, including the need to design a flexible and adaptive curriculum that can meet the various needs of students. Educators must also be equipped with adequate training and resources to implement this model effectively [30]. With the proper support, CBL can provide more meaningful and relevant learning experiences for students. Overall, the CBL model offers a more practical approach to vocational education, ensuring that students not only know but are also able to apply the skills they learn in a real-world context [31]. Through the integration of authentic assessment and CBL, students can be better prepared for the challenges and demands they will face in the world of work.

3 METHOD

This study adopts the ADDIE development method, which stands for Analysis, Design, Development, Implementation, and Evaluation. This method was chosen because it provides a systematic framework for developing educational products, particularly in the context of the CBL-based digital authentic assessment (DAA) model for field work practice programs in vocational high schools. Each stage in the ADDIE method is essential in ensuring the developed model is practical and relevant [32], [33].

The first stage, Analysis, is a crucial first step in the development process. At this stage, the needs and problems that exist in the practice of assessment in vocational high schools are identified. Activities include data collection through teacher interviews, direct observation in the classroom, and surveys to students to understand the ongoing assessment conditions. In addition, a gap analysis was conducted to identify differences between current assessment practices and students' expected competencies, which helped determine the focus of the assessment model development. Goal setting also sets specific objectives, such as improving assessment accuracy and student engagement.

Once the analysis stage is complete, the next stage is Design. At this stage, the framework for the assessment model is designed by considering the results of the previous analysis. The activities include developing the concept of the model, where the structure and components of the DAA model are designed, including assessment criteria, rubrics, and implementation guidelines. Prototyping was also conducted to create an initial prototype of the digital application to be used in the assessment process, designed to accommodate user needs and facilitate the assessment process.

The third stage is development, which involves creating and refining the assessment model based on the design that has been developed. Activities in this stage include creating a digital assessment model that provides for all the components that have been designed previously. Model validation is carried out by inviting experts and practitioners to provide input on the design that has been made to ensure the relevance and applicability of the model. Prototype trials were conducted to identify technical issues and application functionality, and these trials were conducted on a small scale to obtain user feedback. Based on the pilot test results, revisions and refinements were made to improve the quality and effectiveness of the model.

After the model was developed and refined, implementation stage was conducted to apply the assessment model in a real educational context. Activities include user training, where teachers and students are given training on using the DAA model and related applications. The implementation of the assessment model was carried out in the field work practice program in several vocational high schools, where data collection was conducted to evaluate the model's effectiveness during the implementation. Monitoring and support are also undertaken during the implementation process to provide technical and pedagogical support to users.

The last stage is evaluation, which aims to assess the effectiveness of the implemented model. Activities in this stage include collecting evaluation data from various sources, including feedback from students and teachers and student competency assessment results. The results are analyzed to determine whether the assessment model has achieved the objectives set at the analysis stage. Based on the evaluation results, recommendations for improvement are provided for future assessment models and processes.

4 RESULTS AND DISCUSSION

4.1 Results

Analysis stages. At the analysis stage, this study successfully identified various needs and problems in assessment practices in vocational high schools. Through interviews with 20 teachers and a survey of 150 students, it was found that most teachers (75%) found it difficult to assess students' practical skills using traditional assessment methods accurately. Students also revealed that they felt they lacked constructive feedback on the skills they had learned. In addition, the gap analysis showed a significant difference between expected and achieved competencies; only 60% of students could meet the competency standards set by the curriculum. This suggests that existing assessment methods are not effective enough to accurately picture students' abilities.

To improve the effectiveness of student competency assessment in vocational high schools, this study identified various needs and challenges faced in current assessment practices. Through a survey involving students, teachers, and industry practitioners, data was obtained indicating difficulties in assessing practical skills, inadequate quality of feedback, and the need to adapt learning materials to the demands of the labor market. Table 1 shows the results of a survey of students, teachers, and industry practitioners regarding the need to develop a DAA model based on CBL in the field work practice program at vocational high schools.

Table 1. Results of the DAA model development needs survey

No	Assessed Aspect	Students (%)	Teachers (%)	Practitioners (%)	Recommendation
1	Difficulty in Assessment	70	75	60	The majority of respondents find it challenging to assess practical skills.
2	Quality of Feedback	65	80	70	Respondents desire more constructive and specific feedback.
3	Engagement in Learning	85	70	75	Students feel more engaged when technology is used in assessments.
4	Relevance to Market Needs	50	65	85	Industry practitioners emphasize the importance of skills
5	Expectations for Digital Model	80	90	75	Respondents hope that the digital assessment model can enhance assessment effectiveness.
6	Training in Technology Use	55	65	70	Teachers and practitioners feel the need for further training in technology use.
7	Access to Technology	60	50	65	Access to technology poses a challenge for students and teachers.
8	Relevance of Learning Materials	75	80	90	All parties agree that learning materials must be relevant to industry needs.

Based on Table 1, the survey results presented earlier provide a comprehensive picture of the perceptions and expectations of various parties regarding developing the DAA model. From the data obtained, it appears that most respondents, both students and teachers, want an increase in the quality of assessment that is more accurate and constructive, as well as greater involvement in the learning process through the use of technology. Several recommendations need to be considered in developing a DAA model for vocational students' field work practice activities. First, it

is essential to develop an assessment model that does not only focus on the result but also provides continuous feedback throughout the learning process. Second, teachers' training on the use of technology in assessment needs to be improved to ensure that they can implement this model effectively. Third, collaboration with industry should be strengthened to ensure that the competencies taught in vocational high schools are relevant to the needs of the labor market so that graduates can be better prepared to face challenges in the world of work.

Design stages. In the concept development stage of the model, the structure and components of DAA were designed with the main focus on clear and measurable assessment criteria. The assessment rubric is structured to cover various aspects of practical skills that students must master so that it can provide constructive and specific feedback to help students understand the areas that need improvement. In addition, guidelines for implementing the assessment are also developed to ensure that all parties involved, including teachers and students, have the same understanding of the assessment process to be carried out. This assessment component becomes an integral part of internship learning process, where the assessment will measure learners' mastery of competencies in three main aspects: attitude, knowledge, and skills. This assessment serves as feedback for the world of work and schools to improve the learning process and as a consideration for teachers in making decisions regarding students at the end of the study period, including the need for remedial or enrichment material.

The assessment carried out by internship instructors and supervising teachers is comprehensive, aiming to obtain thorough information about the development of students in the aspects of attitude, knowledge, and skills. Therefore, internship supervisors in schools and instructors in the world of work require different assessment instruments to measure various aspects of development. This planned assessment is prepared as a reference for educators and education units to measure the overall achievement of education and learning objectives. According to the education assessment standards, assessment must ensure planning in accordance with the competencies to be achieved, professional and educative implementation, and objective and accountable reporting of results. Assessment must also reflect the social context of learners, not just assessing the school. Assessment results, both in numerical and verbal data, must be reported objectively and accountably, providing accurate information for learners and parents.

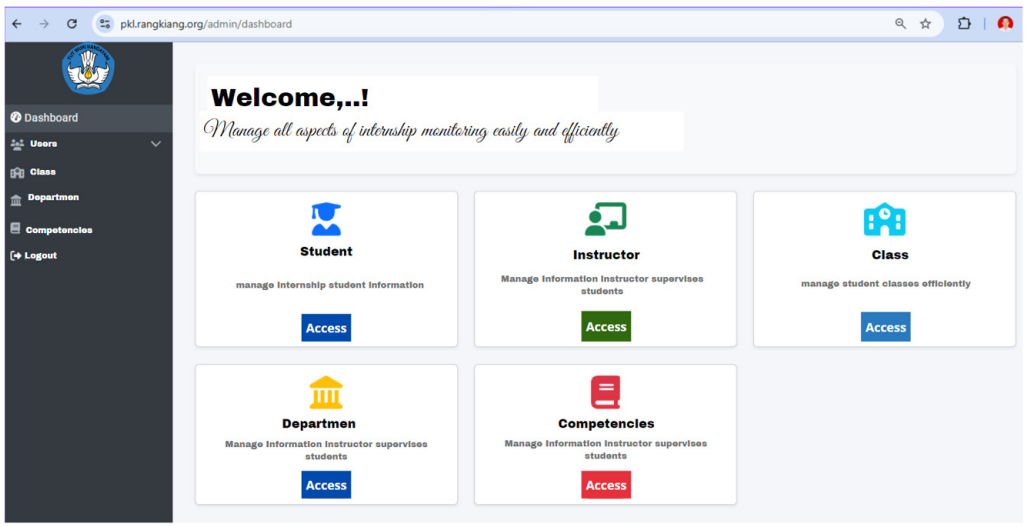

Fig. 1. Digital authentic assessment website prototype

Once the conceptual model was developed, the next step was to create an initial prototype of the digital application for assessment. As shown in Figure 1, the prototype was designed with user needs in mind, including ease of access and use. Features in the app include real-time assessment data collection, feedback storage, and the ability to integrate assessment results with the existing curriculum. With this prototype, it is expected that the assessment process can be carried out more efficiently and effectively and provide a better experience for students participating in fieldwork practice.

Development stage. The development stage is a crucial step in creating a DAA model for vocational students' fieldwork practice. At this stage, the assessment model that has been designed in the previous design stage begins to be created and refined. The following are details of the activities carried out in the development stage:

4.2 Model validation

After the initial model is created, the next stage is model validation. At this stage, experts and practitioners with experience in vocational education were invited to provide input. They evaluate the assessment model's design to ensure that it is not only theoretical but also applicable and relevant to the current needs of the industry and the world of work. The input from these experts is significant to ensure that the assessment model can function well in natural conditions.

Table 2. Results of KMO and Bartlett's test variable eligibility analysis

Measure	Value
Kaiser-Meyer-Olkin (KMO)	0.785
Bartlett's Test of Sphericity	
– Approx. Chi-Square	52.347
– Degrees of Freedom (Df)	21
– Significance (Sig.)	0.000

The analysis results in Table 2 show that the Kaiser-Meyer-Olkin (KMO) value of 0.785 indicates that the data is very suitable for factor analysis. This value indicates a reasonably strong correlation pattern between variables, which means that the variables have a good relationship to form relevant factors Coyne et al. (2021). In addition, Bartlett's Test of Sphericity results showed a chi-square value of 52,347 with a significance of 0.000. The very low significance ($p < 0.001$) provides enough evidence to reject the null hypothesis, which states that the variables in the model are not correlated. This finding supports that the data used has sufficient structure for factor analysis. With these results, it can be concluded that the assessment model developed has a strong and reliable basis for further analysis. This ensures that the model can function well in the context of vocational education, positively contributing to the development of students' competencies in facing challenges in the world of work.

4.3 Factorization process of assessment model

In today's digital era, authentic assessment models are becoming increasingly important, especially in the context of vocational education. Factoring, or factor

analysis, is a statistical technique used to identify unobserved variables that can explain correlation patterns between observed variables. In the context of digital assessment, this process helps develop more effective and efficient evaluation tools that can measure student competencies more accurately.

Table 3. Total explained variance for the digital assessment model

Variable	Initial	Extraction
Technical Proficiency	1.000	0.875
Critical Thinking Skills	1.000	0.820
Collaboration Skills	1.000	0.910
Communication Skills	1.000	0.670
Knowledge Application	1.000	0.845

From the commonalities in Table 3, we can see that 'Collaboration Skills' has the highest extraction value (0.910), indicating that 91% of the variation in collaboration skills can be explained by the factor formed. This indicates that collaboration skills are an essential component in the assessment model and significantly contribute to the underlying factor. In contrast, 'Communication Skills' has the lowest extraction value (0.670), indicating that only 67% of the variation in communication skills can be explained by the factor. This suggests that other factors affecting communication skills may not be captured in the current factor model.

The factoring process in this digital assessment model shows that while some skills, such as collaboration and application of knowledge, are well explained by the factors formed, there is room for improvement in the model, especially in integrating factors that might affect communication skills. These results provide valuable insights for further developing authentic digital assessment models, ensuring that they are relevant and practical in holistically measuring students' competencies.

4.4 Total variance explained in the digital authentic assessment model

Total variance explained is an essential metric in factor analysis that describes how much variability in a dataset can be explained by the extracted factors. It provides insight into the effectiveness of the model in capturing important information from the observed data. In the context of digital assessment models, it helps determine the number of factors that should be considered to get an accurate representation of the data.

Table 4. Total variance explained untuk model asesmen digital

Factor	Initial Eigenvalues	Total	Variance (%)	Cumulative (%)
1	3.456	3.456	45.2	45.2
2	1.678	1.678	22.1	67.3
3	1.032	1.032	13.5	80.8
4	0.895	0.895	11.7	92.5
5	0.456	0.456	7.5	100.0

Based on Table 4, total variance explained, it can be seen that the first factor has a very high eigenvalue (3.456) and explains 45.2% of the total variance in the dataset. This indicates that this first factor is significant and represents most of the information in the dataset. The second and third factors explain 22.1% and 13.5% of the variance, respectively, which shows that they also have significant contributions to the model. Cumulatively, the first three factors explain 80.8% of the total variance, which is quite a high proportion, indicating that most of the critical information in the data is explained by these three factors. The fourth and fifth factors add 11.7% and 7.5% to the total explained variance, which brings the cumulative total to 100%. Although these factors make smaller contributions, they are still crucial for understanding the finer aspects of the dataset.

The total variance explained shows that the factor model used in this assessment effectively captures the relevant variability of the dataset. This result indicates that the developed assessment model robustly represents the skills and competencies analyzed. This information is essential for validating the digital assessment model used and offers insights for further refinement in optimizing the evaluation tool for vocational education needs.

Implementation stages. The validated prototype of the assessment model was then piloted. This trial is conducted on a small scale with a small user group, usually students and teachers. The purpose of the pilot test is to identify technical issues, evaluate the application's functionality, and get users' direct feedback. This feedback is crucial for further improvements and adjustments to the assessment model. Based on the results of the prototype trial and the feedback received from users and experts, revisions and modifications were made to the assessment model.

Overall, the implementation stage is crucial to ensure that the digital assessment model that has been developed not only functions theoretically but can also be applied practically and effectively in improving the quality of vocational education in vocational high schools. Through training, proper implementation, and continuous support, it is expected that this assessment model can have a positive impact on the learning process and student competency development. The following is a table of the results of the practicality test of the digital assessment model conducted on students, teachers, and practitioners of industry.

Table 5. Results of the practicality test

User Group	Assessed Aspect	Average	Criteria
Students	Ease of Use	4.5	Very Practical
	Relevance of Material	4.6	Very Practical
	Student Engagement	4.4	Very Practical
Teachers	Ease of Use	4.3	Practical
	Alignment with Curriculum	4.5	Very Practical
	Effectiveness in Teaching	4.2	Practical
Practitioners	Alignment with Industry Needs	4.7	Very Practical
	Quality of Assessment	4.6	Very Practical
	Implementation in the Field	4.5	Very Practical

The results of the practicality test of the digital assessment model showed that students, teachers, and practitioners received it well from industry. Table 5 of the practicality test results shows high average scores across all user groups, with most aspects rated as "very practical." The average scores for ease of use (4.5), material relevance (4.6), and student engagement (4.4) indicate that students feel comfortable and engaged in the learning process using this assessment model. The high score on material relevance indicates that the content matches students' needs and interests, which is essential to increase learning motivation.

Overall, the results of the practicality test show that the developed digital assessment model has a high level of acceptance among students, teachers, and DUDI practitioners. High average scores in all aspects signify that the model is theoretical, practical, and relevant to be applied in the context of vocational education. Feedback from users provides a solid basis for continuing the implementation of this model, noting that some areas can still be improved, especially in terms of teaching effectiveness from the teachers' perspective. Thus, this assessment model has the potential to improve the quality of vocational education and better prepare students to enter the world of work.

Evaluation stages. Evaluation is a crucial stage in the development of the DAA model for internship programs in vocational high schools. The evaluation process aims to assess the effectiveness, relevance, and sustainability of the assessment model that has been developed, as well as to ensure that the model can meet the needs of vocational education and industry. The main objective of this evaluation is to identify the extent to which the DAA model can improve the quality of learning and student competency outcomes during the internship. The review also aims to measure the impact of the assessment model on students' practical skills and obtain feedback from various stakeholders, including students, teachers, and industry practitioners. Thus, this evaluation focuses on the final results and the process students go through during the internship.

The evaluation methodology in developing the DAA model for fieldwork practice in vocational high schools includes several comprehensive and systematic approaches. First, surveys and questionnaires were used as the main tools to collect data from students and teachers regarding their experiences in using the assessment model. The questionnaire was designed to evaluate various aspects, including ease of use, relevance of materials, and the impact of the model on the learning process. The questions in the questionnaire were carefully formulated to ensure that the data obtained could provide a clear picture of the effectiveness of the DAA model.

Furthermore, interviews were conducted with practitioners from the world of business and industry to get their perspectives on the suitability of the assessment model to industry needs. This interview is essential to ensure that the model developed is relevant in the context of education and meets the standards expected by the world of work. Through interviews, practitioners can provide in-depth feedback on how the DAA model can be applied in real situations in the field and suggestions for further improvement. The following Table 6 represents the evaluation results related to the application of the DAA model for fieldwork practice in vocational high schools. This table includes the various aspects assessed, the average score, and a description of the effectiveness of the assessment model.

The results of this evaluation show that the DAA model has a significant positive impact on the learning process and student competency outcomes during fieldwork practice. With high average scores in various aspects, this model is not only

relevant in the educational context but also meets the needs of the industrial world, so it can be relied upon to improve the quality of vocational education in vocational high schools.

Table 6. Evaluation results of the digital authentic assessment model for internships

Assessed Aspect	Average Score	Description
Ease of Use	4.5	Very Satisfactory
Relevance of Material	4.6	Very Satisfactory
Impact on Learning	4.4	Satisfactory
Student Engagement	4.5	Very Satisfactory
Alignment with Curriculum	4.3	Satisfactory
Quality of Assessment	4.7	Very Satisfactory
Alignment with Industry Needs	4.6	Very Satisfactory
Feedback from Industry Practitioners	4.5	Satisfactory

5 DISCUSSION

The development of the DAA model based on CBL in internship program at vocational high schools is an innovative step that aims to improve the effectiveness of learning and the relevance of competencies possessed by students. The DAA model is designed to provide a more holistic assessment of the practical skills required in the industrial world so that students are assessed based on theory and their ability to apply that knowledge in the field.

The importance of authentic assessment in vocational education cannot be underestimated. Authentic assessment allows students to demonstrate their skills and knowledge in an accurate and relevant context. Several studies have shown that students who engage in authentic evaluations tend to be more motivated and actively participate in the learning process Russell et al. [1], Baharom et al., [6]. Thus, applying the DAA model can increase student engagement during internship.

The DAA model based on CBL significantly enhances vocational education by integrating digital technology and authentic assessment approaches [19]. This model not only measures learning outcomes but also improves the learning process through real-time monitoring, practical skill evaluation, and faster feedback. Unlike traditional assessments, the DAA model emphasizes real-world challenges during internships, aligning students' skills with industry needs. Collaboration among students, teachers, and industry practitioners ensures relevance, fostering a more inclusive learning environment. Despite challenges such as unequal access to technology, stakeholder support and policy backing are crucial for the model's sustainable implementation and effectiveness.

Research highlights that technology integration in assessment increases efficiency, engagement, and accuracy in measuring competencies. The DAA model motivates students to actively participate in learning and take responsibility for their outcomes, addressing shortcomings of traditional methods. By aligning vocational education with global technological and industrial demands, this model offers a transformative approach, setting a new standard for vocational education assessment in Indonesia and beyond.

6 CONCLUSION

The development of the DAA model based on CBL in the context of the field work practice program at vocational high has made an essential contribution to the evolution of vocational education in Indonesia. This model has successfully integrated digital technology into the assessment process, which not only improves the efficiency and effectiveness of evaluation but also enables the provision of quick and accurate feedback. This is vital as it allows students to understand and improve their skills on an ongoing basis, thereby substantially improving the quality of their learning.

However, implementing the DAA model has also encountered some challenges, particularly related to access to technology. Therefore, collaborative efforts are needed to provide adequate facilities and effective training for students and teachers so that all students can make the most of this model. This requires commitment and policy support from all stakeholders, including government, schools, and industry, for investment in educational technology and infrastructure development.

The sustainability of the DAA model in vocational education largely depends on the ongoing commitment of all stakeholders. Policy supports in favor of technology integration in vocational education will ensure widespread and sustainable implementation of this model across vocational high schools in Indonesia. Overall, the DAA model based on CBL in the field practice program at vocational high schools has brought significant innovation and has important implications for improving the quality of vocational education. Through the focus on practical skills, utilization of technology, and support from various stakeholders, this model not only improves the quality of education but also ensures that Vocational High school graduates are ready to contribute effectively in an increasingly competitive and dynamic job market.

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