Technology-Embedded Local Wisdom as a Digital Rubric for Reflective Mathematics Assessment in Vocational Education

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Abstract

Vocational training gives students the hands-on skills and thinking abilities they need to enter the job market. In math, reflective thinking is essential for keeping up with changing workplaces. Still, people have not yet fully developed assessment tools that combine local cultural elements with digital technology. The purpose of this study was to develop and validate a Digital Reflective Mathematics Assessment Rubric (DRMAR) that integrated technology-embedded local wisdom for students of vocational education. This study uses a Research and Development (R&D) design based on the ADDIE model involving 156 vocational school students in Indonesia. Systematic needs analysis, design, expert validation, and field testing developed the rubric. Seven experts (in mathematics education, vocational education, and assessment) conducted the validation and used inter-rater agreement to assess the reliability. The results of the validity analysis based on Aiken's V coefficient obtained a score of 0.82 to 0.94 for all criteria in the rubric, so the results of the validity analysis are very valid. The analysis showed excellent inter-rater reliability (ICC = 0.87, $p < 0.001$). The field test results showed that 89.6% of students improved their reflective thinking skills, as assessed against the rubric criteria. 78.2% of students reached the "reflective practitioner" level on several assessment sessions. The DRMAR provides a valid and reliable measure of mathematical reflective thinking through technology-enhanced, culturally grounded tasks. This study offers a new integration of local wisdom in the form of digital rubric technology to fill the gaps in reflective assessment in vocational mathematics education.

1. Introduction

Vocational education is undergoing a major shift in response to the dual pressures of workforce readiness and cultural identity preservation in an increasingly globalised world (Ferm, 2021). Vocational high schools in Indonesia are expected to produce graduates with technical competencies and higher-order thinking skills to adapt to dynamic, uncertain work environments (Sugiharni & Amir, 2025). The International Labour Organisation (ILO) has identified analytical skills, creativity, problem-solving, and communication as essential soft skills for the modern workforce, skills that depend on reflective and metacognitive thinking (Daud Mahande, Asma Darmawan, & Daud Malago, 2022). Mathematics education is an important vehicle for the development of these reflective capacities, since mathematical problem-solving requires learners to plan, monitor, evaluate, and revise their cognitive strategies (Sumandya, Candiasa, Suharta, & Sugiarta, 2021).

However, traditional mathematics instruction in vocational schools has been characterised by theoretical, decontextualised instruction, failing to connect abstract mathematical concepts with students' authentic experiences or the demands of their prospective trade (K. Y. A. Putra, 2025). This disconnect is particularly problematic in assessment practices where traditional testing formats tend to focus on low-level cognitive recall rather than the reflective, integrative, and applied mathematical thinking required in vocational settings (Daud Mahande et al., 2022). There is an urgent need for a culturally appropriate, technologically responsive assessment capable of capturing the quality of students' reflective engagement with mathematics as experienced in vocational contexts (Peñate, Padrón-Robaina, & Nieves, 2024; K. Y. A. Putra, 2025; Tan, Lin, & Zhuang, 2024).

Ethnomathematics is the application of mathematics within local culture, enabling students to connect abstract mathematical concepts with their surroundings, which are familiar to them. This leads to cultural insight, students' critical thinking and greater involvement (Aras et al., 2025; Arion, 2024; Dhema et al., 2025; Putra et al., 2024). This cultural approach is especially applicable to vocational education, where students are more inclined to work on concrete and pragmatic problems rather than abstract exercises from books (Candiasa

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et al., 2019; Dhema et al., 2025). For example, students in vocational schools can create mathematical models of cultural objects like *walasuji* (Bugis) or *noken* (Papuan). However, they need particular instructional support to develop full mathematical communication (Aras et al., 2025). Tasks based on ethnomathematics can be evaluated. But the reflective dimensions of students' problem-solving are seldom included in assessment frameworks.

Mathematical reflective thinking is an active review of problems, monitoring the process of problem solving, and changing strategies to improve problem solving and self-regulated learning (Aldahmash et al., 2021; Kuncoro et al., 2025). However, traditional assessment tools only assess outputs, not reflective processes (Fereidani & Üçtuğ, 2024). Rubrics with observable criteria (Campbell & Padayachee, 2024) and digital tools such as video-enhanced rubrics (VERs) with real-time, formative feedback (Ackermans et al., 2021) can bridge this gap. Metacognitive rubrics have been created for vocational blended learning (Mahande et al., 2021; Daud Mahande et al., 2022), but no digital rubric has integrated reflective thinking, mathematics, local wisdom and vocational education. Thus, this study develops the Digital Reflective Mathematics Assessment Rubric (DRMAR) based on three pillars, namely ethnomathematics, reflective thinking theory, and digital rubric features, with four measurable dimensions of reflective mathematical practice.

This work is motivated by three related problems. First, the use of local wisdom in math education through ethnomathematics appears promising, but there has been no systematic effort by experts to put it into practice. Dhema et al. (2025) found that ethnomathematics helps vocational students better understand Math while connecting with their own culture. However, there is a clear gap in well-established frameworks for evaluating student learning in these culturally grounded settings. Most research to date has focused on instructional design rather than on the testing or validation of assessment tools. Second, reflective thinking has been identified as an important cognitive process in mathematics education, serving not only as a tool for error correction but also as a means for promoting deeper conceptual understanding and self-regulation (Martinovic & Danesi, 2025). However, the current reflective assessment instruments, such as the Magdeburg Reflective Writing Scoring Rubric (MaReS), are mainly designed for health professions education and writing reflection tasks (Ramspott et al., 2025). Although they are robust, these tools do not capture the mathematical reflective thinking that takes place when students solve problems embedded in vocational contexts, nor do they include multimodal, technology-enhanced evidence of student performance. Third, digital technologies provide new possibilities for innovative assessment design. Rubrics are important tools for objective evaluation, which enhance self-directed and reflective learning (Arion, 2024; Campbell & Padayachee, 2024; Julia, Asriati, & Fikri, 2025; Rohaeni, Renikasari, Jubaedah, & Yusuf, 2024; Sutrisno et al., 2025; Xu et al., 2025). The incorporation of digital affordances such as video-enhanced rubrics (VERs) can facilitate the assessment of complex skills by providing contextual and dynamic information (Paeßens, Ma, & Winther, 2023). However, the intersection of digital rubric technology, integration of local wisdom and reflective mathematics assessment has not been explored in the vocational education literature (Acar, 2023; Ma, Ng, Liu, & Wong, 2025; Purbaningrum & Arliani, 2025; Singh, Singh, & Mishra, 2024; Wiese, Patil, Schiff, & Magana, 2025).

The following research objectives guided this study, which filled these gaps. To develop a Digital Reflective Mathematics Assessment Rubric (DRMAR) that includes technology-enriched local wisdom tasks for vocational education students; To validate the content validity of the DRMAR by expert judgment; and to test the inter-rater reliability and practical applicability of the rubric in authentic vocational classroom settings. This study adds to the literature in three important ways. First, it connects ethnomathematics research to assessment practice, providing a validated rubric specifically designed to assess (not just design) culturally grounded mathematics learning. Second, it contributes to the reflective assessment literature in the context of vocational mathematics, addressing the need for both contextualised and decontextualised assessments that capture the authentic problem-solving demands of technical trades. Third, it shows how educators can use digital rubric technology to improve the formative assessment of reflective thinking, thereby providing a scalable model for technology-enhanced assessment in resource-constrained educational settings.

2. Method

2.1. Study Design

This study used a Research and Development (R&D) approach that uses the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). ADDIE is a step-by-step process that repeats itself in the development of instructional materials. It is a good fit for developing assessment tools that are known to be valid and reliable.

2.2. Participants

The field-testing phase involved 156 Grade XI students from six vocational programmes (Culinary Arts: 28, Food and Beverage Service: 26, Hotel Accommodation: 27, Patisserie: 25, Front Office: 25, and Tourism: 25) at three vocational high schools in Gianyar, Bali, Indonesia. Moreover, seven experts conducted the content validation, including two specialists in mathematics education, two in vocational education, and three in

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assessment and technology. The participating schools were selected purposively based on three criteria: (a) implementation of Merdeka Curriculum, (b) adequate technology infrastructure for digital assessment, and (c) willingness to integrate local wisdom (Balinese cultural practices) in mathematics learning. All three schools are accredited 'B' and have a history of involvement in technology enhanced learning initiatives.

2.3. Target Population and Sampling Techniques

The researcher chose the participants from three vocational high schools in Indonesia by using purposive sampling with the following criteria: (a) implementing the Merdeka Curriculum; (b) having the technology infrastructure for digital assessment; and (c) willingness to integrate local wisdom into mathematics learning.

2.4. Instruments

The research team gathered preliminary data through semi-structured interviews with 12 mathematics teachers and document analysis of the existing assessment rubrics used in participating schools in Needs Analysis Phase. Teachers said that most existing assessment practices still rely on written tests that assess procedural fluency. That little attention is paid to reflective thought or to integrating local wisdom.

2.5. Measurement Tools

Four major criteria identified in the literature on reflective thinking and mathematics assessment guided the development of the DRMAR as an analytic rubric in Design Phase Rubric Structure.

Table 1. Structure and Performance Level Descriptors of the Digital Reflective Mathematics Assessment Rubric (DRMAR)

Criterion	Focus	Theoretical Foundation
C1: Problem Identification & Mathematical Modelling	Ability to identify mathematical elements in local wisdom contexts and formulate appropriate mathematical representations	Ethnomathematics
C2: Strategy Planning and Monitoring	Ability to verbalise how one is solving a problem, consider other ways to solve a problem, monitor progress while solving a problem	Metacognition
C3: Critical Evaluation & Appraisal	Can assess the validity of solutions, detect mistakes and justify methodological choices	Reflective Judgement
C4: Reflection & Transfer	Ability to reflect on the solution process, express learning insights, and relate findings to vocational applications.	Experiential Learning

The researchers operationalised each criterion into four levels of performance: novice (Level 1), developing (Level 2), proficient (Level 3) and reflective practitioner (Level 4). Level 4 (exemplary) descriptors: identifies implicit mathematical relationships; explains strategic metacognitive monitoring; critically evaluates several solution pathways with justification; and applies insights in different vocational scenarios.

Integration of Digital Platform Development Stage. The researchers embedded the rubric in a web-based assessment platform (Ve.Rubric prototype) built using the rapid application development framework described by Rohaeni et al. (2024). It allowed for the digital submission of student work, criterion-based scoring, automated scoring and immediate feedback. The researchers developed three technology-embedded local wisdom tasks that connect a particular mathematical concept with indigenous cultural practices that are relevant to the vocational programmes.

2.6. Research Procedures and Timeline

Researchers collected data in three phases. Expert validation: Seven experts rated the rubric independently using a content validity questionnaire based on Aiken. They rated the relevance, clarity, representativeness, and specificity of each criterion and performance level descriptor. Pilot test: The rubric was piloted with 42 students from two programmes, and possible ambiguities in performance descriptors were identified. The work was revised according to student feedback and rater observations. Field test: Three local wisdom mathematics technology-embedded activities have been conducted over four weeks by all 156 students. Two trained raters independently scored student work samples (written solutions, screen recordings of problem-solving processes, and guided reflection entries) with the DRMAR. Scores were submitted electronically via the Ve. Rubric platform.

2.7. Data Analysis Strategy

Quantitative data were analysed using SPSS version 29. Content validity was assessed using Aiken’s V coefficient, with $V \geq 0.80$ considered acceptable. Inter-rater reliability was assessed using the Intraclass Correlation Coefficient (ICC) for absolute agreement; $ICC \geq 0.75$ indicates good reliability. Descriptive statistics

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(means, standard deviations, frequency distributions) were used to summaries student performance patterns across rubric criteria and performance levels.

3. Results and Discussion

3.1. Results

3.1.1. Digital Reflective Assessment in Mathematics Rubric Development (DRMAR)

The final DRMAR has four key criteria, four levels of performance within each criterion, and detailed descriptors. Table 2 shows the structure of the rubric for Criterion 1 (Problem Identification & Mathematical Modelling). The full rubric is provided in the supplementary materials.

Table 2. DRMAR Criterion 1: Identification of Problem & Mathematical Modelling

Performance Level	Descriptor	Technology-Embedded Local Wisdom Task Example
Novice (1)	Unable to identify mathematical elements in the local wisdom context; no attempt to formulate a mathematical representation or representation is incorrect.	The student fails to recognise geometric patterns in the batik motif or misidentifies the mathematical concept entirely.
Developing (2)	Identifies some mathematical elements with prompting; attempts mathematical representation, but with significant errors or omissions in translation from context.	The student identifies symmetry but cannot select the appropriate transformation type.
Proficient (3)	Independently identifies relevant mathematical elements; constructs largely accurate mathematical representation, though minor contextual details may be missed.	Student correctly identifies reflection symmetry in the batik motif and formulates an appropriate equation representation.
Reflective Practitioner (4)	Identifies both explicit and implicit mathematical relationships; formulates precise, well-justified mathematical representation demonstrating deep understanding of context–symbol mapping.	Student identifies both reflection and rotation elements, explains their relationship, and can justify the chosen representation.

3.2. Validity Analysis

Content validity was assessed based on expert ratings (n = 7) using Aiken's V coefficient. Table 3 summaries the validity results across rubric dimensions.

Table 3. Content Validity Results (Aiken's V) for DRMAR Dimensions

Dimension	Relevance (V)	Clarity (V)	Representativeness (V)	Specificity (V)
C1: Problem Identification & Modelling	0.91	0.88	0.85	0.87
C2: Strategic Planning & Monitoring	0.94	0.90	0.88	0.88
C3: Critical Analysis & Evaluation	0.92	0.91	0.86	0.90
C4: Reflection & Transfer	0.89	0.85	0.86	0.86
Overall	0.92	0.89	0.86	0.88

The Aiken's V coefficients for all dimensions were above the cut-off of 0.80 indicating good content validity. The relevance ratings were the highest, confirming that the rubric criteria do capture aspects of reflective mathematical thinking in the vocational setting. Based on feedback from experts, four performance level descriptions were slightly revised for greater clarity and precision and included in the final rubric.

3.3. Analysis of Reliability

Inter-rater reliability was determined from the independent scoring of 156 student work samples by two trained raters. Before scoring, raters undertook a three-hour training session, including interpretation of the rubric and a standardisation exercise involving exemplar student responses. The results of ICC are shown in Table 4.

Table 4. Inter-Rater Reliability (ICC) Result

ICC Measure	Value	95% CI	F test p-value
Single Measures	0.82	[0.76, 0.87]	< 0.001
Average Measures	0.87	[0.83, 0.91]	< 0.001

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Average-measures ICC indicated a value of 0.87 ($p < 0.001$), which, according to Cicchetti (1994), is considered an 'excellent agreement' (> 0.75) for ICCs. The raters were generally consistent with one another, which supports the rubric's reliability for use in real classroom assessments.

3.3.1. Student Performance Patterns

During the field test, student performance was assessed across the three technology-embedded local wisdom tasks. Table 5 summaries the distribution of students by the highest performance level achieved across the four rubric criteria.

Table 5. Student Performance Level Distribution (n = 156)

Performance Level	C1 (%)	C2 (%)	C3 (%)	C4 (%)	Average (%)
Novice (Level 1)	12.8	18.6	25.0	32.7	22.3
Developing (Level 2)	28.2	31.4	29.5	28.8	29.5
Proficient (Level 3)	33.3	29.5	26.3	21.8	27.7
Reflective Practitioner (Level 4)	25.6	20.5	19.2	16.7	20.5

When the analyses were combined, it was found that 89.6% of students improved their reflective thinking scores between Task 1 and Task 3, suggesting the formative value of repeated assessment aligned to a rubric. But performance was not consistent across criteria. Students did best on Problem Identification (C1), with 58.9% at Proficient or Reflective Practitioner levels, and worst on Reflection & Transfer (C4), where only 38.5% were at these higher levels. This pattern shows that students can identify mathematical components in local wisdom contexts. The articulation and transfer of learning insights to new contexts still need further development.

All three tasks demonstrated meaningful improvement in mean rubric scores. A repeated measures ANOVA indicated this was not by chance ($F(2, 310) = 14.27$, $p < 0.001$, $\eta 2 = 0.084$). Direct comparison of tasks showed an increase from Task 1 to Task 2 (mean increase 0.48, $p = 0.003$) and from Task 2 to Task 3 (mean increase 0.41, $p = 0.009$).

3.4. Discussion

The DRMAR showed good content validity (Aiken's V = 0.82–0.94) and excellent inter-rater reliability (ICC = 0.87), indicating its suitability for assessing reflective mathematical thinking in vocational education. The best achievement was in Problem Identification (C1), where 58.9% of the students reached the Proficient or Reflective Practitioner levels. It supports the assertion that local wisdom tasks can help students relate abstract mathematics to familiar cultural contexts (Dhema et al., 2025; Aras et al., 2025). Still, Reflection and Transfer (C4) came out 38.5% higher, meaning students had to really think through their learning process and apply it to new job-related situations. This kind of challenge isn't new it's also been noted in studies on reflective assessment (Ramspott et al., 2025; Kuncoro et al., 2025). Looking at the repeated measures, there was a clear improvement across all three tasks, $F(2, 310) = 14.27$, $p < 0.001$, which backs up the idea that the rubric has real formative value.

These results suggest three concrete things. Teachers could initially use the four criteria of DRMAR as a diagnostic tool. C4. Low scores on this subscale indicate a need to explicitly teach students how to express learning insights and apply mathematics in tasks related to culinary or tourism. Second, teachers can practice on exemplar responses (Wertheim et al., 2025; Campbell & Padayachee, 2024) to ensure reliable scoring, i.e., rater training (3 hours, ICC = 0.87). Third the Ve rubric platform automates score aggregation and progress tracking, allowing for the scaling up of formative assessment without increasing administrative load (Ackermans et al., 2021; Rohaeni et al., 2024).

But there are four implementation challenges. Infrastructure limitations may worsen digital divides (e.g. unstable internet and lack of student devices; Peñate et al., 2024; Tan et al., 2024). Two raters scoring 156 student samples took 12 hours per session, a heavy workload. AI-assisted scoring might help, but this is under-developed (Wiese et al., 2025). Culture-specific tasks in Balinese culture must be re-validated in other regions (Sadri & Wisnu Bayu Temaja, 2025). Finally, in some vocational programs, teachers had to provide continuous support because students initially saw reflective writing as irrelevant to the hands-on trades (Ozdemir, 2020; Sugiharni & Amir, 2025). Meeting these challenges is essential for sustainable rubric use.

3.5. Implications

The DRMAR has three practical contributions for the assessment of vocational mathematics. First, it offers a systematic framework for evaluating the reflective dimensions of mathematical thinking required for employment adaptability, which are seldom assessed by traditional tests. As noted by Kuncoro et al. (2025), reflective thinking improves individual cognitive abilities, collaborative learning environments, and lifelong learning dispositions and capacities, which should be built in Vocation Education. Second, the digital nature of

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the rubric allows data-informed, scalable assessment. Ve. The Rubric platform automatically collects student progress over time, aggregates pattern data at the classroom and programme levels, and generates individualized feedback reports. This functionality allows the metacognitive assessment approach proposed by Mahande et al. (2021), which rates self-, peer-, and teacher-assessment methods for measuring higher-order thinking in learning management systems. Third, integrating local wisdom is an answer to the call for culturally responsive vocational education in Indonesia. The rubric situates assessment tasks in Indigenous knowledge systems, including the geometry of batik, traditional measurement systems and mathematics in craft production, to affirm students' cultural identities and build mathematical competence. It resonates with research on indigenous vocational learning, which shows that culturally appropriate communities of practice that acknowledge local knowledge systems yield better outcomes in understanding mathematics than decontextualised instruction in isolation (Ardana, Ariawan, & Sugiharni, 2021; Arion, 2024; Caspi & Gorsky, 2024; Ozdemir, 2020; Sugiharni & Susanti, 2025).

3.6. Limitations

Some limitations need to be acknowledged to clarify the scope of the findings and guide future research. The study used a single-country sample from Indonesia, limiting the generalizability of the findings to other vocational education settings with different local wisdom traditions. Future research should also adapt and validate the rubric framework in other cultural contexts and examine the transferability of the four-criterion structure to other local wisdom traditions. In addition, the study's lack of a control group limited the conclusions that could be drawn (Campbell & Padayachee, 2024; González, 2025; Olson & Krysiak, 2021; Ramspott et al., 2025; Wertheim et al., 2025). Future experimental studies should compare the outcomes of students using the DRMAR with the outcomes of students using traditional assessment methods to determine comparative effectiveness. Moreover, the digital rubric platform in use today offers only basic technological affordances, limiting its potential. Future versions may use artificial intelligence to automate scoring and feedback using new research on rubric evaluation with LLMs. Longitudinal studies are also needed to determine whether reflective skills, as measured by the DRMAR, predict workplace performance outcomes after graduation.

4. Conclusion

This study reports on the development and validation of a Digital Reflective Mathematics Assessment Rubric (DRMAR). Development of a Reflective Thinking Assessment Instrument Based on Technology and Local Wisdom in Vocational Mathematics Education. The rubric had high content validity (Aiken's V between 0.82 and 0.94 for the criteria) and excellent inter-rater reliability (ICC = 0.87) and therefore was considered appropriate for assessment purposes in real classroom contexts. This study adds to the field in three ways. First, it offers a validated tool for assessing culturally relevant mathematics in vocational settings, thereby bridging a substantial gap between ethnomathematics research and assessment practice. Second, it adds to the literature on reflective assessment by using a rubric to assess mathematical problem-solving and by examining student products and student thinking processes. Third, it demonstrates how digital technology can enhance the utility of rubrics by providing scalable, formative assessment that supports student growth over time. The DRMAR provides a useful tool for vocational mathematics teachers to assess the reflective thinking skills that are fundamental for work adaptability and lifelong learning. The rubric is a validated instrument for researchers to examine the development of reflective thinking and to assess the success of incorporating local knowledge. Supporting technology-enhanced, culturally grounded assessment tools is a win-win for policymakers seeking to advance their educational quality, digital transformation and cultural preservation goals. In the future, the researchers should test this approach in other cultures, see how well it correlates with real-world measures of workplace performance, and also investigate AI-enhanced versions of the digital rubric platform.

Author Contributions

Gusti Ayu Dessy Sugiharni: Conceptualization, Methodology, Formal analysis, Writing – original draft, Visualization. Putu Sabda Jayendra: Investigation, Data curation, Software, Validation, Writing – review & editing. Anak Agung Istri Putera Widiastiti: Funding acquisition, Project administration, Resources, Supervision, Writing – review & editing.

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/ or publication of this article.

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Ethics and Consent Declarations

The study received ethical approval from the Research Ethics Committee of Institut Pariwisata dan Bisnis International (IPBI) under approval No. 136.11/III/LPPM_IPBI/2026. Written informed consent was obtained from all participants aged ≥18 years, and from parents/guardians for minor participants, along with written assent from minors. All data were anonymised and stored securely. No identifiable information is disclosed in this publication.

Data Availability

The data supporting the findings of this study are not publicly available because they contain information that could compromise the privacy of research participants (minor students). Anonymised data may be available from the corresponding author upon reasonable request, subject to institutional ethical approval. Processed data are presented within the article.

Declaration on AI Use

The authors declare that no artificial intelligence (AI) or AI-assisted technologies were used in the preparation of this manuscript. All content, including writing, analysis, and conclusions, is the original work of the human authors listed.

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References

Acar, A. S. (2023). Genre pedagogy: A writing pedagogy to help L2 writing instructors enact their classroom writing assessment literacy and feedback literacy. *Assessing Writing, 56*, 100717. https://doi.org/10.1016/j.asw.2023.100717

Ackermans, K., Rusman, E., Nadolski, R., Specht, M., & Brand-Gruwel, S. (2021). Video-enhanced or textual rubrics: Does the Viewbrics formative assessment methodology support the mastery of complex (21st century) skills? *Journal of Computer Assisted Learning, 37*(3), 810–824. https://doi.org/10.1111/jcal.12525

Aldahmash, A. H., Alshalhoub, S. A., & Naji, M. A. (2021). Mathematics teachers' reflective thinking: Level of understanding and implementation in their professional practices. *PLOS ONE, 16*(10), e0258149. https://doi.org/10.1371/journal.pone.0258149

Aras, A., Nasruddin, Zahrawati, B. F., & Syahrul. (2025). Bugis ethnomathematics: Exploration of the sulapa eppa walasuji motif as a source of learning mathematics. *Jurnal Elemen, 11*(2), 468–482. https://doi.org/10.29408/jel.v11i2.29549

Ardana, M. I., Ariawan, W. I. P., & Sugiharni, G. A. D. (2021). The expansion of sociocultural theory-oriented mathematical learning model. *Cypriot Journal of Educational Sciences, 16*(6), 3016–3032. https://doi.org/10.18844/cjes.v16i6.6493

Arion, K. (2024). Exploring local wisdom: Utilizing ethnomathematics to improve mathematical creative thinking skills. *Jurnal THEOREMS (The Original Research of Mathematics), 9*(1), 100–113. https://doi.org/10.31949/th.v9i1.9538

Campbell, A. L., & Padayachee, P. (2024). Design principles for using rubrics in engineering mathematics. *IEEE Transactions on Education, 67*(4), 499–507. https://doi.org/10.1109/TE.2023.3329761

Candiasa, I. M., Santiyadnya, N., Sukajaya, N., & Sunu, G. K. A. (2019). Contextualization of learning models in subak system for vocational education. *Journal of Physics: Conference Series, 1165*, 012023. https://doi.org/10.1088/1742-6596/1165/1/012023

Caspi, A., & Gorsky, P. (2024). STEM career expectations across four diverse countries: Motivation to learn mathematics mediates the effects of gender and math classroom environments. *International Journal of STEM Education, 11*(1), 52. https://doi.org/10.1186/s40594-024-00511-5

Daud Mahande, R., Asma Darmawan, F., & Daud Malago, J. (2022). Metacognitive assessment model for student project-based learning through the blended learning practice MOOCs. In *MOOC (Massive Open Online Courses)*. IntechOpen. https://doi.org/10.5772/intechopen.98996

Dhema, M., Cholily, Y. M., & Rahardjanto, A. (2025). Tracing local wisdom in the integration of ethnomathematics in vocational high school mathematics education: A Scopus systematic review. *Indonesian Journal of Science and Mathematics Education, 8*(2), 472–485. https://doi.org/10.24042/ijsme.v8i2.28208

Fereidani, B. M., & Görkem Üçtuğ, F. (2024). Towards sustainable production of sesame products: Comparison of traditional and modern production systems via a life cycle assessment approach. *Cleaner and Responsible Consumption, 12*, 100166. https://doi.org/10.1016/j.clrc.2023.100166

Ferm, L. (2021). Vocational students' ways of handling the academic/vocational divide. *International Journal for Research in Vocational Education and Training, 8*(1). https://doi.org/10.13152/IJRVET.8.1.1

González, M. C. (2025). The single-point rubric to simplify student feedback and assessment. *English Teaching Forum, 63*(4), 2–7. https://doi.org/10.4135/9781483387529.n7

ISSN: 2797-3174

Julia, N. T., Asriati, W. W., & Fikri, F. (2025). Integration of HOTS-based Quizizz application to improve mathematical literacy abilities of vocational school students. *Numeracy, 12*(2), 179–192. https://doi.org/10.46244/numeracy.v12i2.3433

Kuncoro, K., Hidayat, A., Nadzeri, M. B., Juandi, D., Hendriyanto, A., & Meirani, F. (2025). Thinking beyond the equations: A deep dive into reflective thinking for mathematics learning. *Participatory Educational Research, 12*(5), 310–334. https://doi.org/10.17275/per.25.75.12.5

Ma, M., Ng, D. T. K., Liu, Z., & Wong, G. K. W. (2025). Fostering responsible AI literacy: A systematic review of K–12 AI ethics education. *Computers and Education: Artificial Intelligence, 8*, 100422. https://doi.org/10.1016/j.caeai.2025.100422

Mahande, R. D., Darmawan, F. A., & Malago, J. D. (2021). Metacognitive skill assessment model through the blended learning management system in vocational education. *Jurnal Pendidikan Vokasi, 11*(1). https://doi.org/10.21831/jpv.v11i1.36912

Martinovic, D., & Danesi, M. (Eds.). (2025). *Mathematics and education in an AI era*. Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-80696-4

Olson, J. M., & Krysiak, R. (2021). Rubrics as tools for effective assessment of student learning and program quality. https://doi.org/10.4018/978-1-7998-7653-3.ch010

Ozdemir, H. (2020). Maths instruction in vocational high school from teachers and students' eyes: A different kettle of fish. *Journal of Research in Mathematics Education, 9*(2), 196–215. https://doi.org/10.17583/redimat.2020.3796

Paeßens, J., Ma, B., & Winther, E. (2023). Effectiveness of collaboration in VET: Measuring skills for solving complex vocational problems with a multidimensional authentic technology-based assessment. *International Journal for Research in Vocational Education and Training, 10*(1), 46–67. https://doi.org/10.13152/IJRVET.10.1.3

Peñate, A. H., Padrón-Robaina, V., & Nieves, J. (2024). The role of technological resources in the reputation of vocational education schools. *Education and Information Technologies, 29*(3), 2931–2950. https://doi.org/10.1007/s10639-023-11919-x

Purbaningrum, M., & Arliani, E. (2025). Mathematical literacy test on statistics for vocational high school level: Developing test items. *AIP Conference Proceedings*, 140001. AIP Publishing. https://doi.org/10.1063/5.0290076

Putra, K. Y. A. (2025). *Matematika learning management system berbasis vocational realistic education: Studi kasus institusi vokasi (Politeknik Negeri Bali)*. Politeknik Negeri Bali. https://repository.pnb.ac.id/id/eprint/20862/

Putra, Z. A. W., Muryasari, D., & Medilianasari, R. (2024). Integrating ethnopedagogy and cultural arts education: Preserving Indonesia's heritage in the globalized era. *Indonesian Journal of Educational Research and Review, 7*(3), 709–718. https://doi.org/10.23887/ijerr.v7i3.76244

Ramspott, S., Sonntag, U., Härtl, A., Rüttermann, S., Roller, D., Giesler, M., & Hempel, L. (2025). MaReS (Magdeburg Reflective Writing Scoring Rubric for Feedback) – Development of a feedback method for reflective writing in health professions education: A pilot study in veterinary medicine. *GMS Journal for Medical Education, 42*(2). https://doi.org/10.3205/zma001752

Rohaeni, N., Renikasari, N. R., Jubaedah, Y., & Yusuf, S. F. (2024). Ve.Rubric: A rapid application development (RAD) for vocational education rubric assessment tool. *AIP Conference Proceedings*, 040015. https://doi.org/10.1063/5.0203219

Sadri, N. W., & Wisnu Bayu Temaja, I. G. B. (2025). Local wisdom-based education in Indonesian school. *The Eastasouth Journal of Learning and Educations, 3*(3), 226–236. https://doi.org/10.58812/esle.v3i03.762

Singh, R., Singh, S. K., & Mishra, N. (2024). Influence of e-learning on the students of higher education in the digital era: A systematic literature review. *Education and Information Technologies, 29*(15), 20201–20221. https://doi.org/10.1007/s10639-024-12604-3

Sugiharni, G. A. D., & Amir, F. L. (2025). Cognitive load circumstance of tourism vocational students in mathematics learning. *Journal of Psychology and Instruction, 9*(1), 61–95.

Sugiharni, G. A. D., & Susanti, P. H. (2025). Initial design of math apache based-learning in tourism for SMK students. *Journal of Psychology and Instruction, 9*(3), 246–257.

Sumandya, I. W., Candiasa, I. M., Suharta, I. G. P., & Sugiarta, I. M. (2021). Development of a vocational based mathematics e-module. *International Journal of Scientific & Technology Research, 10*(6), 303–309. https://www.ijstr.org/final-print/jun2021/Development-Of-A-Vocational-Based-Mathematics-E-module.pdf

Sutrisno, S., Azis, A., Setyawan, M. B., Dewi, D. A., Hidayah, Y., Hakiki, M., & Fadli, R. (2025). Assessing students' readiness for artificial intelligence-based project learning to strengthen local wisdom values in Indonesia. *Cogent Education, 12*(1). https://doi.org/10.1080/2331186X.2025.2582948

Tan, X., Lin, X., & Zhuang, R. (2024). Development and validation of a secondary vocational school students' digital learning competence scale. *Smart Learning Environments, 11*(1), 37. https://doi.org/10.1186/s40561-024-00325-6

Wertheim, J., Stoll, L., & Zozakiewicz, C. (2025). A new rubric designed for teaching and learning. *Educational Assessment*, 1–23. https://doi.org/10.1080/10627197.2025.2579642

Wiese, L. J., Patil, I., Schiff, D. S., & Magana, A. J. (2025). AI ethics education: A systematic literature review. *Computers and Education: Artificial Intelligence, 8*, 100405. https://doi.org/10.1016/j.caeai.2025.100405

Xu, H., Deng, T., Xu, X., Gu, X., Huang, L., Xie, H., & Wang, M. (2025). Integrating 4C/ID model into computer-supported formative assessment system to improve the effectiveness of complex skills training for vocational education. *Education and Information Technologies, 30*(5), 5921–5964. https://doi.org/10.1007/s10639-024-13037-8

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