Evaluating the Impact of CIDOS in Enhancing Digital Literacy and Learning Outcomes among Community College Students: A Focus on Accessibility and Usability

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Abstract: *The study examines the impact of the Curriculum Information Document Online System (CIDOS) on digital literacy and learning outcomes among students at Selayang Community College, Malaysia. A mixed-methods approach combined quantitative data from 200 student surveys with qualitative insights from 15 in-depth interviews. Using the Technology Acceptance Model, the research found that perceived usefulness and student engagement were significant predictors of learning outcomes. In contrast, ease of use was not a significant predictor of learning outcomes. Challenges such as inconsistent internet access and varying digital literacy levels were identified, but they did not significantly hinder academic performance. The study emphasises the importance of content relevance and engagement features over technical simplicity in driving effective digital learning. Recommendations include system stability, expanding digital literacy programs, and improving internet accessibility.*

Keywords: *Curriculum Information Document Online System (CIDOS), Learning Management System (LMS), Technology Acceptance Model (TAM), Digital Learning (DL)*

1. INTRODUCTION

Educational practices are redefined as traditional teaching and learning methods are adapted to present-day digital platforms. In academic settings, digital literacy is key, particularly at the college level. Integrating technology in education, primarily via Learning Management Systems (LMS), underscores the strong emphasis needed on digital literacy for academics. UNESCO's (2021) research indicates that drawbacks to digital literacy are often exacerbated by socio-economic factors, uneven access to technological resources, and patchy internet connectivity, which can render live communication impossible between students and the platform.

In Malaysia, the Curriculum Information Document Online System (CIDOS) is a tool designed to support online and blended learning in polytechnics and community colleges. Initially developed for the delivery of curricula and blended learning for Polytechnic students, CIDOS has evolved into a multifunctional tool that aims to increase peer collaboration, knowledge exchange, and hands-on digital skills building (Yahya, Hussin, Abdullah, 2024; Hasnan Mohin, 2021). CIDOS, which was initiated in 2023, is a Web-based tool to promote digital learning experiences throughout the Malaysian Community College system.

Based on the Technology Acceptance Model (TAM), this research examines how CIDOS influences students' technological confidence and classroom success. Despite the growing reliance on CIDOS in Malaysian Community Colleges, there is a noticeable lack of empirical research assessing its real-world effectiveness, particularly concerning its usability, accessibility, and impact on digital literacy and learning outcomes. Most existing studies focus on Polytechnic institutions, with minimal attention given to Community Colleges, where students may face unique socio-economic and technological challenges.

In Malaysia's Community Colleges, CIDOS was introduced to enhance digital learning experiences. Despite its implementation, the acceptance of using CIDOS for teaching and learning faces challenges related to inconsistent internet connectivity, inadequate user training, and complex interface design. Most current studies have focused on Polytechnics. Yong et al. (2022) and Hasnan and Mohin (2021) highlight these systemic barriers; however, limited research exists on how these issues affect students' digital literacy and learning outcomes in Community Colleges.

Although CIDOS was introduced to enhance the digital learning experiences of various communities, including those in campus-based schools and students from lower-income backgrounds, its implementation has encountered challenges such as inconsistent internet access, insufficient staff training prior to the project launch, and a complex interface design that yields unexpected results. In short, there is still little research to verify how these systematic obstacles affect students' digital literacy and their study achievements in Community Colleges.

This study aims to bridge the gap by exploring the specific challenges faced by Selayang Community College students to identify strategies to improve CIDOS' usability and accessibility. The findings will provide ideas for improving CIDOS to serve better its objective of supporting effective digital learning and fulfilling the goal of providing individuals from all backgrounds within the Malaysian Community College System with an equal opportunity to be educated through virtual classrooms.

2. LITERATURE REVIEW

2.1 LEARNING MANAGEMENT SYSTEM (LMS) EVOLUTION AND CIDOS IN MALAYSIAN HIGHER EDUCATION

The Learning Management System (LMS) has evolved to support modern learning and content creation. It enables a combination of teaching and learning methods, including blended learning, tools for resource sharing, and real-time collaborative resources (Jansen et al., 2020). In Malaysia, CIDOS (Curriculum and Instructional Design Online System) is the Learning Management System (LMS) of the Department of Polytechnic and Community College Education (DPCCE), specifically designed for use in Technical and Vocational Education and Training (TVET) institutions, also known as community colleges. Unlike Moodle or Canvas, CIDOS supports the integration of curricula and the management of learning materials (Hasnan & Mohin, 2021). However, its implementation phase presents several obstacles, including inconsistencies in internet access and maladaptation (Yahya et al., 2024). CIDOS makes course delivery efficient for educators, but its success ultimately depends on overcoming barriers related to accessibility and usability.

2.2 DIGITAL LITERACY AND LEARNING OUTCOMES

Digital literacy (DL) is the capacity to navigate, evaluate, and create digital content, which directly impacts students' academic performance. In a previous study, Ying et al. (2022) found a positive relationship between the frequency of CIDOS usage and the better digital literacy (DL) skills of Malaysian community college students, especially in online collaboration and information retrieval. However, DL benefits are not uniform: learners with prior experience in technology outperformed their colleagues by 25% in course completion rates. Garcia et al. (2023) highlighted the role of mentorship in driving behaviour, demonstrating that DL training increased assignment submission rates by 40%. Most studies overlook the impact of DL on long-term educational outcomes, certifications, and employability. This study addresses this gap by linking CIDOS engagement to measurable learning outcomes such as grades and skill acquisition.

2.3 COMPARATIVE STUDIES AND ALTERNATIVE PLATFORMS

Rodriguez et al. (2022) and Tan et al. (2023) found that Canvas is superior in terms of interaction design and third-party tool integration for Learning Management System (LMS) platforms. However, due to its ease of integration with Office applications, Teams is the preferred choice. The two studies highlight the vital role that user training and technical support can play in enabling the successful adoption of the LMS, emphasising the need for LMS systems with greater functionality.

Meanwhile, compared to Moodle and Google Classroom, Hasnan and Mohin (2021) stated that CIDOS, while aligning effectively with curriculum objectives and organising course resources, lacked a user-friendly design and real-time communication functions. According to Yong et al. (2022), usability issues and a lack of interactive features impeded the adoption of CIDOS in Malaysian Polytechnics, suggesting that design and functionality improvements are essential.

2.4 BRIDGING THE GAP BETWEEN USABILITY AND DESIGN WITH TAM

Usability profoundly shapes student involvement within LMS platforms. TAM hypothesises that perceived ease of use (PEOU) and perceived usefulness (PU) determine technology adoption (Davis, 1989). Studies analysing CIDOS reveal mixed results: while its curriculum-oriented organisation advances PU, poor interface and constrained interactivity limit PEOU (Yong et al., 2022). For instance, Razali and Shahbodin (2014) found that CIDOS's complex navigation discouraged nearly one-third of learners from participating in online discussions. These findings suggest CIDOS can improve critical thinking and problem-solving skills, particularly in virtual learning environments. This aligns with Islam et al. (2023), who argue that virtual learning promotes creativity and flexibility, especially in higher education settings.

Despite these observations, the studies lack actionable recommendations for improving CIDOS's design or functionality. Moreover, existing research on CIDOS primarily focuses on technical aspects rather than its educational impact. For instance, while Anggraeni et al. (2023) emphasise the importance of immediate feedback in LMS, there is insufficient exploration of how CIDOS's feedback mechanisms influence student learning outcomes. Furthermore, perceptions of CIDOS's usefulness and ease of use vary among user groups (Navin & Sulaiman, 2021; Yong et al., 2022). In contrast, platforms similar to Canvas prioritise straightforward design and third-party integration, enhancing PEOU and PU (Rodriguez et al., 2022). Training courses can mitigate these issues; Garcia et al. (2023) demonstrated that structured digital literacy preparation amplified LMS involvement by 60%. This analysis applies the Technology Acceptance Model (TAM) to assess how a usability overhaul and instructional initiatives in CIDOS could enhance acceptance.

3. METHODOLOGY

This research adopts a blended approach, integrating statistical analysis with narrative insights to assess how effectively CIDOS bridges digital literacy gaps among students at Selayang Community College. Framed within

the Technology Acceptance Model (TAM), the study prioritises four core dimensions: ease of use, perceived usefulness, accessibility, and impact on learning outcomes. It strives to paint a complete picture of how CIDOS shapes students' academic journeys by weaving together numerical data and interviews.

The research population for this study was the CIDOS users enrolled at Selayang Community College. To ensure credibility, 200 students were surveyed to capture broad trends, while 15 participated in interviews to share their experiences. This study used stratified sampling, ensuring diverse representation across academic programmes and levels.

For the quantitative phase, a structured survey was deployed, using a 5-point rating scale (1 = Strongly Disagree to 5 = Strongly Agree) to measure perceptions of CIDOS's practicality, relevance, accessibility, and influence on learning. Content validation of the survey instrument was conducted through a systematic expert review process involving two senior lecturers in educational technology, each with extensive experience in digital learning environments and instructional design.

Following the expert validation, a pilot test was administered to 20 students from Selayang Community College who were not part of the final study cohort. The pilot's objective was to evaluate the instrument's reliability, internal consistency, and comprehensibility from the students' perspective. Responses were analysed for reliability using preliminary Cronbach's Alpha, and cognitive debriefing was employed to gather participant reflections on the clarity and interpretability of the items. Based on this feedback, revisions were made to ambiguous questions, and formatting adjustments were introduced to improve the user experience prior to the full-scale survey rollout.

To ensure the reliability of the questionnaire, the researcher employed the Cronbach's Alpha method to assess internal consistency. The total reliability for all items was determined to be 0.975 (Table 1), showing high internal consistency.

Cronbach's Alpha N of Items	Cronbach's Alpha N of Items
.975	25

Table 1: Overall Reliability Statistics for the Questionnaire

These results suggest that the survey items are highly reliable and consistent in measuring the intended constructs. Each section of the survey also demonstrated high reliability, with values exceeding 0.90, reinforcing the consistency of the responses.

The qualitative stage involved semi-structured interviews with 15 purposefully selected students to capture in-depth perspectives on their experiences with CIDOS. It explored the challenges students faced using the platform, identified possible improvements that could be made, and gathered reflections on the impact of CIDOS on their learning outcomes. Thematic analysis was employed as the analytical framework, following Braun and Clarke's (2006) six-phase approach: familiarisation with the data, initial coding, theme generation, theme review, definition and naming of themes, and report production. Coding was performed inductively to allow patterns to emerge from the data, while also being informed deductively by the Technology Acceptance Model (TAM) constructs. Three overarching themes were identified: (1) Navigational Accessibility and Interface Design, (2) Learner Autonomy and Motivation, and (3) Infrastructure and Device Limitations. These themes provided nuanced insights that complemented the quantitative findings and helped contextualise statistical associations with authentic student narratives. These themes offered rich contextual insights that complemented and substantiated the quantitative findings (Garcia, Lopez, & Martinez, 2023; Islam et al., 2023).

The data were processed using SPSS (version 29) to examine the influence of CIDOS (Community College Digital Learning System) on improving digital literacy and academic outcomes among community college students, with an emphasis on accessibility and usability. The results are presented in the following sections.

4. RESULT

4.1 HOW DO COMMUNITY COLLEGE STUDENTS PERCEIVE THE USABILITY AND ACCESSIBILITY OF CIDOS?

The findings indicate that community college students perceive CIDOS as a user-friendly and accessible platform. Perceived Ease of Use had a mean score of 3.659, while Perceived Usefulness recorded a mean of 3.714. These values suggest that most students found the system relatively easy to navigate and beneficial for learning activities. The instrument's internal consistency was strong, with Cronbach's Alpha of 0.941 for Ease of Use and 0.969 for Usefulness, supporting the reliability of these constructs.

Internet accessibility results showed that 56% of students had consistent access when using CIDOS, and 52% primarily accessed the system via smartphones, underscoring its cross-device usability. However, 37% noted that their internet access was only occasionally reliable, indicating that connectivity remains a barrier for some students.

Qualitative insights further reinforce these findings. Students commonly cited the following features as beneficial:

a. Ease of use (e.g., "Mudah untuk difahami" / "Easy to understand")
b. Access to structured learning materials
c. Convenient revision tools (e.g., "Senang melihat nota dalam CIDOS untuk ulang kaji" / "Easy to review notes in CIDOS")

Quantitative correlation analysis showed strong, statistically significant relationships between students' perceptions and their learning outcomes:

Variables	Correlation Coefficient (r)	Significance (p)
Perceived Ease of Use	0.778	$p < 0.001$
Perceived Usefulness	0.894	$p < 0.001$
Engagement	0.889	$p < 0.001$
Challenges	0.419	$p < 0.001$

Table 2: Pearson Correlations with Learning Outcome (N = 200)

These results suggest that students who perceive CIDOS as useful and engaging report better learning outcomes. Notably, the effect of Perceived Usefulness (r = 0.894) is stronger than that of Perceived Ease of Use, aligning with the notion that content relevance outweighs technical simplicity in learning environments.

4.2 TO WHAT EXTENT DOES CIDOS CONTRIBUTE TO DEVELOPING DIGITAL LITERACY SKILLS AMONG STUDENTS?

The data reveal that CIDOS plays a significant role in developing digital literacy skills among students. According to the Digital Literacy Level variable, 49.5% of students identified as beginners, 40% as intermediate, and 10.5% as advanced users. However, a one-way ANOVA revealed no statistically significant differences in Perceived Ease of Use, Perceived Usefulness, Engagement, Learning Outcomes, or Challenges across the different digital literacy groups (Beginner, Intermediate, Advanced). This suggests that the platform is inclusive and accessible, regardless of students' prior digital proficiency.

Variables	Beginner (n=99)	Intermediate (n=80)	Advanced (n=21)	Total Mean
Perceived Ease of Use	3.59	3.68	3.89	3.659
Perceived Usefulness	3.65	3.74	3.90	3.714
Engagement	3.63	3.65	3.70	3.644
Learning Outcome	3.64	3.57	3.77	3.629
Challenges	3.09	3.30	3.51	3.207

Table 3: Descriptive Means by Digital Literacy Level

Moreover, the high average scores for Engagement (mean = 3.644) and Learning Outcomes (mean = 3.629) indicate that CIDOS enhances digital literacy and supports students in applying these skills to their academic activities. The system's design caters to a broad range of digital competencies, making it an effective tool for developing practical digital skills across proficiency levels.

Qualitative data also supported these findings. Students who self-identified as beginners expressed that CIDOS was easy to learn and navigate. This positive feedback across all digital literacy groups suggests that the platform is adaptable and responsive to a broad spectrum of user needs.

4.3 WHAT IS THE RELATIONSHIP BETWEEN CIDOS USAGE AND STUDENT ENGAGEMENT IN LEARNING ACTIVITIES?

The correlation analysis revealed a strong positive relationship between CIDOS usage and student engagement. Specifically, Perceived Usefulness and Engagement showed a correlation coefficient of $r = 0.911$ ($p < 0.01$), indicating that students who found CIDOS to be useful and well-designed were significantly more engaged in their learning activities.

The regression analysis reinforced this observation. Engagement emerged as a significant predictor of learning outcomes, with a standardised beta coefficient (β) of 0.446 and $p < 0.001$, confirming its crucial role in enhancing educational performance through active digital participation.

Relationship Tested	Pearson r	Significance (p)	Regression β	p-values
Engagement ↔ Learning Outcome	0.911	< 0.01	0.446	< 0.001
Usefulness ↔ Engagement	0.911	< 0.01	-	-
Ease of Use↔ Engagement	0.823	< 0.01	-	-

Table 4: Correlation and Regression Summary – Engagement and Learning Outcomes

The high engagement scores (mean = 3.644) suggest that CIDOS effectively captures students' interest and motivates them to participate in learning activities. The platform's interactive features and accessibility likely contribute to this high level of engagement, making it a valuable tool for fostering active learning.

4.4 WHAT CHALLENGES DO STUDENTS FACE WHEN USING CIDOS TO BRIDGE DIGITAL LITERACY GAPS?

Despite the overall positive perceptions of CIDOS, students reported several challenges in using the platform. The Challenges section (Section F) yielded a mean score of 3.207, suggesting that students experience moderate difficulties interacting with the system.

The most frequently cited challenges included:

a. Occasional internet access issues (with 37% reporting the internet as only "sometimes available"),
b. More advanced digital skills are needed, particularly among students identifying as beginners (49.5%),
c. An interface navigation difficulty.

During interviews, over 50% of students highlighted internet connectivity disruptions as the most common issue (e.g., "Kadang kala gangguan internet" / "Occasional internet disruptions"). Other qualitative responses emphasised:

a. Technical issues (e.g., system lag, slow loading times)
b. Limited access to digital devices
c. Navigation difficulties for first-time users

To quantify these perceptions, a correlation analysis revealed a moderate but significant relationship between Challenges and Learning Outcomes ($r = 0.419$, $p < 0.01$), indicating that difficulties do not critically obstruct students' ability to achieve learning goals.

Relationship Tested	Pearson (r)	Significance (p)
Challenges ↔ Learning Outcome	0.419	$p < 0.01$
Challenges ↔ Engagement	0.395	$p < 0.01$
Challenges ↔ Perceived Usefulness	0.349	$p < 0.01$

Table 5: Correlation Between Challenges and Other Constructs

The correlation analysis also revealed a moderate positive relationship between Challenges and Learning Outcomes ($r = 0.419$, $p < 0.01$), indicating that challenges do not significantly hinder students' ability to achieve positive learning outcomes. However, addressing these challenges, such as improving internet access and providing additional digital literacy training, could further enhance the effectiveness of CIDOS.

4.5 DOES CIDOS USAGE SIGNIFICANTLY IMPROVE STUDENTS' LEARNING OUTCOMES?

The findings confirm that the use of CIDOS significantly improves students' learning outcomes. The Learning Outcome construct had a mean score of 3.629, indicating that most students experienced positive academic benefits when using the platform.

A strong positive correlation was observed between CIDOS usage and Learning Outcome ($r = 0.894$, $p < 0.01$), highlighting the system's effectiveness in enhancing academic performance. These outcomes support the claim that CIDOS strengthens digital literacy and learning engagement among community college students.

The regression analysis revealed that Perceived Usefulness and Engagement were significant predictors of Learning Outcomes, collectively accounting for 83.2% of the variance ($R^2 = 0.832$). This reinforces the platform's role as a strategic educational tool.

Predictor	Standardised β	Significance (p)	R^2	Adjusted R^2
Perceived Usefulness	0.504	< 0.001	0.832	0.830
Engagement	0.446	< 0.001		
Ease of Use	-0.019	0.745 (n.s.)		

Note: $R^2 = 0.832$, $F(3,196) = 323.96$, $p < 0.001$

Table 6: Regression Summary – Predictors of Learning Outcome

Qualitative responses also aligned with these results. Approximately 70% of students reported that CIDOS prepared them well for future academic or professional demands. Key comments included:

a. "Ya, kerana nota dalam CIDOS boleh digunakan sebagai rujukan masa hadapan." ("Yes, because the notes in CIDOS can be used as future references.")
b. "I can do the work easily without stress and understand better."
c. "Yes, because CIDOS is a platform that encourages independent learning."

These results suggest that CIDOS enhances digital literacy and improves student learning outcomes, particularly when learners perceive the platform as useful and engaging.

In summary, the findings indicate that CIDOS is perceived as a usable and accessible platform that effectively enhances digital literacy and learning outcomes among community college students. While some challenges exist, such as occasional internet access issues and varying levels of digital literacy, these do not significantly hinder the system's effectiveness. The strong relationship between CIDOS usage, student engagement, and learning outcomes highlights the platform's potential as a valuable tool for supporting student success in a digital learning environment. Future efforts to address the identified challenges could further enhance the impact of CIDOS on student learning and the development of digital literacy.

5. DISCUSSION

The findings of this study highlight the primary role of CIDOS in promoting digital literacy and improving learning outcomes among Selayang Community College students. The discussion below situates these results by integrating quantitative and qualitative insights within the broader context of existing literature and theoretical models, particularly the Technology Acceptance Model (TAM).

5.1 SYNTHESISING KEY QUANTITATIVE FINDINGS WITH PRIOR RESEARCH

The quantitative results illustrate strong positive correlations between CIDOS usage and both student Engagement ($r = 0.911$, $p < 0.01$) and Perceived Usefulness ($r = 0.894$, $p < 0.01$). Furthermore, regression analysis reveals that Perceived Usefulness ($\beta = 0.504$, $p < 0.001$) and Engagement ($\beta = 0.446$, $p < 0.001$) significantly predict Learning Outcomes, whereas Perceived Ease of Use does not ($\beta = –0.019$, $p = 0.745$). These outcomes resonate with the established tenets of TAM (Davis, 1989), which identify Perceived Usefulness as a core determinant of Behavioural Intention and, by extension, system usage.

TAM Construct	Correlation with Learning Outcome (r)	B Coefficient	Significance (p)
Perceived Usefulness	0.894	0.504	< 0.001
Engagement	0.911	0.446	< 0.001
Ease of Use	0.778	-0.019	0.745 (n.s.)

Table 7: Summary of Correlation and Regression with TAM Constructs

Despite the strong correlation between Ease of Use and Learning Outcomes ($r = 0.778$, $p < 0.01$), the regression analysis revealed a non-significant effect ($\beta = –0.019$, $p = 0.745$). The non-significant effect of Ease of Use on Learning Outcomes differs from many TAM-based studies that propose ease of use as equally influential (Yong et al., 2022).

One possible reason is that, while usability remains important, students may place greater emphasis on the practicality and relevance of CIDOS content, particularly under time constraints or when course performance is at stake. This suggests that for community college learners, the perceived relevance of online resources may overshadow minor navigation or interface limitations, and practical value may outweigh usability when evaluating the effectiveness of a digital learning platform.

From a comparative standpoint, these results align with research showing that well-structured LMS platforms significantly enhance engagement and performance (Tan et al., 2023). Hasnan and Mohin (2021) noted that properly aligned curriculum-based content can mitigate usability issues. In the current study, although some respondents reported moderate design complexities, the system's strong alignment with course objectives and convenient features appear to overshadow interface shortcomings, reinforcing its perceived usefulness.

5.2 ENGAGEMENT AND DIGITAL LITERACY: CONVERGENCE WITH LITERATURE

Another key finding is the strong association between high levels of student engagement (mean = 3.644) and robust learning outcomes (mean = 3.629). In CIDOS, interactive features such as discussion boards, quizzes, downloadable notes, structured modules, and self-paced review tools foster repeated student interaction with course materials. These platform elements sustain students' motivation and engagement, encouraging them to revisit and master content over time.

Past research confirms that such LMS features are essential for engagement in digital learning environments (Garcia et al., 2023). When learners frequently access and interact with materials through discussion boards, quizzes, or collaborative activities, engagement increases, leading to improved knowledge retention and digital skill development (Rodriguez et al., 2022). CIDOS appears to replicate this pattern, leveraging its content structure to encourage repeated exposure, enhance digital proficiency and support deeper learning.

Digital Literacy Level	Engagement Mean	Learning Outcome Mean
Beginner (n=99)	3.63	3.64
Intermediate (n=80)	3.65	3.57
Advanced (n=21)	3.70	3.77
Total (n=200)	**3.64**	**3.63**

Table 8: Engagement and Learning Outcomes by Digital Literacy Level

These results also reveal that over 49.5% of the participants identified as beginners in digital literacy. Despite this, their learning outcomes were comparable to those of intermediate and advanced users. This supports findings from Ying et al. (2022), who reported that LMS platforms can effectively scaffold digital skills among novice users. It also highlights the importance of platform design that accommodates diverse digital proficiencies—a conclusion echoed in Malaysian-based research (Yahya, Hussin, & Abdullah, 2024).

CIDOS's ability to align content with course goals and reduce interface complexity allows beginner users to engage confidently. The platform's relevance and structure serve as scaffolding to bridge knowledge gaps, empowering students to grow their digital competence without being overwhelmed by unfamiliar tools.

5.3 CONTRASTING EASE OF USE AND PERCEIVED USEFULNESS

According to the Technology Acceptance Model (TAM), Perceived Ease of Use and Perceived Usefulness are essential predictors of user acceptance and educational effectiveness (Davis, 1989). In LMS research, interface simplicity is often emphasised as a key factor influencing user satisfaction and platform adoption (Razali & Shahbodin, 2014). Systems that are intuitive and easy to navigate are believed to lower user resistance and promote continuous usage.

However, findings from the current study contrast with this conventional view. While Perceived Ease of Use received a relatively favourable mean score (3.659) and correlated significantly with Learning Outcomes ($r = 0.778$, $p < 0.01$), it did not emerge as a significant predictor in the regression model ($\beta = –0.019$, $p = 0.745$). In contrast, Perceived Usefulness showed both a strong correlation ($r = 0.894$) and a substantial predictive effect ($\beta = 0.504$, $p < 0.001$) on student learning outcomes.

Variables	Mean	Correlation (r)	B Coefficient	Significance (p)
Perceived Ease of Use	3.659	0.778	-0.019	0.745 (n.s.)
Perceived Usefulness	3.714	0.894	0.504	< 0.001

Table 9: Comparison of Ease of Use vs. Usefulness

This result supports Hasnan and Mohin's (2021) finding that curriculum alignment and content relevance can outweigh superficial design preferences. In the context of community college students, the utility and alignment of content with academic goals may override the need for perfect usability. Students facing time constraints and heavy workloads may tolerate interface complexity if the content helps them achieve their educational objectives.

The study suggests that usefulness trumps simplicity—a content-rich, assessment-aligned LMS like CIDOS can foster meaningful engagement and academic performance, even if its interface is only moderately intuitive.

5.4 PERSISTENT CHALLENGES AND THEIR LIMITED IMPACT

Despite the system's overall strengths, students did highlight persistent internet connectivity challenges—37% reported that the internet was only sometimes available. Additionally, nearly half of the participants indicated limited access to digital devices as a recurring obstacle. These challenges reflect broader infrastructural issues in Malaysia's rural and semi-urban settings, as highlighted by UNESCO (2021) and the World Bank (2021).

However, the moderate correlation between these challenges and learning outcomes ($r = 0.419$, $p < 0.01$) suggests that while connectivity constraints pose an inconvenience, they do not substantially derail academic performance for most students—particularly those who have found workarounds, such as downloading materials for offline study or using college-provided internet facilities at scheduled times. This resilience may be explained by students' adaptive strategies, such as downloading materials for offline access, completing work during scheduled internet availability, or utilising campus-provided Wi-Fi facilities.

Moreover, students may overcome these barriers due to several mitigating factors:

a. Intrinsic motivation to succeed, particularly among working learners, is a challenge when balancing multiple responsibilities.

b. Campus-based support systems include access to computer labs, technical help desks, and peer assistance networks.
c. Cultural emphasis on educational achievement, especially within communities where formal qualifications are highly valued.

These factors likely buffer the impact of digital access limitations, allowing students to maintain academic progress even under suboptimal technological conditions.

Nevertheless, the ongoing reports of technical disruptions, slow loading times, or occasional platform lags underscore the need for more robust system stability and institutional support. Continuous improvement in this area—possibly through campus Wi-Fi upgrades, mobile-friendly design enhancements, or partnerships with telecommunication providers—remains vital. This perspective is strongly echoed in previous work by Aljaraideh et al. (2023), who highlight that even minor technical barriers can accumulate over time to disengage users, especially for students already coping with time or skill constraints.

In summary, while challenges persist, students' adaptive behaviours, external support structures, and internal motivation help them navigate and overcome barriers, ensuring that CIDOS continues to support learning outcomes effectively.

5.5 ALIGNMENT WITH THEORETICAL PERSPECTIVES AND FUTURE DIRECTIONS

Research by Jansen et al. (2020) and Singh and Thurman (2023) highlights the growing importance of Learning Management Systems (LMS) in higher education, particularly in facilitating content distribution, evaluation, and interaction between instructors and learners. The positive reception and impact of CIDOS on learning outcomes align well with TAM's proposition that technology adoption is contingent on the system's perceived value and alignment with users' tasks (Davis, 1989). The present study diverges from some earlier research (Yong et al., 2022) in its finding that perceived ease of use did not significantly impact learning outcomes. This discrepancy highlights the importance of context, namely, that in community college environments where academic goals can overshadow minor usability hurdles, perceived usefulness

and engagement become the foremost drivers of success. Additionally, the system's ability to cater to multiple digital literacy levels addresses calls in the literature for inclusive Learning Management System (LMS) design (Chen et al., 2022).

The findings have several practical implications:

a. For LMS Designers: Systems should prioritise curriculum alignment, practical utility, and assessment relevance over excessive emphasis on visual or interface simplicity. Features such as downloadable content, offline accessibility, and scaffolded feedback mechanisms can enhance engagement even when usability is moderate.
b. For Community College Policy: Policymakers should invest in connectivity infrastructure, student digital literacy programs, and institutional support mechanisms (e.g., help desks, training modules). These provisions would buffer technological limitations and promote equitable access across socio-economic segments.

In the future, researchers could incorporate longitudinal analyses into their investigations to determine whether these results persist over multiple semesters or program cycles. Investigating longer-term educational attainment and employability (Garcia et al., 2023) would also be beneficial, as it addresses gaps in prior investigations. In addition, cross-LMS studies comparing CIDOS with other systems, such as Moodle or Canvas, would shed further light on its strengths and weaknesses in comparison to other Learning Management Systems (LMSs). Such studies will likely lead to improved platform design and university-level practice grounded in evidence.

In sum, the research adds to the body of evidence that a context-aligned LMS – linked to specific course objectives, featuring engaging aspects, and viewed as helpful for academic grades – can bring strong learning outcomes from students, even in situations where the ease of use is only rated as moderate and not exceptionally high. CIDOS is revealed as a powerful tool for enhancing digital literacy and learning. This evidence supports earlier research (Yahya et al., 2024; Hasnan & Mohin, 2021) on LMS adoption in Malaysia's higher education institutions, extending the topic in this context. By referring to existing empirical studies and situating the observations

within theoretical frameworks (such as the Technology Acceptance Model), this discussion emphasises the need to improve connectivity, user training, and technical support in a manner sensitive to local conditions. CIDOS stands out as a functional and inclusive digital platform that promotes digital literacy development and learning performance among Malaysia's diverse and heterogeneous community college populations.

6. CONCLUSION

The results showed that CIDOS was perceived as a highly usable and accessible intervention that could successfully build up digital literacy skills and enhance learning outcomes. Findings show students had high engagement with the platform, and correlations indicated strong positive relationships between CIDOS ease of use, perceived usefulness, engagement, and learning outcomes.

While there are challenges, such as occasional difficulties in accessing the internet and students' different levels of digital literacy, these have not made CIDOS less effective as a bridge to digital literacy, as it helps students achieve their academic goals. Designed to support students of varying digital literacy levels, the platform provides interactive and engaging learning opportunities for all students.

Nevertheless, it also highlights several shortcomings, including addressing internet connectivity issues, enhancing system stability, and providing more interactive and engaging content. This could further optimise CIDOS and solidify its place as a valuable digital learning tool for community colleges.

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9. AUTHORS' CONTRIBUTION

Wan Syukriah Wan Mohamad conceptualised the study, identified the research focus, and designed the methodological framework. Malathi A/P Palanisamy collected the data and facilitated the focus group discussions. Idayati Piduman contributed to the analysis and interpretation of the findings. All authors reviewed and provided critical feedback on the research process, contributed to the data analysis, and participated in the writing and revision of the manuscript.

10. CONFLICT OF INTEREST DECLARATION

We hereby certify that the article is the original work of the authors and co-authors. It has not been previously published and is not under consideration for publication elsewhere. This research has not been submitted for publication, in whole or in part, in any other journal or outlet. We affirm that all Authors have contributed significantly to the conception, execution, and interpretation of the research, and take full responsibility for the validity and integrity of the data and its findings.

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