

Research Article

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Adaptive Assessment in Digital Learning Environments: An Expectancy-Value Theory Approach to Enhancing Learner Motivation

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Abstract

Background/purpose. This study addresses the problem of demotivation generated by traditional assessment methods, which are often standardized, unengaging, and ill-suited to individual differences. In an increasingly digitized educational context, the primary objective is to assess the ability of an adaptive assessment system, developed on the Moodle platform, to stimulate learner motivation in accordance with the components of expectation-valence theory.

Materials/methods. A mixed-methodology approach was adopted, combining quantitative data (academic results) with qualitative data (motivational questionnaire). The sample consisted of 72 senior students from a Moroccan public high school, randomly divided into two groups: an experimental group that underwent an adaptive online assessment, and a control group that received a traditional uniform assessment. The scenario integrated into Moodle included differentiated levels, immediate feedback, and progressive access conditions.

Results. The results reveal a significant improvement in performance for the experimental group (average of 14.56/20 compared to 11.87/20). Qualitative data indicate a strengthening of perceptions of competence (expectancy), task usefulness (instrumentality), and assessment value (valence). The program was well received, with a satisfaction rate of 97.2%.

Conclusion. Adaptive assessment appears to be an effective pedagogical lever for strengthening student motivation. The study proposes a transferable model that aligns LMS functionalities with the psychological determinants of motivation, in favor of a more inclusive and regulatory assessment of learning.

1. Introduction

In an educational context profoundly transformed by the digitization of pedagogical practices (Reis-Andersson, 2024), information and communication technologies (ICTs) offer renewed opportunities to rethink teaching and learning modalities, particularly in terms of assessment (Salinas-Navarro et al., 2024). Long treated as a mere instrument for measuring achievement, assessment is increasingly recognized as a pedagogical act in its own right, capable of shaping learners' motivation and engagement (Yusron Abda'u Ansya et al., 2024). When designed adaptively and personalized to learners' needs, skill levels, and profiles (Memarian & Doleck, 2024), assessment becomes a strategic lever for more inclusive, equitable, and motivating education (Chima Abimbola Eden et al., 2024). From this perspective, learners' motivation is a crucial determinant of success, influencing persistence, cognitive engagement, and self-regulation capacities (Grund et al., 2024). Among the theoretical frameworks for understanding the mechanisms underlying motivation, the expectation-valence theory (Lagou et al., 2024), is particularly relevant: it posits that motivation depends on expectation (belief in one's ability to succeed), instrumentality (perception that performance leads to a reward), and valence (value attributed to the expected outcome), dimensions that are especially sensitive to pedagogical practices and assessment methods (Nakata et al., 2025). Contemporary digital learning environments provide a fertile ground for implementing innovative assessment systems that dynamically adjust to individual characteristics (Multimedia Engineering Department, Hannam University, Daejeon, South Korea et al., 2024). By dynamically adjusting the difficulty of exercises, the richness of question formats, and the nature of feedback (Simon et al., 2024), adaptive assessment can plausibly reinforce both expectation and valence. Despite these promises, empirical studies explicitly examining how adaptive assessment affects each motivational component of expectation-valence theory remain scarce. In particular, little is known about the extent to which a concrete, LMS-implemented adaptive device maps specific design features to expectation, instrumentality, and valence, and how these motivational effects relate to learners' engagement and performance. Addressing this gap, the present study examines adaptive assessment as a motivator in digitally mediated learning contexts (Machkour et al., 2025). Grounded in expectation-valence theory, this analysis examines the extent to which and the ways in which an adaptive assessment implemented in Moodle can strengthen learners' motivational determinants, thereby supporting engagement, self-confidence, and perseverance in learning. The study contributes by operationalizing the three components of expectation-valence within a real LMS-based assessment scenario and providing empirical evidence that jointly considers academic performance (quantitative) and motivational data (qualitative). The first part presents the theoretical framework. The second section details the practical framework methodology, the Moodle-based scenario, and an analysis of both quantitative (performance) and qualitative (questionnaire) results. The third offers a general conclusion, including a synthesis of findings, pedagogical and institutional recommendations, research perspectives, and study limitations.

2. Literature Review

2.1. Motivation

Motivation can be defined as a psychological process that initiates, directs, and maintains goal-oriented behavior by mobilizing an individual's internal and external resources. It generally falls into two categories: intrinsic motivation, which stems from the interest or pleasure felt during the activity, and extrinsic motivation, which is based on external factors such as rewards or constraints (Wigfield et al., 2021). Understanding motivation is essential in various fields, including education (Al-Aamri et al., 2024), work, and psychology, as it influences perseverance, commitment, and overall performance. So, a high level of intrinsic motivation is associated with better well-being and greater

self-efficacy. Among the major theories of motivation are the theory of self-determination, Maslow's hierarchy of needs, the goal theory, and the theory of expectation-valence (Bandhu et al., 2024).

2.2. The theory of expectation-valence

The theory of expectations (expectation-valence), initially developed by Vroom in 1964 within the context of organizational psychology, constitutes a significant contribution to understanding the motivational mechanisms related to intentional action (Levitts et al., 2025). According to this model, an individual's motivation to engage in an activity depends on the subjective evaluation he or she makes of three dimensions: (1) expectation, i.e. the perceived probability of succeeding in a given task by mobilizing a certain level of effort; (2) instrumentality, defined as the perception of the link between performance and the achievement of a desirable reward or result; and (3) valence, which refers to the value that the individual assigns to this expected outcome. In an educational context, this theoretical framework has been adopted and expanded upon by research that has emphasized the significance of these three components in promoting learner persistence in the face of complex tasks (Permzadian & Shen, 2024), particularly in self-directed or collaborative learning environments. Expectation is thus closely linked to the notion of self-efficacy, while instrumentality is based on the clarity of objectives and the visibility of educational rewards. Valence, on the other hand, depends on the degree to which the learning objectives correspond to the learner's personal interests or aspirations. Figure 1 represents the determinants of motivation according to the theory of expectations.



Figure 1. The determinants of motivation according to the theory of expectation-valence

Despite its widespread use and explanatory power, expectancy-valence theory has been the subject of several criticisms. One significant limitation is its low sensitivity to interindividual differences, such as prior learning, self-regulation abilities, or cultural dispositions, which strongly influence motivational dynamics. Furthermore, the model is sometimes considered reductive because it prioritizes a rational cost-benefit assessment logic over affective, social, and contextual dimensions. In particular, the theory struggles to explain socio-motivational contexts such as peer interactions, classroom climate, and collective norms, which are nevertheless decisive factors in learner engagement. These limitations call for the expectation-valence framework to be supplemented by broader approaches that integrate both individual variability and the social dynamics of learning.

2.3. LMS as a context conducive to the activation of the expectation-valence theory

Opting for an LMS (Learning Management System) as part of the learning assessment is a strategic choice to maintain and stimulate learners' motivation. Unlike traditional modalities, which are often perceived as rigid, stressful, or disconnected from individual needs, the LMS offers a flexible, interactive, and learner-centered environment that transforms assessment into a lever for engagement (Wang et al., 2024). With the variety of LMS tools, learners can more clearly see the value of their efforts and can visualize their progress in concrete terms, which feeds their sense of competence and effectiveness. In addition, the possibility of evaluating in a less anxiety-provoking setting (adaptable time, familiar environment, differentiated activities) helps to reduce apprehension and strengthen confidence (Supiani et al., 2024). Figure 2 summarizes some of the motivational benefits of LMSs in the context of the evaluation (Setiasih et al., 2024).

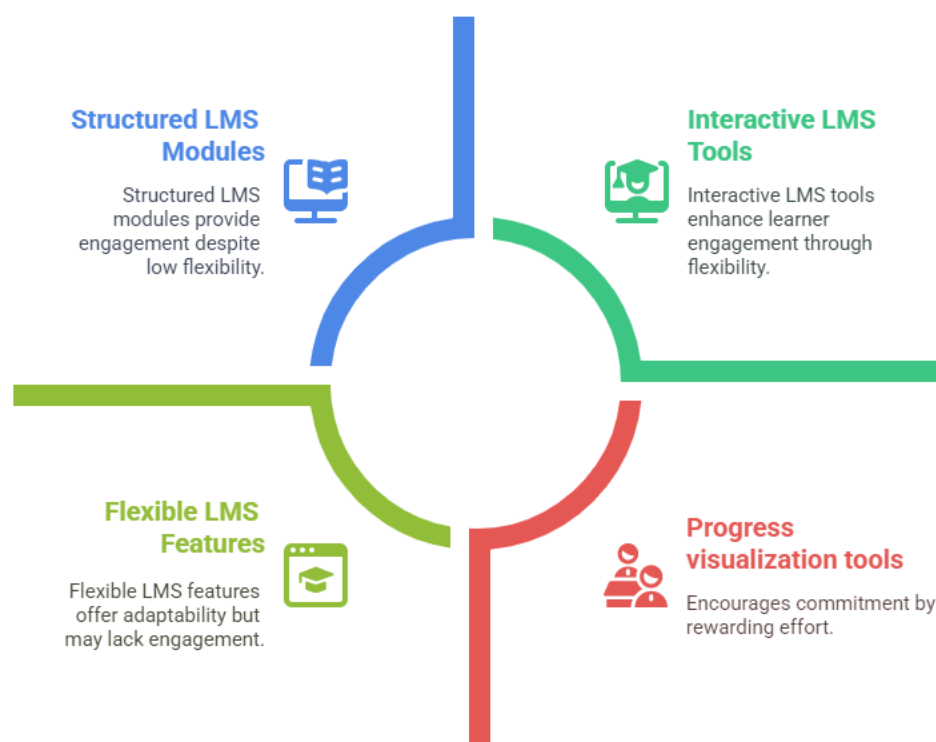


Figure 2. Motivational advantages of LMS in evaluation

By integrating dimensions of personalization, autonomy, and valorization, the LMS aligns itself with the main principles of contemporary motivational theories, particularly expectation-valence, and thus makes it possible to transform evaluation from a source of stress into a sustainable learning engine.

2.4. Boosting expectation in LMSs

Expectation (or expectation of success) is the belief that an individual can perform a task successfully. It is conceptually similar to the concept of self-efficacy, a key determinant of self-regulated behavior in learning situations. The more a learner perceives that they possess the skills to succeed, the more likely they are to actively engage in the proposed activity (Yüksel & Alcı, 2012). In digital learning environments, several devices can reinforce this perception of effectiveness. Adaptive pathways, by automatically adjusting activities according to the Student's skill level or learning pace, help avoid repeated failure situations while maintaining an optimal level of challenge (Ryoo & Winkelmann, 2021). Similarly, personalized dashboards, which visualize progress in real-time, serve as metacognitive feedback that acknowledges the efforts made (Lankauskienė et al., 2025). Research

suggests that alignment between the perceived level of competence and the task demands promotes cognitive engagement. The integration of these adaptive tools into LMSs is therefore a promising strategy to increase expectation and, consequently, motivation to get involved in evaluation activities (Song & Zheng, 2024). Figure 3 summarizes the strengthening of self-efficacy in LMS.

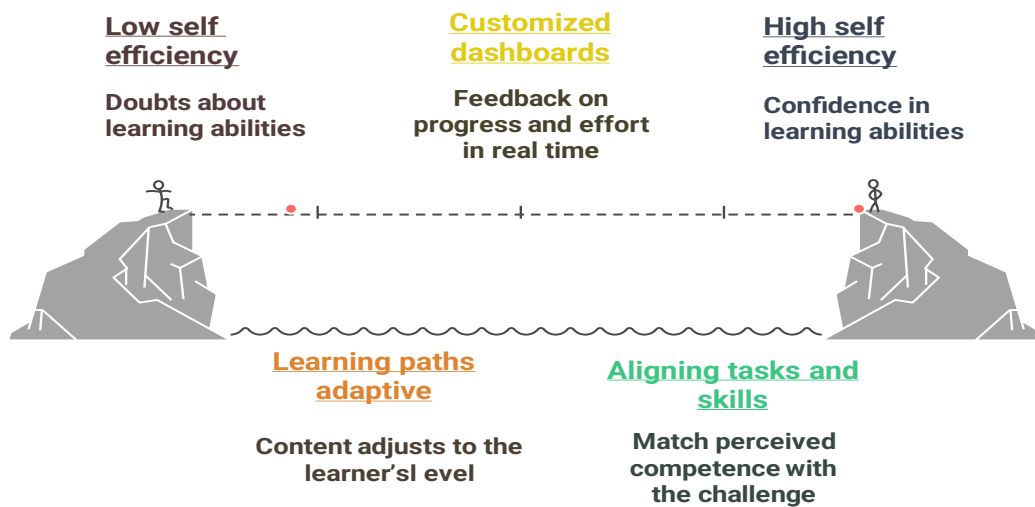


Figure 3. Strengthening self-efficacy in LMS

2.5. Stimulation of instrumentality in LMSs

Instrumentality (or the perceived relationship between performance and outcome) refers to the degree to which a learner believes that a certain level of performance will lead to desirable consequences. This concept is based on a teleological view of action: commitment is not only related to the task itself, but also to the perceived usefulness of that task for future goals (Mishra et al., 2022). In digital platforms, several techno-pedagogical levers can make this effort-benefit relationship more explicit. Immediate automated feedback makes it easier to understand the quality of responses and allows learners to proactively regulate their performance (Black & Wiliam, 1998). The awarding of digital badges, in recognition of achieved goals, acts as a positive reinforcement system. Finally, conditional progression, which unlocks the next steps based on previous performance, reinforces the perception of a structured path, directly influenced by the efforts invested. These mechanisms of gamification or conditionality contribute to reinforcing the perception that success is both possible and valued, thus increasing the perceived instrumentality. Their integration into LMSs makes it possible to clarify pedagogical expectations while stimulating learners' motivation through tangible or symbolic rewards (Talysheva et al., 2021). Figure 4 clarifies the relationship between performance and reward, aiming to increase motivation.

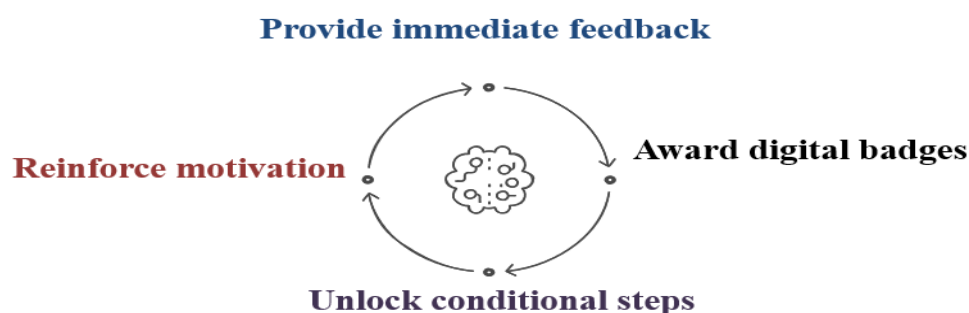


Figure 4. The link between effort and reward in digital learning environments

2.6. Valence Stimulation in LMS

Valence (or subjective value of the outcome) refers to the affective or utilitarian value that an individual places on the outcomes of an activity (Vu et al., 2022). This value depends on the extent to which the learning objectives are perceived as personally relevant, interesting, or meaningful to the learner. In LMSs, several pedagogical strategies can increase the perceived valence. The personalization of educational objectives, particularly through the selection of activities or themes, enables a better alignment of the proposed tasks with individual aspirations (Cheung et al., 2021). The offer of varied learning modalities (text, video, quizzes, audio) responds to cognitive styles and personal preferences, increasing sensory and cognitive engagement. Finally, the integration of contextualized projects, linked to real problems or learners' interests, promotes deeper involvement, rooted in the perceived relevance of learning (Kolb, 1984). Research in the psychology of motivation confirms that the more significant a task is perceived to be, the more attentional and emotional resources individuals invest in it (Stranford, 2024). The activation of valence through personalization mechanisms in LMSs is, therefore, a privileged way to stimulate sustainable and intrinsic motivation in evaluation processes. Figure 5 presents strategies for boosting valence in digital learning environments.

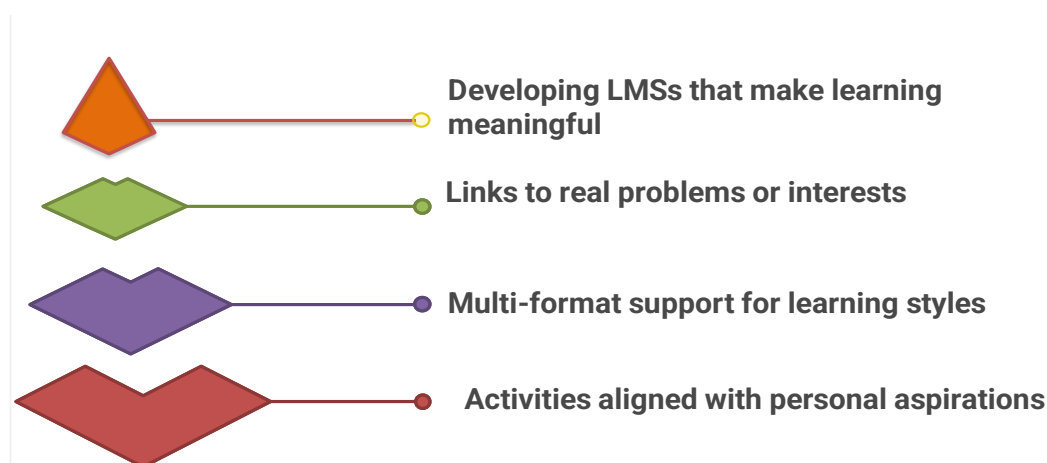


Figure 5. Strategies for boosting valence in digital learning environments

3. Methodology

This study employs a mixed-methods approach, combining quantitative and qualitative data to assess the impact of adaptive online assessments on learner motivation, drawing on components of value and expectation theory (expectation, instrumentality, valence). More specifically, a convergent mixed model was used: data from academic results (quantitative phase) and data collected through a motivational questionnaire (qualitative phase) were collected in parallel, then analyzed separately before being integrated into the final interpretation. There were two main reasons for choosing this design: to strengthen the internal validity of the results by cross-referencing performance indicators and subjective perceptions, and to gain a deeper understanding of the motivational process by combining objective and self-reported measures. The experiment was conducted in a digital learning environment, specifically on the Moodle platform, chosen for its rich functionality, pedagogical flexibility, and ability to support differentiated assessment.

3.1. Design of the digital evaluation system

In order to examine the influence of adaptive assessments on learners' motivation, a dedicated space has been designed on the Moodle platform, based on a pedagogical scenario structured around three types of adaptations:

- Content: gradual adjustment of the level of difficulty according to the complexity of the concepts covered.
- The format of the questions: diversity of types (multiple-choice questions, drag and drop, matching, open-ended answers) in order to vary the modes of cognitive solicitation.
- Response methods: immediate feedback, conditional access to subsequent activities, and limiting the number of attempts to reinforce rigor.

Learners were automatically directed to a personalized initial level, defined from a diagnostic test. This mechanism has enabled the development of differentiated assessment pathways, with progress regulated by the results obtained at each stage, thereby ensuring individualized learning experiences. Thus, Moodle enables the anchoring of evaluation in a motivating framework by making explicit the link between effort, performance, and benefit, in accordance with the principles of expectation-valence theory. Thanks to the tools integrated into the platform, learners can concretely visualize that their efforts (time invested, tasks completed) lead to measurable performance (results displayed, visible progress) and are valued (grades, badges, access to higher levels). This consistent link between personal investment and results turns the evaluation into an opportunity for success, rather than a punishment. The process thus becomes a driver of motivation, insofar as it reinforces the perception of control, the recognition of efforts, and the sense of evaluative activity. Table 1 summarizes the correspondence between Moodle's functionalities and the principles of motivation, as outlined in the expectation-valence theory. Table 1 summarizes the correspondence between Moodle's functionalities and the principles of motivation, as outlined in expectancy-valence theory.

Table 1. Motivational alignment of Moodle tools

Activities / Moodle Resources	Expectation	Instrumentality	Valency
Lesson with conditional navigation	Reinforces the feeling of control and gradual success.	Helps identify the effort required at each step.	Values personalized paths aligned with goals.
Activity Completion	Makes progress visible, increases confidence.	Clearly indicates the tasks to be completed in order to move forward.	Promotes engagement by recognizing the work that has been accomplished.
Personal dashboards	Allows learners to track their progress.	Links efforts to results achieved.	Reinforces the importance given to the objectives achieved.
Restricted activities (conditional access)	Helps structure learning step by step.	Highlights the relationship between performance and progression.	Generates interest in unblocked content.
Feedback in quizzes/tests	Clarifies what is understood and what is not, improves self-efficacy.	Makes the effort-reward link immediate.	Makes the results more meaningful to the learner.
Digital Badges	Builds trust through external recognition.	Clear link between performance and reward.	Increases the perceived value of accomplishments.

Automated Feedback in Quizzes	Supports self-regulation through quick feedback.	Promotes a clear perception of performance.	Strengthens commitment by taking effort into account.
Level system (skills)	Structures learning into attainable steps.	Shows the benefits associated with progressive mastery.	Gives meaning to the learning path.
Gamification with plugins (e.g. Level Up)	Encourages effort by making progress visible.	Rewards every step taken.	Brings fun and meaning to the process.
Activity "Workshop" (peer review)	Builds trust through peer input.	Offers recognition by the community.	Gives meaning to evaluation through the co-construction of knowledge.
Multimodal resources (videos, PDF, audio)	Support understanding through different channels.	Improve accessibility to information.	Meet individual learning preferences.
Thematic discussion forum	Allows you to formulate your thoughts and receive feedback.	Highlights the value of participation.	Creates a sense of belonging and fosters a sense of contribution.
"Homework" activity with topic of your choice	Builds confidence by customizing the task.	Links performance to valuable production.	Increases motivation through self-interest.
Customizable database	Encourages active contribution and knowledge building.	Allows you to identify the forces related to each input.	Enhances the learners' productions.

3.2. Participants

3.2.1. Sampling procedure

The sample was constituted by simple random sampling from the official lists of high school students at a Moroccan public school. This choice was intended to reduce selection bias and ensure minimum representativeness of the target population. The inclusion criteria were as follows: being enrolled in the final year of high school, having taken French as a compulsory subject, and having parental permission to participate in the study. No additional exclusion criteria were applied in order to maintain the heterogeneity of the group.

3.2.2. Group allocation

The lists of students used to form the sample came from Massar. This national school management system ensures that students are distributed evenly across classes according to their level (high achievers, average, and struggling). Using these homogeneous lists, the groups were formed according to a randomization principle: the 72 students selected were randomly divided into two equivalent groups, with 36 in the experimental group and 36 in the control group. This dual procedure, involving initial balancing guaranteed by Massar and manual randomization during assignment, ensures initial comparability between the groups and thus reinforces the internal validity of the study.

- Experimental group: made up of 36 learners, and subject to an adaptive assessment via Moodle.
- Control group: made up of 36 learners, and assessed using standardised and identical activities for all.

3.3. Quantitative phase

In the quantitative phase, the study adopted a pre-test/post-test experimental design with parallel groups. Two equivalent groups (experimental and control), formed by randomization, were subjected to different assessment methods: adaptive assessment via Moodle for the experimental group and standardized assessment for the control group. Academic performance was measured using a diagnostic pre-test and a final post-test to compare learning progress between the two conditions. The use of this experimental sub-design made it possible to control for initial differences between groups and rigorously evaluate the effect of the digital intervention.

3.4. Qualitative phase

Only students in the experimental group (n = 36) completed the motivational questionnaire, which was integrated into the Moodle platform at the end of the experiment. This restriction stems from the fact that the digital device was the main object of qualitative analysis (perceptions related to adaptability and gamification). For the control group, no qualitative data was collected, with analyses limited to academic results.

3.5. Variables studied

The pedagogical system integrates French language activities from the Moroccan curriculum. Three dimensions from the theory of value and expectation were measured:

- Expectation: perception of the ability to succeed in the tasks proposed.
- Instrumentality: perception of the usefulness of evaluation to achieve a goal (academic success, personal improvement).
- Valence: The degree of importance or value placed on the assessment.

These variables were assessed using a self-report questionnaire, administered after the experiment. The analysis of the evolution of these components enables the evaluation of the motivational impact of adaptive assessment. To illustrate the three dimensions of expectancy-valence theory, a few examples of items are presented below, each question is rated using a Likert scale:

- Expectancy (confidence in one's ability to succeed)
 - I feel capable of successfully goals completing the activities proposed in this module.
 - Even if the exercises are difficult, I think I can complete them successfully.
- Instrumentality (perception of the usefulness of effort)
 - The effort I put into these tasks will help me improve my academic performance.
 - Completing these activities is important for achieving my academic.
- Valence (interest and importance attributed to the activities)
 - The activities in this module are important and useful to me.
 - I want to actively participate in these activities because I find them enriching.

3.6. Data collection tools

All the data for the study were collected through a Moodle platform, which served as the primary support for disseminating activities and collecting learning traces. The instruments varied somewhat depending on whether the subjects were in the experimental or control groups. For the experimental group, the data consisted of: results of assessment activities extracted from the Moodle gradebook, indicators of evolution (completion of activities, participation, attempts) based on automatically generated reports, and a motivational questionnaire based on the theory of value and expectation, carried out after the experiment in Moodle itself. The motivational questionnaire was developed entirely on the basis of the conceptual and empirical foundations of expectancy-valence theory. The literature served as a theoretical framework to guide the formulation of questions relating to the three dimensions of the model (expectancy, instrumentality, valence). The tool was then adapted to the Moroccan context using a translation and back-translation procedure, and validated by a committee of experts to ensure its clarity, cultural relevance, and content validity. A pre-test phase was conducted with 12 students from the same grade level, but not included in the final sample, to verify the clarity of the items and adjust the wording as necessary. Exploratory factor analysis conducted on this pre-test confirmed the expected tripolar structure (expectancy, instrumentality, valence). The internal reliability of the tool was deemed satisfactory, with a Cronbach's alpha of 0.82 for the "expectancy" dimension, 0.85 for "instrumentality," and 0.81 for "valence." The overall scale had a coefficient of 0.86, indicating high internal consistency. The questionnaire was administered in the form of a Likert scale ranging from ("strongly disagree") to ("strongly agree"). The motivational components (expectancy, instrumentality, valence) were measured only in the post-test, at the end of the experiment. This methodological choice can be explained by organizational and pedagogical constraints related to the school calendar and the management of assessment time. Administering an additional pre-test questionnaire would have lengthened the duration of the sessions and risked demotivating or tiring the learners, thereby compromising the reliability of the responses.

Furthermore, the main objective of the study was to analyze the immediate impact of the adaptive system on perceived motivation, which justifies the focus on post-experimental measurement. Nevertheless, this decision constitutes a recognized methodological limitation, and future work will incorporate a pre-test/post-test protocol in order to better isolate the effects of the digital system from initial individual characteristics. For the control group, the data collected include the scores obtained in the initial diagnostic test and the results of the classic controls carried out according to standard evaluation methods.

3.7. Implementation of the assessment scenario in the Moodle digital environment

After an initial diagnostic assessment, learners in the experimental group are automatically assigned to one of three difficulty levels (beginner, intermediate, advanced) for each activity. This process is managed without direct intervention from the teacher, thanks to the access restriction algorithms and completion conditions offered by Moodle. Table 2 summarises the pedagogical scenario of all the sessions integrated into the adaptive assessment system on Moodle.

Table 2. Pedagogical scenario of the adaptive assessment system

Session / Sequence	Educational objective	Strong point	Differentiated levels	Evaluation methods	Passing Criteria
Session 1	Identify the initial level of learners	Diagnostic test	Undifferentiated	Online test (MCQ, comprehension)	Automatic D/M/A distribution according to score
Session 2	Reading and understanding a literary text	Guided reading and quiz	D: simple questions M: MCQ + vocabulary A: inferences + criticism	Formative Assessment (Quiz + Feedback)	≥ threshold set to move to the next level
Session 3	Produce a structured oral text	Audio recording (oral situation)	D: keywords / sentences M: guided presentation A: free reasoned production	Self-assessment + criterion-based grid	Validation of the previous level
Session 4	Produce an argumentative paragraph	Written Writing	D: simple sentences M: structured plan A: complete argumentation	Digital handing over + teacher annotation	Minimum score achieved or automatic remediation
Session 5	Analysing an excerpt from a novel	Literary Analysis Questionnaire	D: Fact-finding M: Interpretation A: Literary criticism	Adaptive Quiz + Justification	Passage conditioned by previous score
Session 6	Consolidate what has been learned (remediation or deepening)	Targeted activities by level	D: Support exercises M: reformulation A: critical extension	Adapted training activities	Completion required for module validation
Session 7	Summative evaluation	Final test (written + oral + analysis)	Unique final course	Automatic grading + teacher appreciation	Final result + progress report

Each activity is scripted to allow a personalized progression: access to an activity depends on the score obtained in the previous activity. Figure 6 shows an example of a Moodle activity designed in three levels.



Figure 6. Example of an activity designed in three different levels of difficulty

4. Analysis and discussion of results

The results of the experiment showed significant differences between the two groups of learners, in favour of those who benefited from adaptive assessment. The experimental group improved its academic performance, both in terms of progression from pre-test to post-test or compared to the standard assessment group. Figure 7 illustrates the evolution of the experimental group's results between the diagnostic test and the final assessment, presenting the means, standard deviations, and dispersion of scores. It highlights a significant performance improvement, with scores that are generally more consistent and centered around the mean. Figure 8 presents the results of the control group according to the same pre-test/post-test comparison. Although progress is observed, the scores remain lower overall and more dispersed than those of the experimental group, reflecting greater variability in learning.

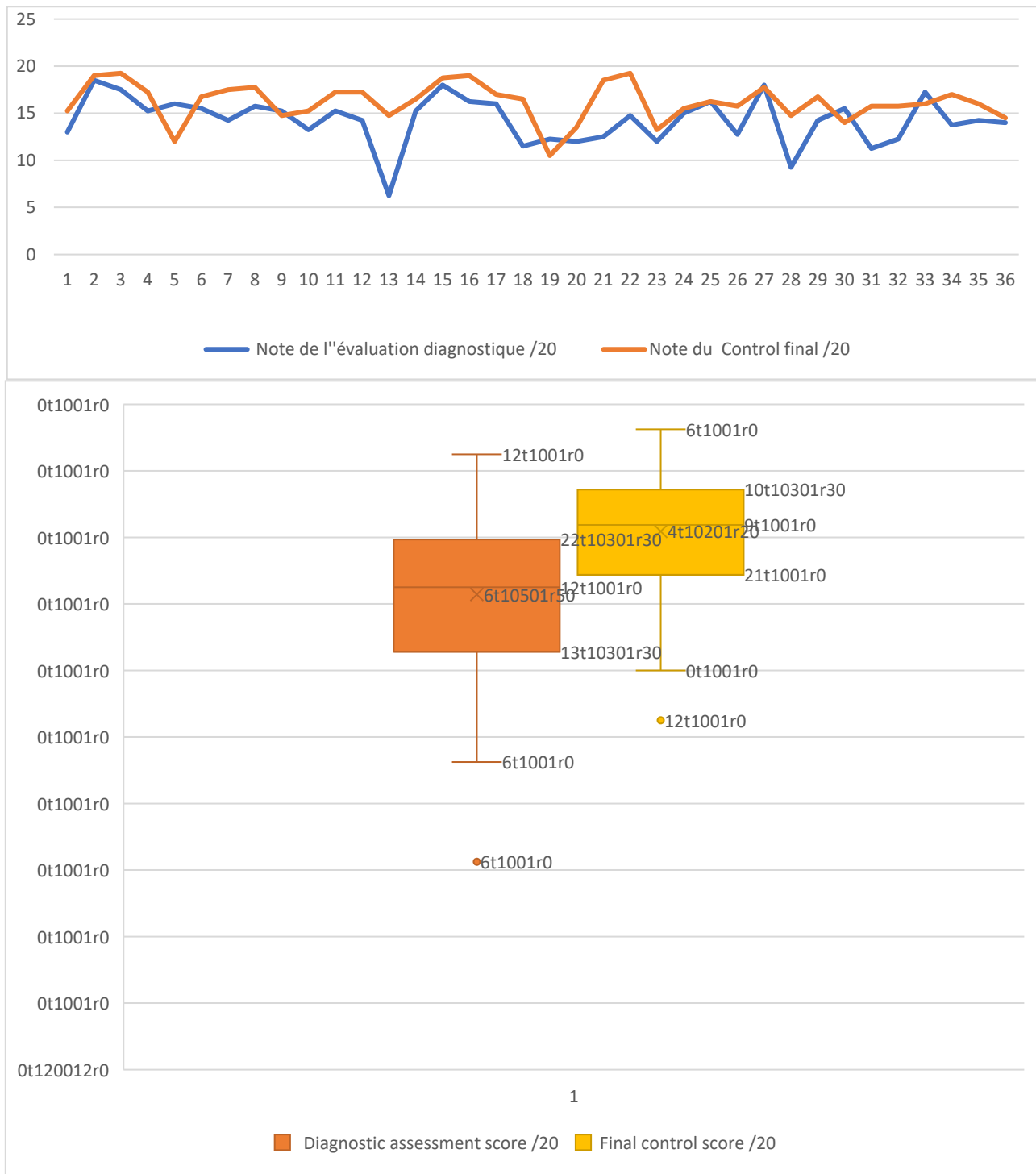


Figure 7. Graphical representation of the scores of the experimental group

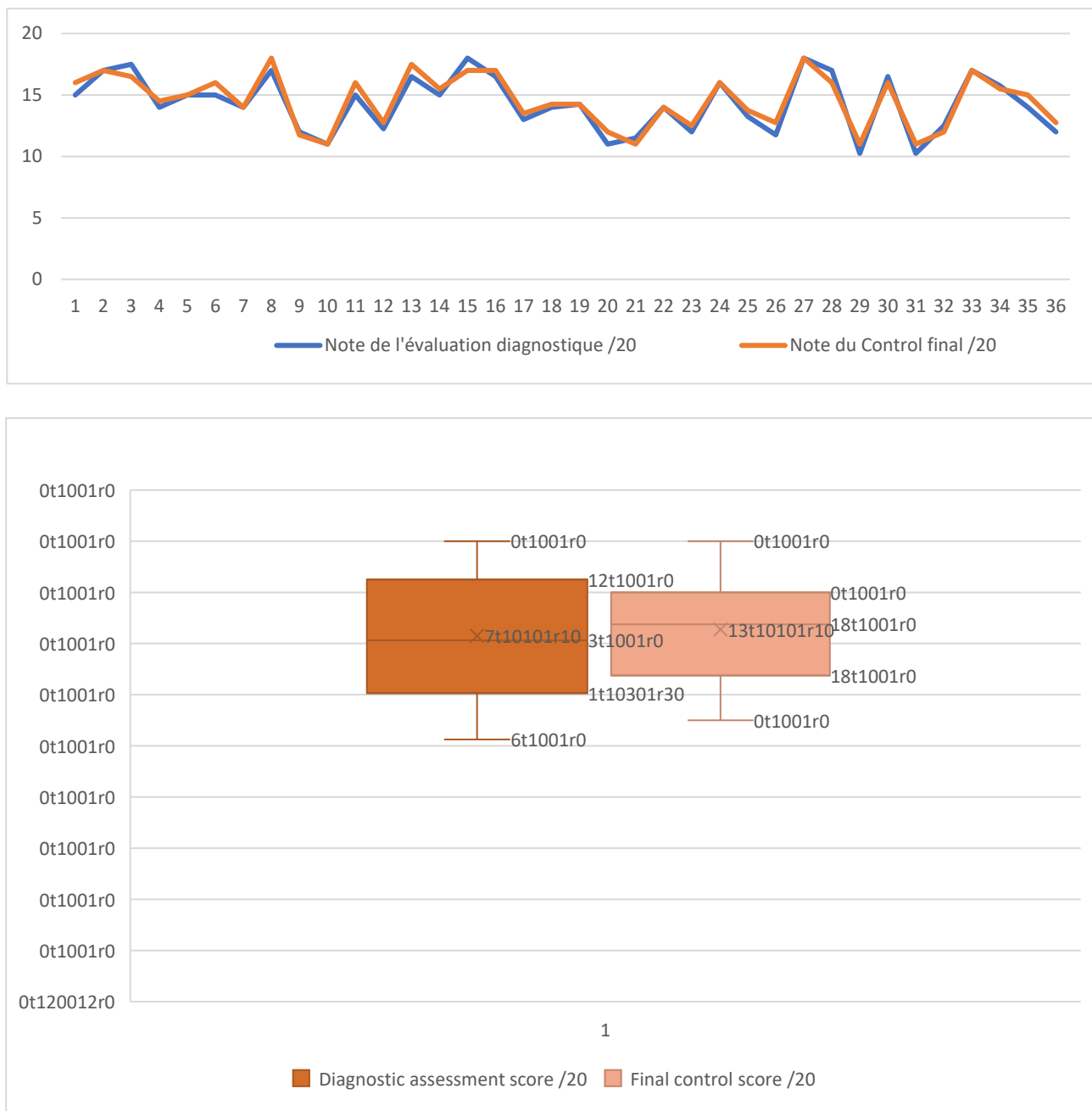


Figure 8. Graphical representation of the scores of the control group

Descriptive analysis reveals that the experimental group achieved a significantly higher mean ($M = 16.52$; $SD = 1.60$) compared to the control group ($M = 14.51$; $SD = 2.18$). The Student's t-test for independent samples confirms this difference, $t(66) = 4.47$, $p < 0.001$, with a large effect size (Cohen's $d = 1.05$), indicating a substantial impact of the adaptive device on academic performance.

This difference in performance appears to be directly related to the nature of the assessment system, specifically to the ability of adaptive assessment to adjust the level of difficulty of tasks, provide immediate personalized feedback, and encourage autonomous and targeted progression. These findings are consistent with the results of previous studies on the impact of adaptive environments on learner success (Chemsi et al., 2020). This is explained by the logic of the adaptive system, which increasingly aligns the level of competence of an individual student with the complexity of the assessment tasks. This principle is at the heart of differentiated teaching (Wormeli, 2023) (Van Geel et al., 2019), but also Universal Design for Learning (UDL), which advocates for variability in the means of representation, engagement and expression to meet the needs of all

learner profiles (Hehir, 2002) (Delaney & Hata, 2020). Thanks to Moodle's personalized approach, students were able to interact with their tasks at their own pace of progress. This match between perceived difficulty and actual level of difficulty was instrumental in shaping the perception of competence, which, according to value and expectation theory, is a key determinant of motivation. Analysis of the responses to the question on the effort made to familiarize oneself with the Moodle platform reveals a diversity in learners' perceptions (see Figure 9).

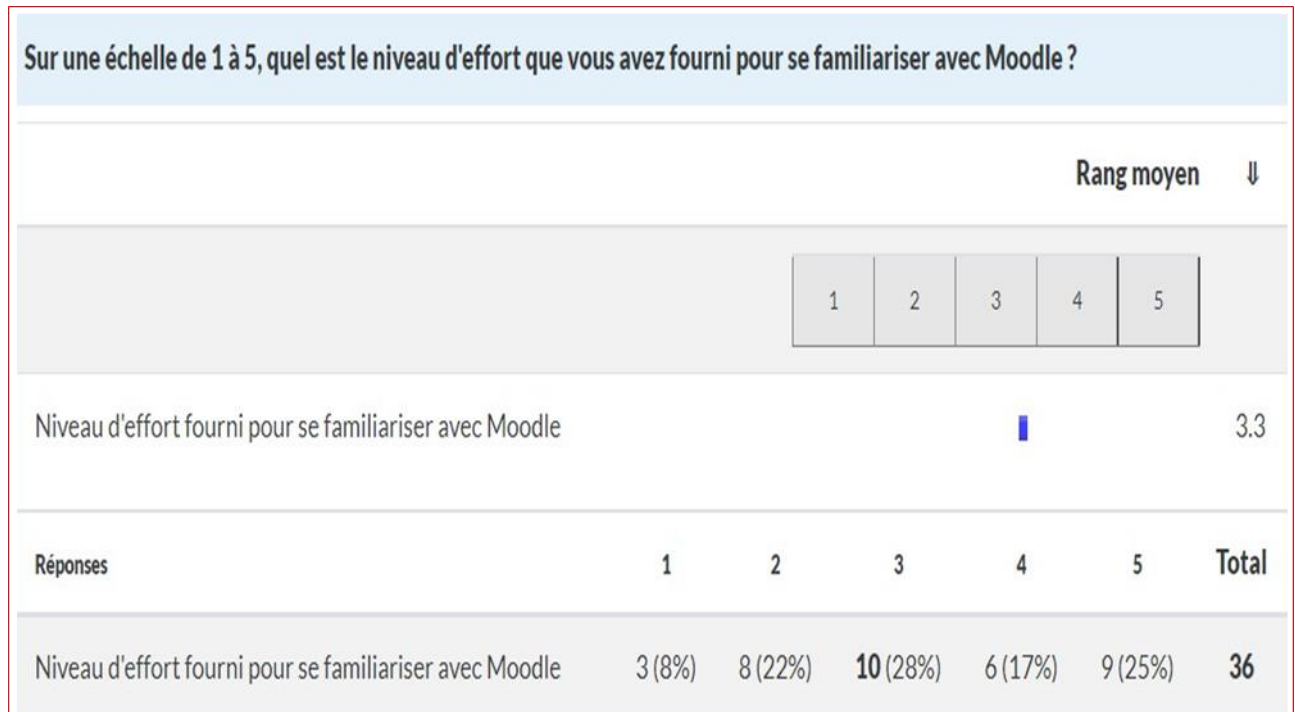


Figure 9. Responses regarding the effort made to become familiar with Moodle

In fact, 42% of students felt that they had to make a significant or very significant effort, 28% an average effort, and 31% a low or very low effort. This balanced distribution indicates that, although some learners encountered initial difficulties, these did not constitute an obstacle to overall adherence to the system. On the contrary, the perceived effort seems to have been interpreted as a normal adaptation phase to a new digital learning environment. Learners frequently experienced successful events, which reinforced their expectations of success and engagement in learning. Such an evaluative environment is considered benevolent and structuring, and goes against traditional normative assessments, which generate discouragement among the most fragile learners. By elsewhere, the integration of the system on Moodle has had significant repercussions on the organization of teaching work. The automation of feedback, conditional access management, completion monitoring, and the centralization of training data have allowed for significant time savings on technical evaluation tasks. These digital features support a streamlining of processes, as highlighted by some previous work (Alves et al., 2013) (Kapsargina & Olentsova, 2020), which highlight the interest of LMS platforms in reducing the workload related to correction, editing results, or managing sequences. Freed from certain repetitive tasks, the teacher can thus refocus on pedagogical follow-up and the qualitative analysis of pathways. Finally, the analysis of the data from the satisfaction questionnaire shows a strong support of students for the proposed system. Of the 36 learners, 35 (97.2%) expressed their overall satisfaction (see Figure 10).

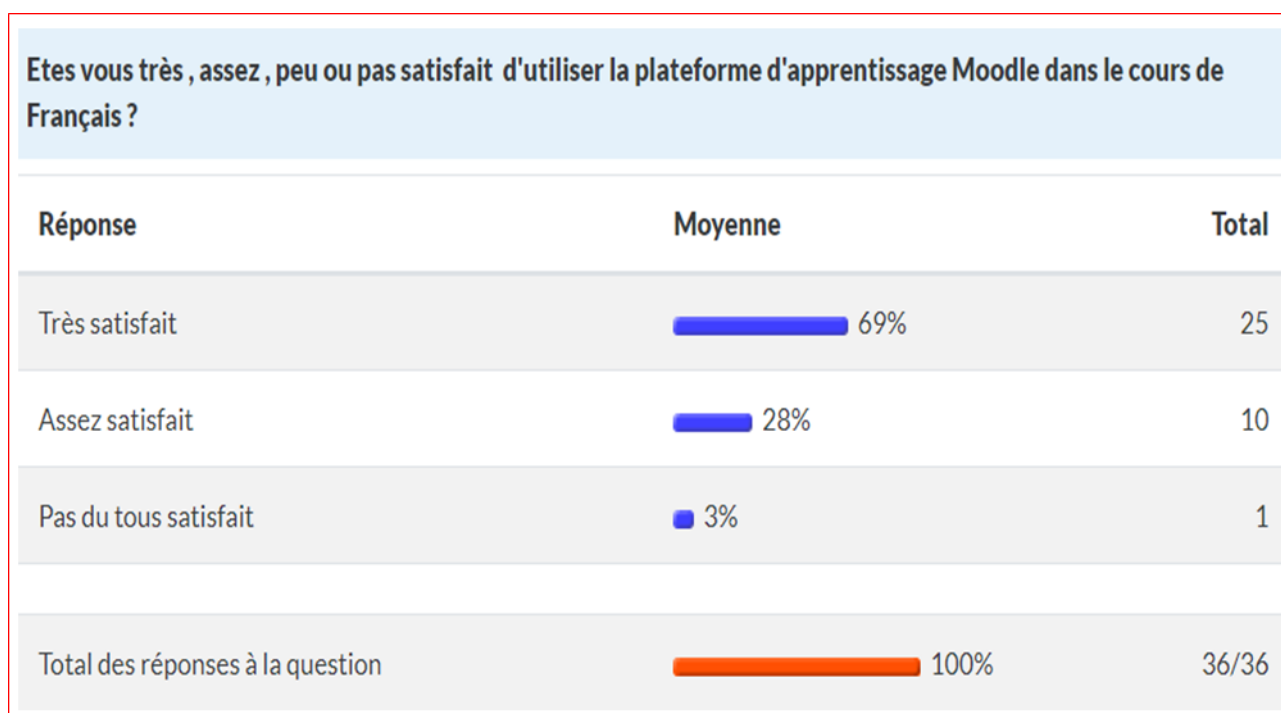


Figure10. Representation of responses on overall satisfaction with the use of Moodle

This high satisfaction rate reflects a very strong valence: learners attribute a positive value to their learning experience via Moodle, which reflects a high level of intrinsic motivation. The feeling of having made progress, as well as comments on the clarity, relevance and value of the activities, suggest that adaptive assessment was perceived as a lever for motivation. This perception is in line with the conclusions of several studies that have highlighted the impact of customizable digital environments on learners' motivation and satisfaction (Gamage et al., 2022) (Banes et al., 2020). Indeed, Moodle offers pedagogical scripting possibilities that make evaluative tasks more engaging, interactive, and better aligned with student expectations. To assess learners' propensity to recommend the use of the Moodle platform, we calculated a recommendation index based on the responses collected on a scale of 0 to 10 (see Figure 11).

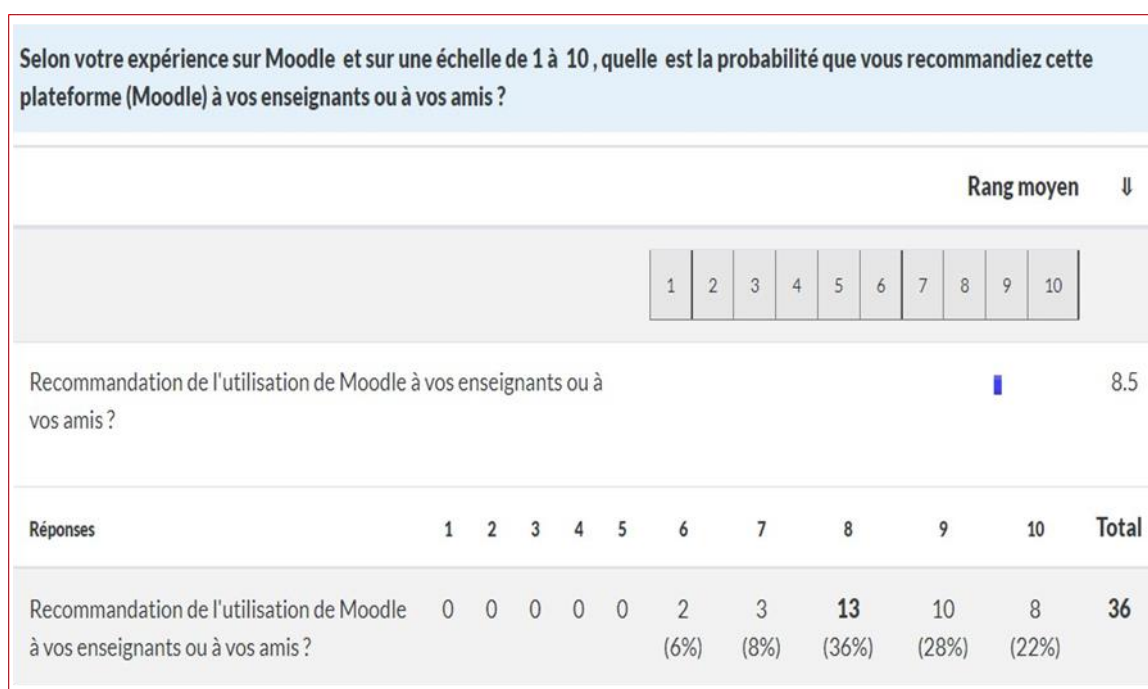


Figure 11. Responses that concern Moodle's recommendation to other people

This method is based on a standard categorization of responses according to three profiles:

- Answers between 0 and 6 represent the detractors, who are against.
- Answers 7 and 8 represent the passives, is neither against nor for.
- Answers 9 and 10 represent the promoters, who are in favour.

A net score of 44% indicates a good willingness to recommend Moodle, which can be interpreted as an index of trust and lasting satisfaction. This reinforces the instrumentality component, as learners perceive the platform as useful, functional, and beneficial for their learning. Overall, the results confirm that implementing an adaptive assessment pathway, supported by differentiated instructional design, helps improve learner performance, boost motivation, optimize teacher workload, and increase satisfaction with assessment. These findings prompt us to reconsider the role of assessment in a digital context, no longer as a mere measurement tool, but as a strategic component of the learning process. In this context, the gamification mechanisms integrated into Moodle deserve special attention, as they bring specific added value to the system. Analysis of these mechanisms reveals their distinct contributions to the motivational components of expectancy-valence theory. The badge system primarily operates through instrumentality, making visible the link between effort and recognition. Although the literature emphasizes that badges can strengthen emotional and social engagement, more recent studies suggest that their effect is not always systematic, with some badges having a negligible impact on motivation or performance (Kyewski & Krämer, 2018). The Level Up extension, based on level-based progression, supports expectancy by offering a structured and gradual framework in which learners perceive their success as achievable. Studies report that this type of gradual progression reinforces motivation by consolidating the perception of increasing competence (Barata et al., 2015). Valence is stimulated by the fun and personalized aspects of these mechanisms, promoting interest and enjoyment in the learning process. Previous studies confirm that gamification can increase motivation, engagement, and performance in various educational contexts (Manzano-León et al., 2021). However, the effects of these tools are not uniform: they tend to vary depending on the age and profile of the learners. Some students who are more independent or intrinsically motivated benefit less from them, suggesting the need to adapt gamification strategies to the characteristics of the target audience (Li et al., 2023). Although the results obtained highlight a positive effect of the adaptive system on learners' motivation and academic performance, a significant limitation of the study is that motivational components were only measured in the post-test. This lack of initial data makes it impossible to confirm with certainty that the observed improvement is exclusively due to the adaptive system, independent of the individual characteristics of the students. Future research should incorporate a longitudinal pre-test/post-test design in order to better control for this variable and refine the assessment of the motivational impact.

5. Conclusion

This research investigated the impact of an adaptive assessment device, scripted within the Moodle digital environment, on learners' motivational determinants, drawing on value and expectancy theories. The experiment, based on personalizing learning paths and automating activities through access and completion conditions, enabled the adaptation of tasks to students' profiles. The results reveal a significant impact on academic performance, as well as a strengthening of the three motivational components: expectation, instrumentality, and valence. The integration of Moodle thus appears not only as a technological lever, but also as a pedagogical tool serving differentiation, equity, and motivation. Beyond the immediate results, this study highlights the potential of adaptive assessments to transform assessment practices by supporting learner engagement, regulation and success. It highlights the need to train teachers in pedagogical scripting on LMS platforms, promoting a culture of differentiated formative assessment and ensuring technical

and pedagogical support during implementation. The explicit integration of motivational principles in the design of digital resources is also a major lever of commitment. Ultimately, future research should extend to other disciplines and educational levels to test the model's transferability, while also exploring its lasting effects on motivation and engagement. The use of artificial intelligence to refine the individualization of learning paths, as well as the study of links between motivation, self-regulation and cross-curricular skills, represents a promising avenue for consolidating and enriching the contributions of this experiment.

6. Suggestion

This research suggests that it would also be beneficial for educational institutions to promote the establishment of professional communities of practice, where teachers can share their adaptive assessment scenarios, collectively analyze the challenges encountered, and co-construct teaching resources tailored to the diversity of learner profiles. From a scientific perspective, future research would benefit from examining the long-term effects of these measures on the development of students' autonomy, their resilience in the face of learning difficulties, and the evolution of their engagement in contexts characterized by high heterogeneity or socio-educational vulnerabilities.

Declarations

Author Contributions. All authors have read and approved the published on the final version of the article.

Conflicts of Interest. The authors declare that they have no conflict of interest.

Funding. This research received no funding.

Ethical Approval. Participation was voluntary and required the written consent of both the students and their parents/guardians. The study complied with ethical guidelines governing research in the field of education, particularly with regard to the protection of students' personal data. The data collected (students' grades on the Moodle platform) were anonymized before being analyzed and published. No names, personal identifiers, or other information that could identify the participants were disclosed, thereby ensuring confidentiality and protecting their privacy.

Data Availability Statement. The data can be provided by the corresponding author upon request.

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