

Android-Based CBT Moodle as a Mobile-Assisted Language Learning Ecosystem

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ABSTRACT

This study examined the relationship between the use of an Android-based Moodle Computer-Based Testing (CBT) application and the English learning motivation of adolescent learners enrolled in a private English course. A quantitative one-group pretest–posttest design with correlational analysis was conducted involving 23 intermediate-level students at ZPrivateClass, Cirebon Regency, Indonesia. Data were collected through a motivation questionnaire, classroom observation, interviews, and documentation, and analyzed using descriptive statistics and Pearson's product-moment correlation in SPSS 23. The results revealed a significant positive relationship between Android-based CBT Moodle use and students' learning motivation ($r = .742$, $p < .05$). Mean motivation scores increased from 61.43 in the pretest to 78.26 in the posttest, representing a 27.38% improvement. These findings indicate that the Android-based CBT Moodle environment promoted a more flexible, interactive, and learner-centered learning experience that enhanced learner autonomy, engagement, active participation, and confidence in learning English. Because the study involved only one group of 23 students without a control group, the findings should be interpreted as associative rather than causal, with limited generalizability. The study's novelty lies in conceptualizing Android-based CBT Moodle as an integrated Mobile-Assisted Language Learning (MALL) ecosystem combining content delivery, digital assessment, automated feedback, and learning monitoring within a single mobile platform. The findings contribute to digital language learning research and provide practical guidance for language teachers, schools, and researchers in designing smartphone-based instruction that strengthens students' motivation, engagement, learner autonomy, and digital literacy in English language learning contexts.

Keywords: android-based learning; computer-based testing (cbt); moodle; mobile-assisted language learning (mall); learning motivation; english language learning

INTRODUCTION

Digital transformation has reshaped classroom practice, moving instruction away from a teacher-centered model toward one organized around the learner. Growing ownership of mobile devices, expanding internet access, and the maturation of educational technology have together enabled learning that is flexible, personalized, and continuous (Canton, 2021; Crompton & Burke, 2018). In the years following the COVID-19 pandemic, digital tools have stopped being treated as a stopgap measure and are now considered a standing feature of contemporary schooling, making technology integration central to efforts to raise educational quality and prepare learners for twenty-first-century demands. Evidence gathered during and after this period suggests that learners who grew accustomed to self-paced, flexible digital study during the pandemic have tended to retain those habits even after a return to face-to-face instruction, reinforcing the case for sustained digital integration rather than a temporary rollback (Šramová, 2024).

Language education is one of the areas where this shift has been most visible. A growing body of evidence links digital-tool use to stronger classroom interaction, higher engagement, greater motivation, and increased learner autonomy in language study (Martin et al., 2020). This trajectory has given rise to Mobile-Assisted Language Learning (MALL), an approach that treats mobile devices as the primary medium through which language study can happen at any time and in any place. Beyond flexibility, MALL affords learners more contextualized and interactive experiences that better match a generation already accustomed to constant smartphone use. Structural-equation modelling evidence from controlled MALL studies similarly indicates that app-mediated practice can raise language learners' motivation over conventional instruction, lending further empirical weight to the case for mobile-first pedagogy (Al Khateeb & Alamer, 2022).

Smartphone ownership among Indonesian students continues to climb, and the device has become woven into students' social lives, entertainment, and learning alike. At the same time, evidence suggests adolescent smartphone use remains weighted toward social media and gaming rather than activities that meaningfully support learning (Antoninis et al., 2023). This creates both a risk and an opening for schools: rather than restricting smartphone use outright, teachers can redirect the device toward productive learning through Bring Your Own Device (BYOD) practices, converting what was primarily an entertainment tool into an instructional one.

Among the platforms supporting this shift, Moodle (Modular Object-Oriented Dynamic Learning Environment) is one of the most widely adopted. As an open-source Learning Management System (LMS), Moodle bundles content delivery, discussion forums, quizzes, assignments, Computer-Based Testing (CBT), and automated tracking of learner activity. Recent studies report that, when designed systematically around learner needs, Moodle use is associated with stronger participation, engagement, assessment quality, and overall learning outcomes (Martin et al., 2020; Ifenthaler, 2022). A systematic review of Moodle implementations across STEM and other disciplines likewise identifies engagement, motivation, and assessment quality as recurring outcomes wherever the platform is deployed with clear pedagogical intent (Gamage et al., 2022). Consistent with technology-acceptance research more broadly, students' continued use of such platforms depends heavily on their perceived usefulness and ease of use, factors that a well-designed Android-based Moodle environment can directly address (Zhou et al., 2022). Pairing Moodle with Android devices widens access further, since students can rely on smartphones they already own rather than a shared computer lab.

Within language instruction specifically, motivation is a key determinant of whether learners succeed in building communicative competence: it shapes not just how much students study, but how persistently they study, which strategies they choose, and whether they reach their learning goals. Self-Determination Theory (SDT), developed by Ryan and Deci, offers one of the most widely used frameworks for explaining this motivation. SDT holds that intrinsic motivation grows when a learning environment satisfies three basic psychological needs: autonomy, competence, and relatedness and that

environments offering self-paced study, rapid feedback, and a sense of accomplishment sustain intrinsic motivation over time (Ryan & Deci, 2024) Experimental work on need supportive task design lends further support to this claim, showing that online tasks framed to satisfy autonomy and competence needs raise students' intrinsic motivation and self-assessed performance relative to conventionally framed tasks (Mendoza et al., 2023)

Android-based Moodle maps onto these SDT principles in a fairly direct way. Flexible access gives students control over when and how quickly they study (autonomy). CBT-style quizzes with automated feedback provide a steady stream of small successes that reinforce students' sense of competence. Discussion forums, assignments, and interaction with teachers and peers support the relational dimension (relatedness). Taken together, this suggests that Android-based Moodle can function as more than a delivery or evaluation tool it can shape a learning environment that sustains motivation. This view is consistent with survey evidence from e-learning settings more broadly, where students' academic motivation has been found to hinge on precisely these platform qualities, autonomy-supportive design, timely feedback, and a sense of accomplishment, rather than on the technology itself (Berestova et al., 2022).

Several prior studies provide a direct empirical backdrop for the present work. found that Moodle-based e-learning significantly raised the learning motivation of senior-secondary students, reported that Android-based application learning improved both motivation and achievement in junior-secondary English instruction. At a broader level, (Burston, 2015) synthesised two decades of MALL implementation and documented consistent, if modest, learning gains, and Martin et al. (2020) reviewed online-learning research and identified engagement and interactivity as recurrent drivers of positive outcomes. More recent survival-analysis evidence on mobile-assisted language learning confirms that sustained platform acceptance and engagement, rather than one-off exposure, is what predicts learners' continued motivation over time (Hwang et al., 2024). Taken together, these studies establish that mobile and LMS-based tools can support motivation; however, they typically treat Moodle either as a content-delivery channel or as a stand-alone assessment system, and few examine Android-based CBT Moodle at the secondary level as a single, integrated ecosystem explicitly linked to learning motivation. Addressing this unresolved gap is the specific aim of the present study.

Even so, most existing research on e-learning, LMS platforms, and MALL has concentrated on higher education or has measured cognitive outcomes, user satisfaction, and technology acceptance rather than motivation itself. Studies that examine Android-based CBT Moodle specifically at the secondary level, and that connect its use to learning motivation, remain comparatively scarce. In addition, prior work has tended to treat Moodle either as a content-delivery channel or as an assessment system, rather than as a single integrated ecosystem spanning content, practice, assessment, feedback, and activity monitoring. This gap points to the need for empirical work examining how Android-based CBT Moodle can build learning motivation through an experience that is flexible, interactive, and learner-centered.

The question is timely: as smartphone use among students keeps rising, schools need pedagogical strategies that channel this trend productively, and this study contributes empirical evidence on the effectiveness of mobile-learning integration at the secondary level. Building on this rationale, the study analyzes the relationship between Android-based CBT Moodle use and English-language learning motivation among students at ZPrivateClass Course, Cirebon Regency. It tracks how motivation changes before and after the intervention and measures the strength of the association between platform use and motivation. The study offers three points of novelty relative to prior work. First, it frames Android-based CBT Moodle as a MALL ecosystem that integrates content, practice, digital assessment, automated feedback, and activity monitoring on a single mobile platform, rather than treating these as separate tools. Second, it documents how smartphone use can shift from entertainment-oriented behavior toward more productive, self-directed study. Third, it connects digital-pedagogy perspectives with Self-Determination Theory to explain the mechanism by which mobile-learning technology raises motivation a conceptual pairing that contributes both theoretically and practically to technology-based language education.

Practically, the findings are intended to help teachers design more interactive, learner-responsive English instruction; to support students' motivation, autonomy, and digital literacy through more productive smartphone use; and to give researchers a foundation for further work on MALL-based models, LMS implementation, and the broader digital transformation of language education. Based on the discussion above, the study addresses the following question: is there a positive and significant relationship between the use of Android-based media (CBT Moodle) and English-language learning motivation among Grade Beginner and Intermediate students at ZPrivateClass Course, Cirebon Regency? More specifically, the study aims to (1) describe how intensively students used Android-based CBT Moodle in English instruction; (2) measure the change in students' motivation scores before and after the intervention; and (3) analyze the strength of the relationship between Android-based CBT Moodle use and student motivation.

METHOD

This study employed a quantitative approach using a one-group pretest–posttest design analyzed through correlational analysis to examine the relationship between the use of an Android-based Computer-Based Testing (CBT) Moodle application and students' English-language learning motivation. A single intact class was selected because the research was conducted within a naturally existing learning group rather than a randomly assigned sample. Consequently, no separate control group was included, and the findings should be interpreted as correlational rather than causal. The independent variable (X) was the use of Android-based CBT Moodle, while the dependent variable (Y) was students' English-language learning motivation. For the correlational analysis, the independent variable was operationalized as a continuous CBT Moodle usage-and-engagement score compiled for each student across eight learning sessions, with higher

scores indicating more frequent and comprehensive use of the platform's learning materials, practice activities, and assessment features. The population consisted of 155 students enrolled at ZPrivateClass, Cirebon Regency, Indonesia. A purposive sampling technique was employed to select 23 intermediate-level students because all members of this class owned and were able to access Android devices, which constituted a prerequisite for participating in the intervention. As a non-probability sampling technique was used, the resulting sample was not statistically representative of the population, thereby limiting the generalizability of the findings.

Data were collected using four complementary techniques. First, a closed-ended questionnaire comprising 20 items on a four-point Likert scale measured six indicators of learning motivation adapted from framework: desire and drive to succeed, learning needs, future aspirations, recognition in learning, a conducive learning environment, and engaging learning activities. The instrument's content validity was reviewed by the English teacher as a subject matter expert, while its internal consistency was evaluated using Cronbach's alpha. Second, unstructured interviews were conducted with the English teacher and several students to obtain qualitative insights into the learning process. Third, participatory classroom observations were carried out during the implementation of CBT Moodle to document students' learning behaviors and interactions. Finally, documentation in the form of photographs and field notes was collected to support and triangulate the data obtained from the other instruments. Data analysis was conducted in two stages using SPSS version 23. The first stage involved prerequisite testing through the Kolmogorov Smirnov normality test and Levene's homogeneity test to ensure that the data met the assumptions for parametric analysis. The second stage applied Pearson's product-moment correlation to determine the strength and direction of the relationship between Android-based CBT Moodle use and students' learning motivation. Correlation coefficients were interpreted according to Sugiyono's (2019) criteria: 0.80–1.00 (very strong), 0.60–0.79 (strong), 0.40–0.59 (moderate), 0.20–0.39 (weak), and 0.00–0.19 (very weak). Participation in the study was voluntary, informed consent was obtained from all participants and, where applicable, from their parents or guardians, and all collected data were treated confidentially and used exclusively for research purposes.

RESULTS AND DISCUSSION

Result

Preliminary Tests

Normality results showed significance values of .884 (pretest) and .714 (posttest), both above .05, confirming a normal distribution (Table 1). Homogeneity results showed significance values of .533 (pretest) and .299 (posttest), both above .05, confirming homogeneous variance (Table 2). With both assumptions satisfied, the analysis proceeded to the correlation test.

Table 1. Normality Test Results (Experimental Class)

No	Data	Sig.	Result
1	Pretest	.884	Normal
2	Posttest	.714	Normal

Source: Data Processed

Table 1 shows that the pretest and posttest data in the experimental class are normally distributed. The pretest produced a significance value of **0.884**, while the posttest yielded **0.714**. Because both values exceed the significance threshold of **0.05**, the assumption of normality is fulfilled. Thus, the data satisfy the requirements for subsequent parametric statistical analyses.

Table 2. Homogeneity Test Results

No	Data	Sig.	Result
1	Pretest	.533	Homogeneous
2	Posttest	.299	Homogeneous

Source: Data Processed

Table 2 shows that the pretest and posttest data meet the assumption of homogeneity. The pretest yielded a significance value of 0.533, while the posttest produced a significance value of 0.299. Because both values are greater than 0.05, the variances of the data are homogeneous. Therefore, the homogeneity assumption is fulfilled, indicating that the data are appropriate for subsequent parametric statistical analyses.

Motivation Score Description

Motivation data were collected from the 23 intermediate students before and after an eight-session intervention using Android-based CBT Moodle, across the six indicators drawn from Sardiman's (2006) framework.

Table 3. Mean Motivation Scores by Indicator (N = 23)

Motivation Indicator	Pretest	Posttest	Difference	Gain (%)
Desire and drive to succeed	60.52	78.13	17.61	29.10%
Need to learn	62.17	79.35	17.18	27.64%
Aspiration for the future	58.91	76.09	17.18	29.17%
Recognition in learning	63.48	80.00	16.52	26.02%
Conducive learning environment	61.74	77.83	16.09	26.05%

Motivation Indicator	Pretest	Posttest	Difference	Gain (%)
Engaging learning activities	61.26	78.17	16.91	27.60%
Overall mean	61.43	78.26	16.83	27.38%

Source: Data Processed

Every indicator rose consistently. The overall mean grew from 61.43 to 78.26, a 27.38 percent increase. The pretest–posttest gains for every indicator are displayed in Figure 1. The largest single gain appeared in “aspiration for the future” (29.17%), and the smallest in “recognition in learning” (26.02%). The narrow spread between indicators (3.15 percentage points) suggests that Android-based CBT Moodle influenced motivation broadly rather than boosting one isolated facet.

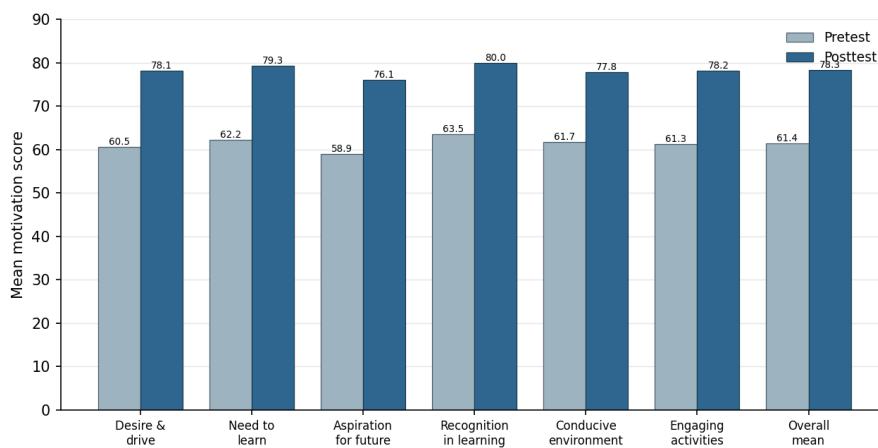


Figure 1. Pretest and posttest mean motivation scores across the six indicators and the overall mean (N = 23).

Correlation Test

The Pearson product-moment correlation tested the relationship between Android-based CBT Moodle use (X) and learning motivation (Y). As defined in the Method, X denotes each student’s CBT Moodle usage-and-engagement score; the coefficient therefore reflects the association between how intensively students used the platform and their motivation, rather than a simple pretest–posttest difference.

Table 4. Pearson Product-Moment Correlation Results

Variable	r (calculated)	r (table, $\alpha=.05$, n=23)	Sig.	Category	Result
X – Y	.742	.413	.000	Strong	Significant

Source: Data Processed

Because the calculated r (.742) exceeded the table value (.413) with $p = .000 (< .05)$, the null hypothesis was rejected: Android-based CBT Moodle use showed a positive,

significant relationship with students' English-language learning motivation. Under Sugiyono's (2019) interpretation criteria, $r = .742$ falls in the “strong” category, implying that more intensive, higher-quality CBT Moodle use is likely to be accompanied by a substantial rise in motivation.

Discussion

Motivation Before and After the Intervention

A 27.38 percent gain in motivation is not a trivial figure, particularly in English instruction, a subject often perceived by students as difficult and unengaging. The pretest mean of 61.43 placed students in a “moderate-to-low” motivation zone a state in which students’ complete tasks to satisfy an obligation rather than out of genuine interest (Djamarah, 2011). After eight sessions using Android-based CBT Moodle, the mean rose to 78.26, moving into the “high” zone. This shift indicates more than increased interest: it points to a reorientation from compliance-driven study toward curiosity-driven study, consistent with the self-determination perspective that motivation grows more organic once a learning environment supports autonomy and competence, even when it originates from an external stimulus (Ryan & Deci, 2024)

Indicator-Level Findings and Implications

The largest gain, in “aspiration for the future” (29.17%), is theoretically notable because this indicator concerns how well students can connect today's learning to their long-term goals. It suggests that successfully navigating the Moodle platform and completing quizzes independently may have provided students with a success experience associated with a stronger belief that they could master English what Bandura termed self-efficacy, a belief in one's capacity to succeed at a given task and a key foundation of long-term motivation. This pattern echoes recent structural-equation findings in online learning contexts, where autonomy-supportive conditions were shown to strengthen learners' engagement precisely through their effect on self-efficacy (Miao & Ma, 2023).

Conversely, the smallest gain, in “recognition in learning” (26.02%), signals that Moodle's digital reward mechanisms automatic scoring and instant feedback did not fully satisfy students' need for social recognition from teachers and peers. Recognition that carries the most weight for students tends to come from a respected authority figure, typically the teacher (Nasution, 1995). Mixed-methods research on automated feedback in mobile-assisted learning reports a similar pattern: system-generated feedback reliably improves accuracy and confidence but does not fully substitute for the affective quality of human recognition (Dai & Wu, 2023) The practical implication is that teachers should continue to provide verbal and non-verbal appreciation alongside Moodle's automated feedback, so that recognition is not reduced entirely to a digital notification.

The 27.60 percent gain in “engaging learning activities” reflects how Moodle's interactive features a responsive interface, varied CBT question types, and access to multimedia content created a more stimulating experience than conventional instruction. Moodle's modularity, which lets teachers combine multiple interlocking course

components, is part of what produces this holistic, non-repetitive learning experience (Rice, 2006). This aligns with findings that game-like, interactive digital elements sustain students' study engagement precisely by breaking up repetitive routines, although such effects tend to depend on how the interactivity is designed rather than being automatic (Chen & Liang, 2022)

CBT Moodle and the Shift from Teacher-Centered toward Student-Centered Learning

One of the more structurally significant patterns associated with CBT Moodle use was a shift from a teacher-centered toward a more student-centered model. In a conventional classroom, the teacher is the sole source of information and students remain largely passive recipients, a configuration that can create a cognitive dependence that dampens intrinsic motivation (Hosnan, 2014). With Moodle, by contrast, students took more control over their own pace: revisiting material repeatedly, working through exercises at their own speed, and checking results instantly without waiting on teacher correction. This shift mirrors recent classroom-technology profiles in secondary education, which distinguish teachers who merely present digital content from those who use it constructively and interactively to foster a genuinely student-centered dynamic, the latter profile being the one this study's findings most closely resemble (Heilporn et al., 2025).

This shift aligns with the twenty-first-century competencies emphasized in Indonesia's Kurikulum 2013 critical thinking, creativity, collaboration, and communication (Mulyasa, 2013). CBT Moodle appears to support all four: analytical quizzes stimulate critical thinking, students' ability to adapt their study strategies reflects creativity, discussion forums support collaboration, and digital presentation of learning outcomes builds communication skills. Its relevance therefore extends beyond motivation into a broader pedagogical framework.

From Online Gaming to Productive Learning

That CBT Moodle use was associated with a shift in students' Android use away from online games toward productive study is a contribution that reaches beyond motivation alone, touching on character education and digital literacy as national priorities. One persistent challenge in digital-era education is competing for students' attention against entertainment content engineered by the games industry, and outright bans on phone use at school have proven ineffective over the long run because they do not address the underlying issue (Hosnan, 2014). Large-sample evidence on adolescents' smartphone-use patterns supports this reading, showing that how a device is used, and toward which achievement goals, matters far more for learning out (Yoon & Yun, 2023) than it is used (Yoon & Yun, 2023)

The approach used here folding device students already own into the learning ecosystem rather than restricting it reflects what might be called “leveraging the moment,” an approach consistent with contextual methodologies in English-language

pedagogy that build motivation through experiences relevant to students' own world (Nuha, 2012). When students recognize that the same device they use for games can also support enjoyable English study, it prompts a cognitive redefinition of what the technology is for.

Observation during the study also noted an unplanned but telling pattern: several students voluntarily accessed Moodle material and practice items outside school hours, and some asked for extra assignments to be posted to the platform. This behavior is a strong signal of genuine internalized interest in learning, a result that goes beyond what a simple rise in questionnaire scores can capture.

Strength of the Relationship and Study Limitations

The strong correlation ($r = .742$) indicates that Android-based CBT Moodle use is a significant predictor of English-language learning motivation. This finding is broadly consistent with prior work: Moodle-based e-learning has been reported to raise senior-secondary students' motivation (Puspitasari, 2018), and Android-based application learning has been linked to both motivation and achievement gains in English instruction at the junior-secondary level (Hidayat & Rohman, 2020). This consistency across contexts lends the present findings some ecological validity. A comparable Indonesian study of computer-based testing likewise reported a significant, moderate-to-strong correlation between CBT use and students' English-learning motivation, although it also cautioned that unresolved technical issues can weaken this relationship, a reminder that platform reliability matters alongside pedagogical design (Dewi et al., 2021).

That said, several limitations deserve honest acknowledgment. First, the relatively small sample ($n = 23$) limits how far the findings can be generalized. Second, the absence of an equivalent control group means external factors teacher effects, material design, or students' home circumstances could not be fully isolated. Third, an eight-session intervention period may be too brief to capture deeper or more durable motivational change; affective shifts such as motivation typically require a longer period to consolidate into a stable disposition (Arikunto, 2006). These limitations point toward further research using more rigorous designs and larger, more representative samples.

Pedagogical Implications and Recommendations

Several pedagogical implications follow from these findings. First, English teachers need to build digital literacy not only as Moodle users but as designers of digital content who can weave English text, recitation audio, and explanatory video into a coherent platform a competency made more relevant by the Kurikulum Merdeka's push for teachers to act as facilitators of technology-based learning (Mulyasa, 2013). Survey evidence from the pandemic-era shift to online teaching similarly found that teachers' digital literacy was closely tied to how comfortably they took on this expanded, content-designing role, underscoring why structured support for teachers cannot be treated as an afterthought (Li & Yu, 2022).

Second, schools need to build adequate supporting infrastructure: stable Wi-Fi, local servers for offline Moodle access, and clear, structured BYOD policies, since without this infrastructure the platform's potential cannot be realized (Rice, 2006). Third, structured training for English teachers is needed on designing CBT quizzes that assess contextual understanding and communicative ability rather than rote memorization alone, so CBT Moodle does not simply reproduce the fatigue of paper-based testing in digital form (Nasution, 1995).

These findings also align with recent scholarship on digital learning more broadly. Digital environments that meet students' psychological needs have been linked to stronger engagement (Chiu, 2022), effective use of LMS features has been associated with greater involvement in online learning (Simelane-Mnisi, 2023), and student engagement more generally has been identified as a key factor in the success of technology-based learning in the Indonesian context (Kristiana, Prihatsanti, Simanjuntak, & Widayanti, 2023).

The present study nonetheless differs from this earlier work in an important respect. Much prior research has positioned Moodle solely as an LMS or a digital assessment tool. This study instead frames Android-based CBT Moodle as a Mobile-Assisted Language Learning ecosystem that integrates content delivery, practice, assessment, automated feedback, and activity monitoring. This integration suggests that motivation gains are not driven by technology use alone, but by pedagogical design that harnesses technology comprehensively to build a meaningful learning experience.

CONCLUSION

This study provided evidence that Android-based CBT Moodle use is positively and significantly associated with English-language learning motivation, reflected in a strong correlation ($r = .742$, $p < .05$) and a 27.38 percent rise in motivation scores following the intervention. The findings indicate that Moodle, deployed as a mobile-device-based LMS, may function as more than a channel for content delivery and evaluation: it can create a more flexible, interactive, learner-centered experience that supports motivation, engagement, and learner autonomy. Theoretically, the study reinforces the applicability of Self-Determination Theory, Mobile-Assisted Language Learning, the Technology Acceptance Model, and digital pedagogy as frameworks for explaining how learning technology raises motivation.

Its novelty lies in framing Android-based CBT Moodle as an integrated MALL ecosystem spanning content delivery, practice, digital assessment, automated feedback, and activity monitoring on a single mobile platform that extends beyond Moodle's conventional role as an LMS or assessment tool. These conclusions should be read in light of the study's limitations a single group of 23 learners, the absence of a control condition, and a short eight-session intervention so the results are best understood as associational and exploratory. Future research should adopt a controlled quasi-experimental or experimental design with a larger, more representative sample and a longer intervention to test whether the observed motivational gains are replicable and durable. Practically, the findings offer teachers guidance for turning smartphones into

productive instructional tools, help schools plan LMS-based digital learning implementation, and provide researchers a foundation for developing more adaptive, data-informed models of technology-based language instruction that strengthen motivation, engagement, and learning outcomes.

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