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THE 4P MODEL: A TYPOLOGY OF INDICATORS FOR PRIMARY EDUCATION EASSESSMENT DASHBOARDS[i]

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Abstract:
The growing integration of digital technology in Moroccan education generates massive data, raising questions about its effective use. This research examines the relevance of eAssessment dashboards for primary teachers, focusing on adoption factors and indicators that align with pedagogical decision-making. Using a mixed-methods approach with 61 teachers in Marrakech-Safi, the study combined quantitative acceptance measures with a lexicometric analysis of social representations. Results highlight a mixed adoption rate (44.3%) and reveal a "training paradox": trained teachers are more skeptical than their untrained colleagues, questioning the adequacy of current training programs. Qualitatively, teachers reject purely accounting-based views of eAssessment in favor of competence development. The article proposes the 4P model, structuring essential indicators into four dimensions: monitoring the Process (progress over time), validating the Profile (competence status), objectifying Performance (raw data), and Positioning (classroom context). It concludes that cognitive ergonomics and diachronic visualization are essential for transforming these tools into effective levers for pedagogical regulation.

Keywords: indicators, dashboards, eAssessment, typology, primary education

Résumé :
L'intégration croissante du numérique dans le système éducatif marocain génère une massification des données scolaires, posant le défi de leur exploitation pédagogique. Cette recherche interroge la pertinence des tableaux de bord d'e-évaluation pour les enseignants du cycle primaire : au-delà de la disponibilité technique, quels sont les

[i] LE MODÈLE 4P : UNE TYPOLOGIE D'INDICATEURS POUR LES TABLEAUX DE BORD D'E-ÉVALUATION DANS L'ENSEIGNEMENT PRIMAIRE

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déterminants de leur adoption et quels indicateurs répondent aux besoins réels du métier ? Adoptant une approche méthodologique mixte, cette recherche a été menée auprès de 61 enseignants de l'AREF de Marrakech-Safi. Le protocole a combiné une mesure quantitative de l'adhésion avec une analyse lexicométrique (analyse de similitude) des représentations sociales des enseignants. Les résultats mettent en évidence un taux d'adhésion mitigé (44,3 %) et révèlent un « paradoxe de la formation » contre-intuitif : les enseignants formés à l'e-évaluation manifestent un scepticisme plus marqué que leurs collègues non-initiés, interrogeant ainsi l'adéquation des dispositifs de formation actuels. Sur le plan qualitatif, l'analyse montre que les enseignants rejettent une vision purement comptable de l'e-évaluation au profit d'une approche centrée sur le développement des compétences. Cette étude aboutit à la proposition d'une typologie fonctionnelle, le Modèle des 4P, structurant les indicateurs essentiels selon quatre dimensions : le suivi du Processus (progression temporelle), la validation du Profil (statut de la compétence), l'objectivation de la Performance (données brutes) et le Positionnement (dans le contexte de la classe). Elle conclut que l'ergonomie cognitive et la visualisation diachronique constituent des conditions indispensables pour transformer ces outils en véritables leviers de régulation pédagogique.

Mots-clés : tableaux de bord, e-évaluation, adoption technologique, besoins métier, enseignement primaire, Maroc

1. Introduction

The integration of digital technologies into contemporary education systems is no longer limited to modernizing equipment; it involves a total reconfiguration of teaching practices, particularly in the areas of learning management and assessment. In the Moroccan context, this change is part of a reform process in which the use of Information and Communication Technologies for Education (ICTE) is seen as a lever for innovation and performance (El Idrissi & Larhrissi, 2025). This transition, supported by the National Charter for Education and Training (NCET), requires teachers to move beyond traditional assessment and adopt more flexible formative approaches. These new practices must be based on the analysis of learning traces generated during digital interactions in order to support differentiated pedagogy focused on the development of competences (Elamdhi & Lakhmour, 2022).

However, the increasing digitization of learning environments generates a quantity of data that can paradoxically become a source of cognitive overload. The challenge no longer lies in collecting information but in transforming it into actionable knowledge for the classroom. This is where learning dashboards come in. These visualization tools are designed to provide an ergonomic representation of performance indicators, making it easier to identify learning trends and student difficulties (Jivet *et al.*, 2018; Kasepalu *et al.*, 2022).

As Duval *et al.* (2011) and Schwendimann *et al.* (2017) point out, the relevance of graphical representations is essential to ensure that these data effectively support

educational decision-making and the individualization of learning paths (Ouatiq *et al.*, 2022; Wang *et al.*, 2023). However, the implementation of these technologies is not a given. While the theoretical promises are appealing, the reality on the ground is marked by disparities in usage. According to the Technology Acceptance Model (TAM), the sustainable adoption of these tools depends intrinsically on their ease of use and their perceived usefulness by practitioners (Davis, 1989; Scherer *et al.*, 2019). However, the complexity of the tools or lack of training can be barriers to their adoption (El Janous *et al.*, 2022). There is therefore a notable empirical gap: "Which typology of indicators fosters effective appropriation of e-Evaluation dashboards by primary school teachers in Morocco?"

This research aims to explore how primary school teachers in the Marrakech-Safi region perceive dashboards and to establish a typology of the indicators they consider essential, in order to align technological design with local educational requirements and promote the successful integration of eAssessment.

2. Literature Review

The process of integrating digital technologies into education involves a profound reconfiguration of teaching practices, learning management, and assessment methods. In the Moroccan context, this evolution is part of ongoing reforms to the education system aimed at focusing teaching on competences' development and promoting the use of ICT in education as a lever for innovation and performance (El Idrissi & Larhrissi, 2025). The competences-based approach, supported by the NCET, requires more flexible, personalized, and contextualized formative assessment processes. These processes are increasingly based on the analysis of learning traces generated during interactions with digital content and tools (Elamdhi & Lakhmour, 2022).

2.1 eAssessment Dashboards as Visualization and Regulation Tools

The use of eAssessment dashboards is emerging as a tool that can provide a summary visualization of learning data, facilitate educational decision-making, and support the individualization of learning paths (Ouatiq *et al.*, 2022; Wang *et al.*, 2023). These tools provide a clear and dynamic representation of performance indicators, progress, quality of work, and behavior, thereby facilitating the identification of learning trends, difficulties, and successes (Kasepalu *et al.*, 2022; Jivet *et al.*, 2018). Thus, a well-designed implementation of these systems can ensure the monitoring of academic competence development (Cisel & Baron, 2019).

The design of the indicators for these digital dashboards is based on works in educational visualization and Learning Analytics (LA), which emphasizes the importance of ergonomics, clarity, and relevance of graphical representations to ensure the effective usefulness of the tool for both teachers and students (Duval, 2011; Jivet *et al.*, 2017). In this context, the integration of color codes, interactive graphics, and progress matrices responds to the need to make information accessible, interpretable, and immediately usable in educational activities (Black *et al.*, 2004; Black & William, 2018).

However, the technical and ergonomic relevance of these tools alone cannot guarantee their effective adoption in the field. To understand the transition from tool availability to actual use, it is essential to examine the psychosocial determinants that influence teacher acceptance.

2.1 Technological Acceptance of eAssessment Dashboards

The theoretical framework used to understand the acceptance and use of digital systems in education is mainly structured around the Technology Acceptance Model (TAM). This model stipulates that the adoption of a technology is conditioned by two determining factors: the perception of its usefulness and its ease of use (Davis, 1989; Scherer *et al.*, 2019). Indeed, the more a tool is perceived as bringing real added value to the teacher's work, particularly in terms of effective monitoring, helping to personalize activities, and facilitating educational decisions, the more likely it is to be integrated into their practices on a long-term basis (Sclater *et al.*, 2016; Van Leeuwen *et al.*, 2013). Conversely, the ease of use refers to the degree of effort required by teachers to understand and master the device. In this sense, the lack of training, the complexity of tools, or the insufficient technical support are considered as barriers to their adoption (El Janous *et al.*, 2022; Elamdhi & Lakhmour, 2022).

The perception of usefulness and the ease of use, therefore, directly influence the intention and degree of the adoption of digital tools, whether they are learning platforms or eAssessment systems (Ghassoub & Merkazi, 2017; Wang *et al.*, 2023). In addition, more recent models such as the Unified Theory of Acceptance and Use of Technology (UTAUT) also incorporate organizational and technical conditions, training, and digital culture as factors that can facilitate or hinder adopting digital tools (Venkatesh *et al.*, 2003). In Morocco, the application of this model to school information systems confirms the relevance of these contextual determinants (Akkioui, 2022).

While these theoretical models outline the broad dimensions of acceptance, other research has focused on identifying operational levers specific to the teaching profession. Studying the adoption then shifts to the concrete articulation between individual competences and the institutional environment.

2.3 Contextual Factors Influencing the Adoption of eAssessment Tools

While the work of Ouatiq *et al.* (2022) and Kasepalu *et al.* (2022) confirms that the level of acceptance of eAssessment is intrinsically linked to the specific training received, this factor should not be viewed in isolation from the teacher's profile. The professional experience and the organizational context are key determinants of the predisposition to integrate these tools. This is particularly evident among mid-career teachers: with a developing digital culture and faced with growing needs for pedagogical differentiation, they show a greater openness to adopting new tools (Wang *et al.*, 2023; OCDE, 2024).

Finally, beyond individual acceptance, the literature emphasizes the importance of the institutional framework (policies, support, and recognition) in ensuring sustainable integration (Scherer *et al.*, 2019). The success of this transformation does not depend solely on the technical quality of the tools and indicators; it depends just as much on the

education system's ability to equip, support, and value teachers' reflective practices (Sclater *et al.*, 2016; Van Barneveld *et al.*, 2012).

3. Material and Methods

3.1 Research Design and Sampling

To answer our research question, we opted for a mixed methodological approach. This approach allowed us to combine quantitative measurement of eAssessment dashboards' acceptance with a qualitative exploration of indicator needs. We conducted our investigation with a sample of 61 primary school teachers from 8 provincial directorates under the Regional Academy of Education and Training of Marrakech-Safi (Table 1). Although the size of this sample is modest, its stratification ensures geographical and social representativeness that is relevant for exploratory research.

Table 1: Distribution of respondents across Marrakech-Safi provincial directorates

Provincial directorate	Frequency	Percentage (%)	Cumulative percentage
Chichaoua	3	4.9%	4.9%
Elhaouz	4	6.6%	11.5%
Essaouira	5	8.2%	19.7%
Kelaat Sraghna	8	13.1%	32.8%
Marrakech	3	4.9%	37.7%
Rhamna	23	37.7%	75.4%
Safi	13	21.3%	96.7%
Youssoufia	2	3.3%	100.0%
Total	**61**	**100.0%**	

3.2 Sample Characteristics

The sociodemographic analysis of respondents reveals a male predominance (62.3% men against 37.7% women; see Table 2) and indicates a relatively experienced population. With an average age of 39.6 years and an average of 13.7 years of professional experience, the sample demonstrates a professional maturity that serves as a methodological asset, ensuring that responses are grounded in established classroom practice.

Table 2: Demographic characteristics of the respondents

		N	Percentage (%)	Cumulative (%)	Mean	Median	SD	Min	Max
Age		61	-	-	39.3	39	7.94	25	58
Professional experience		61	-	-	13.7	13	8.85	2	37
Gender	Female	23	37.7%	37.7%	-	-	-	-	-
	Male	38	62.3%	100.0%	-	-	-	-	-

However, a contrast emerges when examining teachers' digital skills in eAssessment (Table 3): only 16.4% of teachers surveyed reported having received specific training in eAssessment. This rate of initial or continuing training is a critical contextual variable for interpreting our results.

Table 3: Distribution of the respondents according to training in eAssessment

Training in eAssessment	Frequency	% of Total	Cumulative %
No	51	83.6%	83.6%
Yes	10	16.4%	100.0%

3.3 Data Collection and Analysis Procedure

We collected data using a questionnaire comprising four items. We measured the perceived effectiveness of the dashboards using a five-point Likert scale ranging from "Very low" to "Very high." In addition, we included open-ended questions to give teachers the opportunity to freely explain the indicators and features they consider to be priorities for their evaluation practice.

We processed the data using a two-step procedure. On a quantitative level, in addition to the "Top-2-Box" method used to objectively measure the perceived usefulness (4 and 5 Likert-scale scores), we used inferential statistics to test some hypotheses. The independence between variables was verified using Pearson's chi-square test, supplemented by Cramer's V calculation to measure the strength of the associations observed. Qualitatively, the corpus of open-ended responses was processed using IRaMuTeQ software-assisted lexicometric analysis. This approach enabled us to go beyond thematic content analysis to perform a similarity analysis (the graph method). This technique, based on graph theory, allowed us to visualize the structure of social representations and the strong connections (co-occurrences) between concepts, leading to the identification of the lexical communities that structure our model.

4. Findings

4.1 Teachers' Perception of the Effectiveness of Dashboards

Our analysis of responses regarding the usefulness of dashboards for monitoring skills reveals a divided, even polarized, stance among teaching staff. The overall approval rate (Table 4), calculated using the Top-2-Box method (scores 4 and 5 on a Likert scale), stands at 44.3%. Specifically, 26.2% of participants attribute high effectiveness and 18% very high effectiveness to these tools. This result reflects a genuine, but not majority, recognition of the educational potential of data visualization. Opposing this group of supporters is an almost equivalent bloc of skeptics: 32.8% of respondents rate the effectiveness of these tools as low (16.4%) or very low (16.4%). Between these two extremes, nearly a quarter of teachers (23%) adopt a neutral or wait-and-see position, suggesting a need for concrete evidence before adoption.

Table 4: Distribution of teachers' perceptions of the effectiveness of dashboards

Percieved effectiveness	Frequency	Percentage	Valid %	Cumulative %
Very low	10	16.4	16.4	16.4
Low	10	16.4	16.4	32.8
Neutral	14	23.0	23.0	55.7
High	16	26.2	26.2	82.0
Very high	11	18.0	18.0	100.0

4.2 Relationship Between Professional Experience and Perception of Effectiveness

An examination of the descriptive statistics (Table 5) reveals an interesting trend linking seniority to perception of the tool. The most skeptical teachers (those who rated effectiveness as "Very low") are, on average, the least experienced, with an average seniority of 9.9 years (SD = 8.54). Conversely, groups with a positive perception show greater professional maturity: an average of 14.75 years for those who rate effectiveness as "High" and 15.36 years for "Very high."

Table 5: Statistics on professional experience according to perceived level of effectiveness

Perceived effectiveness		Professional experience	
	N	Mean	SD
Very low	10	9.90	8.54
Low	10	16.30	9.68
Neutral	14	12.21	9.29
High	16	14.75	6.88
Very high	11	15.36	10.36

The scatter plot (Figure 1) visualizes the distribution of effectiveness scores against years of professional experience. The regression line exhibits a slight upward slope, suggesting a modest positive relationship where greater experience correlates with marginally higher perceived effectiveness. However, the confidence interval (the shaded blue area) widens significantly at both ends of the experience spectrum, indicating high variability in the data. This visual dispersion confirms that while a trend exists, experience alone is not a definitive predictor of a teacher's attitude, aligning with the descriptive statistics that show high standard deviations across all groups.

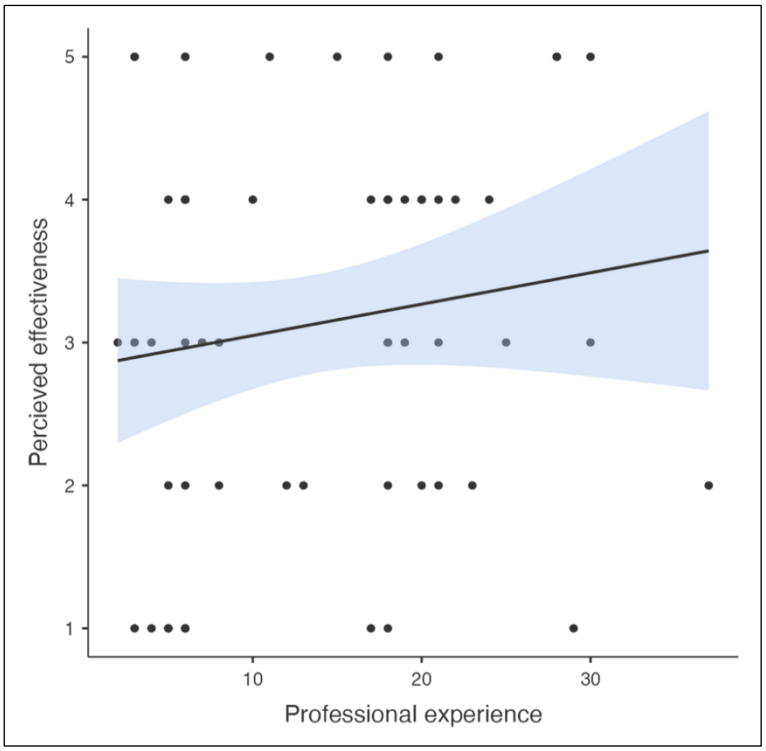

Figure 1: Linear regression of professional experience (years) on perceived effectiveness

However, it is noteworthy that the group that rated effectiveness as "Low" had the highest average seniority (16.3 years). This nuanced result indicates that experience does not automatically lead to acceptance; some experienced teachers remain critical of technology integration.

4.3 Statistical Independence Between Professional Experience Category and Acceptance

The contingency table (Table 6) breaks down teachers according to their career stage. The visual observation of the data indicates that teachers at the beginning of their careers are predominantly skeptical (29.5% of the total sample are skeptical beginners, compared to 16.4% of skeptical beginners). Teachers in the middle of their careers have a more balanced profile, with a slight predominance of adherence (19.7% adherents versus 18% skeptics).

Table 6: Distribution of teachers according to professional experience and acceptance level

		Strong perception		**Total**
Category of professional experience		**Support**	**Skeptical**	
Beginner	% of total	16.4	29.5	45.9
Middle	% of total	19.7	18.0	37.7
End	% of total	8.2	8.2	16.4
Total	**% of total**	**44.3**	**55.7**	**100.0**

The box plot analysis (Figure 2) offers a granular view of the data distribution across career stages. It is observed that the "Middle" career group displays the highest median effectiveness score (Median = 4), represented by the central line within the box, suggesting a peak in tool acceptance during this phase. In contrast, the "Beginning" group shows a lower median (Median = 3) and a compressed interquartile range, reflecting a more consistently skeptical or neutral stance. The "End" career group is notable for its substantial variability, indicated by the elongated whiskers, highlighting that late-career teachers are highly polarized in their reception of the tool.

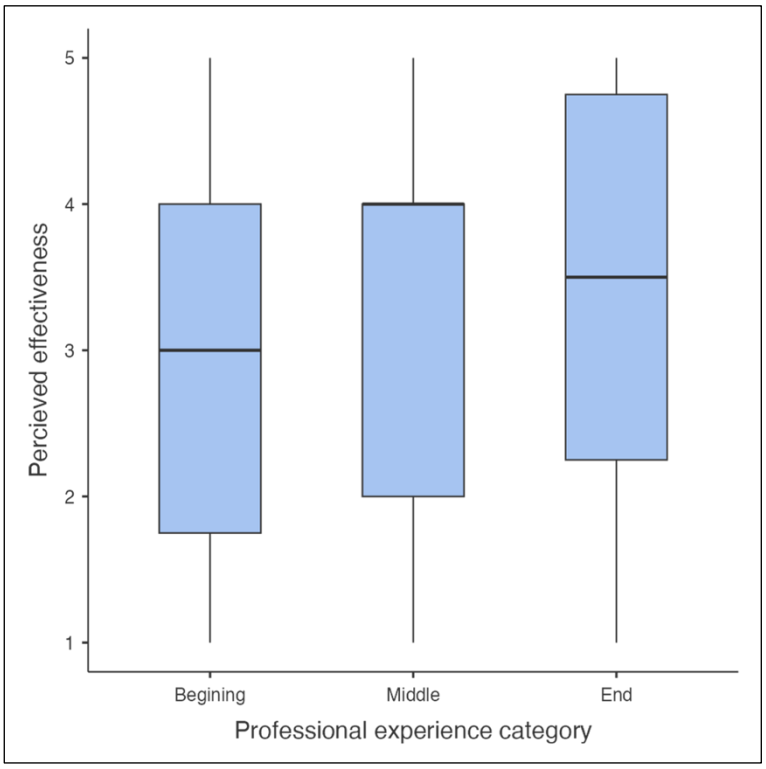

Figure 2: Distribution of perceived effectiveness scores by professional experience category

However, Pearson's Chi-square test (Table 6) indicates that this observed distribution is not statistically significant ($\chi^2 = 1.55$, df = 2, p = 0.462). With a p-value > 0.05, we cannot reject the null hypothesis. This means that, based on this sample size, there is no proven statistical link between the experience category and strong adherence. The variations observed, particularly the peak in commitment in mid-career, should therefore be interpreted as descriptive trends rather than general laws. Cramer's V value (0.159) (Table 7) also confirms a weak association between these two variables.

Table 7: Tests of association between professional experience and adherence to dashboards

Statistical tests	Value	ddl	Sig. (p)	Effect size	Value
Pearson's chi-square	1.55	2	0.462	Cramer's V	0.159
Number of observations (N)	61	-	-	Phi coefficient	-

4.4 Impact of Training on the Perceived Usefulness of Dashboards

The study of the relationship between the training received in eAssessment and the level of perceived usefulness of dashboards reveals a unique dynamic. An examination of the contingency table (Table 8) highlights an uneven distribution: while the rate of acceptance among untrained teachers is close to equilibrium (41% in favor versus 42.6% skeptical across the entire sample), it collapses among trained teachers, where skeptics (13.1% of the total) greatly outnumber supporters (3.3% of the total).

Table 8: Distribution of teachers according to training received and level of agreement

		Strong perception of usefulness		
Training in eAssessment		**Believer**	**Skeptical**	**Total**
No	% of total	41.0	42.6	83.6
Yes	% of total	3.3	13.1	16.4
Total	**% of total**	**44.3**	**55.7**	**100.0**

Visualizing the impact of training via box plots (Figure 3) uncovers a stark contrast in score distributions. The group with no training ("No") exhibits a higher median score and a distribution skewed towards the upper end of the scale (Q3 reaching 4). Conversely, the "Yes" group, those who received training, shows a median score of 3, but significantly, the lower quartile (Q1) drops to the bottom of the scale. This visual shift downward for the trained group reinforces the contingency table data, illustrating that the current training format may be compressing effectiveness scores toward the lower, more skeptical end of the spectrum.

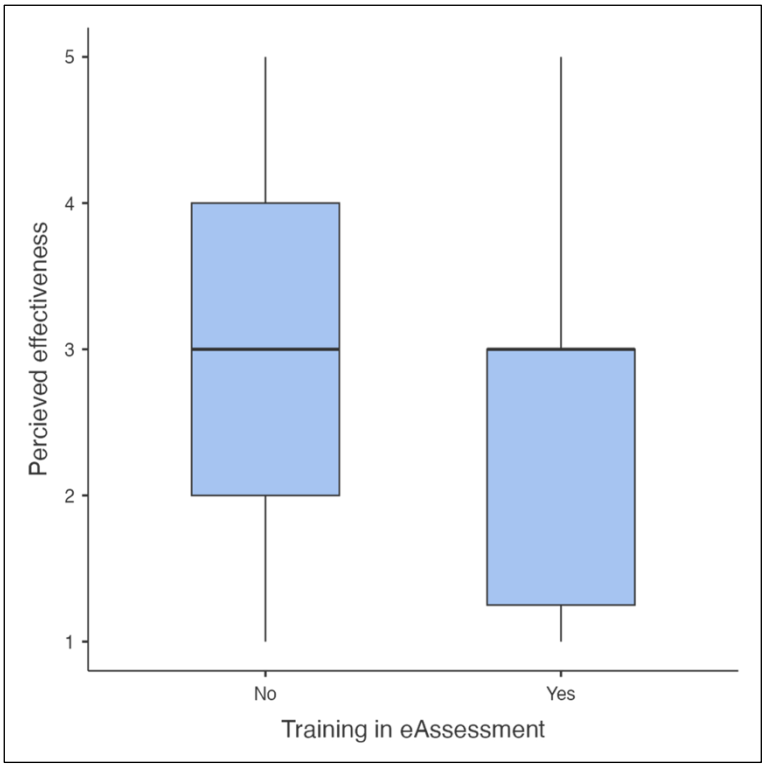

Figure 3: Perceived effectiveness distributions between untrained and trained teachers

In terms of inference, Pearson's Chi-square test (Table 9) shows a value of $\chi^2 = 2.85$ (df = 1) associated with a p-value of 0.091. As this result is higher than the standard significance threshold of 0.05, we cannot conclude that there is a statistically significant dependence in the strict sense. However, this value ($p < 0.10$) indicates a marginal trend that warrants attention. It suggests that with a larger sample size, the observed negative effect of training on the strong perception of usefulness could be statistically confirmed. This interpretation is reinforced by the effect size analysis (Table 9). Cramer's V coefficient is 0.216, which corresponds to a weak to moderate association. This result

supports the hypothesis that training, in its current form, tends to be associated more with skepticism than with a strong perception of the usefulness of dashboards, thus raising the question of the adequacy of training programs to the real needs of teachers.

Table 9: Tests of the association between training and acceptance of dashboards

Statistical tests	Value	ddl	Sig. (p)	Effect size	Value
Pearson's chi-square	2.85	1	0.091	Cramer's V	0.216
Number of observations (N)	61	-	-	Phi coefficient	0.216

Further investigation into the intensity of training (Figure 4) reveals a potentially counterintuitive trend. The regression line for training duration plots a negative slope, indicating that as the duration of training increases (from 0 to 4 months), the perceived effectiveness of the dashboards tends to decrease. While the wide confidence bands suggest caution in generalizing this finding, the downward trajectory is consistent with the negative effect size observed earlier. This visual evidence supports the hypothesis that prolonged exposure to the current training modules may be reinforcing resistance rather than fostering competence or buy-in.

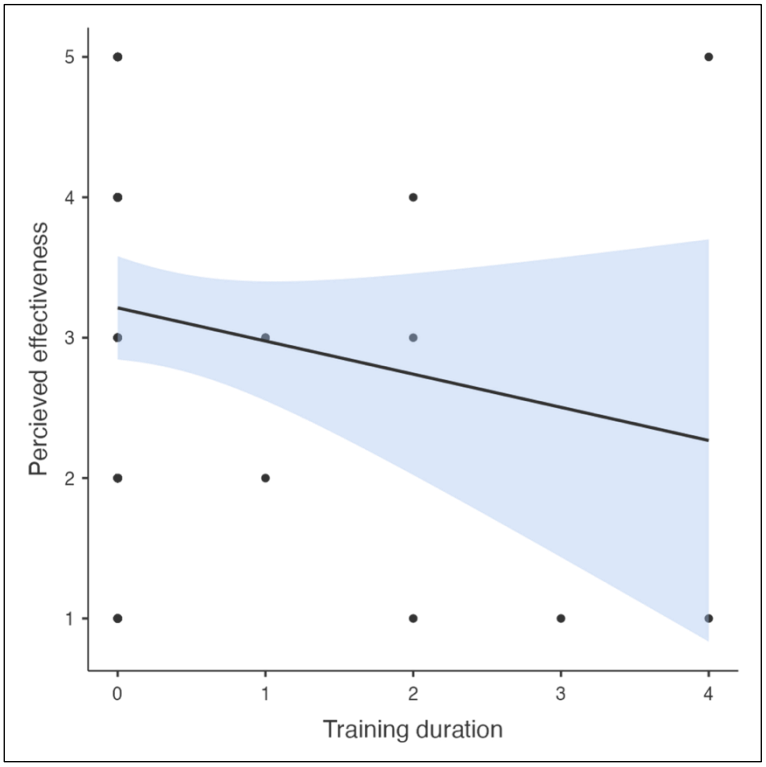

Figure 4: Regression analysis of training duration on perceived effectiveness

4.5 Towards a Typology of Indicators for Designing eAssessment Dashboards

The topological analysis of the similarity graph (Figure 5) provides valuable insight into teachers' cognitive architecture. Beyond word mapping, examining lexical communities – the colored spheres grouping closely connected terms – reveals a hierarchical, dynamic social representation centered on the learning process. From this structural organization

emerges a functional typology that we theorize in the form of the "4P" model: "Process," "Profile," "Performance," and "Positioning."

The first dimension, "Process," stands out as the core of teachers' social representation. It is embodied by the cyan community, dominated by the centrality of the term "learning (apprentissage)" and its strong connection (a weight of 4) with the term "progress (progression)." This sphere indicates that assessment is primarily perceived as highlighting a temporal dynamic rather than a snapshot in time. It is closely linked to the yellow community, which specifies its operating methods: the terms "question (question)" and "difficulty (difficulté)" appear linked, emphasizing that monitoring the process necessarily involves diagnosing the cognitive obstacles encountered during questioning. The essential indicator is therefore one that tracks the student's progress and flags points of friction (those specific moments when the student stumbles over a particular question), allowing the teacher to intervene in real time to remove the blockage.

However, this dynamic is only fully justified in the qualification of the learner's "Profile," which constitutes the second dimension of the model. Carried by the dark purple community, this area acts as a semantic pivot connecting the student's sphere (élève) to that of "competence (compétence)." It reflects a requirement for institutional validation: the dashboard must make it possible to go beyond the continuous flow of activities in order to determine the sustainable "acquisition" of knowledge. The tool is therefore expected to be able to transform the student's activity into an intelligible competence status (acquired, in the process of being acquired, or not acquired), thus defining the unique profile of each learner.

To inform this expert judgment, the system must rely on the third dimension of "Performance," embodied by the red community. This cluster includes raw operational metrics such as "number (nombre)," "response (réponse), "time (temps)," and "execution (exécution)." These keywords refer to the metrological dimension of the assessment: they are the factual evidence of the machine's commitment and effort. Although essential for objectifying the activity, these raw data are not an end in themselves but the necessary substrate for pedagogical analysis. They meet the need for traceability of the student's actions in relation to the machine.

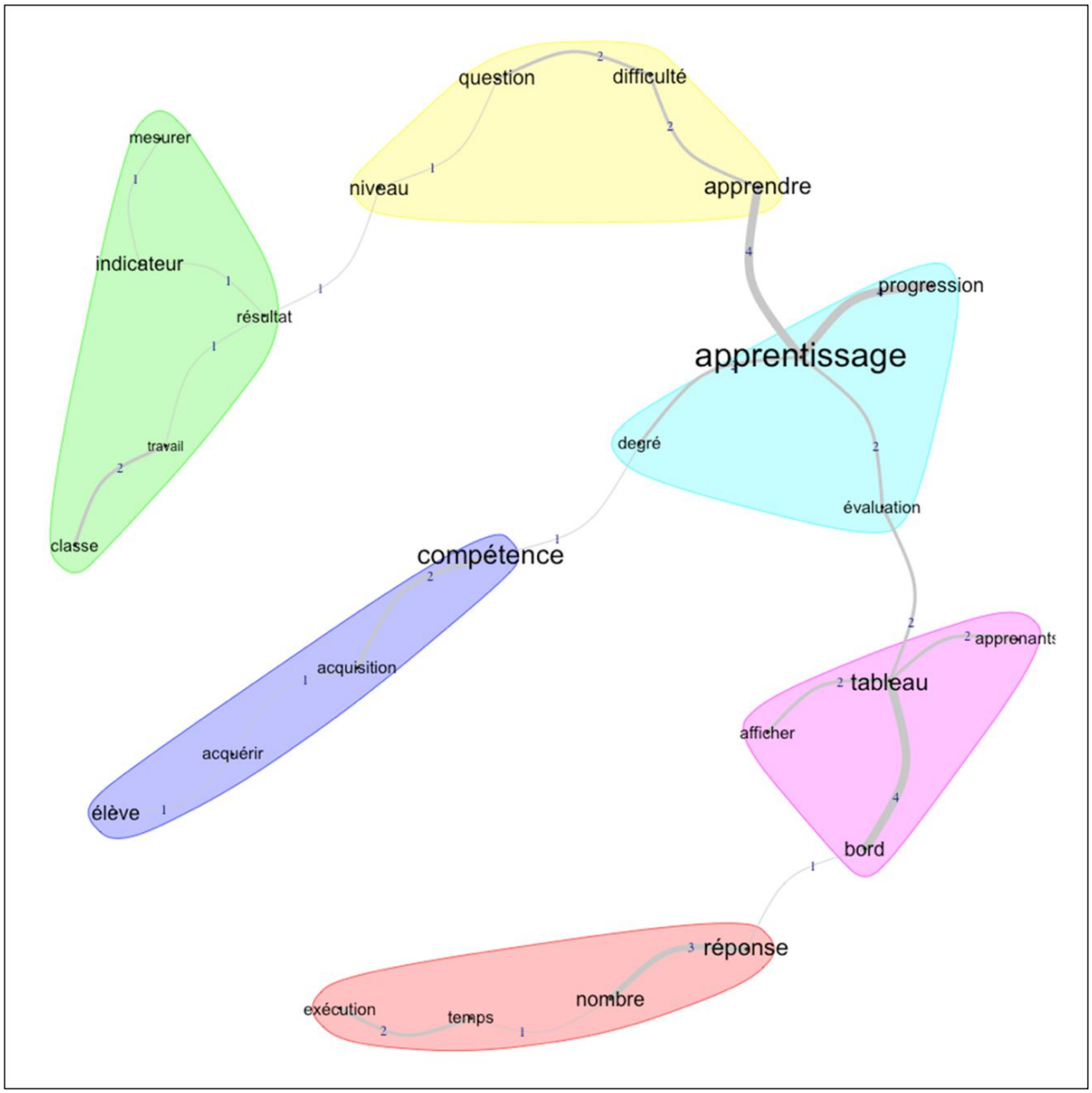

Figure 5: Structure of social representations of eAssessment dashboard indicators

Finally, individual assessment necessarily takes place in a collective context, defined by the fourth dimension of "Positioning." This is revealed by the green community, where the terms "class (classe)," "measure (mesurer)," and "result (résultat)" are predominant. This area expresses the need for normative benchmarks: to give meaning to individual performance, the teacher must be able to situate it in relation to the class group and explain the measurement indicators used.

In summary, the dashboard, identified as a technical tool in the pink community, is conceptualized as the interface responsible for orchestrating these "4Ps" to transform raw data into educational meaning.

5. Discussion

The results highlight a contrasting reality. With an overall adoption rate of 44.3%, the dashboard is not yet a "naturalized" tool in professional practices. While this finding is consistent with the conclusions of El Idrissi & Larhrissi (2025) and El Janous *et al.* (2022) on the structural challenges of integrating ICT in the Moroccan education system, our study reveals a new nuance concerning the determinants of this reluctance.

Contrary to the classic assumptions of the UTAUT model, which posits training as a universal facilitator (Venkatesh *et al.*, 2003; Akkioui, 2022), our results indicate the opposite trend: trained teachers appear to be more skeptical (only 3.3% of adherents in this subgroup) than their self-taught colleagues. This "training paradox" can be interpreted in light of the TAM model (Davis, 1989). It suggests that current training programs, which may be overly focused on technical mastery at the expense of instructional design, could complicate the perception of the tool rather than demonstrating its ease of use. Instead of removing barriers, training seems to increase the perceived cognitive load, transforming the tool into a technological "black box" rather than an agile pedagogical solution.

The analysis of the influence of experience also qualifies the commonly held belief that innovation is the preserve of "digital natives." The peak adoption rate observed among mid-career teachers (19.7% of the total) suggests that adoption is less a question of biological age than of "professional maturity." This result corroborates the work of Wang *et al.* (2023) and the OECD (2024): experienced teachers, who have already consolidated their classroom management skills, are best placed to perceive the real usefulness of data in responding to the complex challenges of differentiated instruction. Conversely, novice teachers, who are often cognitively overloaded with group management, are likely to perceive the dashboard as an additional administrative task rather than a management aid.

In qualitative terms, the emergence of the "4P" model (Process, Profile, Performance, and Positioning) marks a break with the traditional accounting-based view of eAssessment. The centrality of the « Process » dimension and its connection with « Progression » in our similarity graph confirm that Moroccan teachers have internalized the requirements of formative assessment advocated by the NCET. These practitioners are not calling for a punishment tool (the grades are peripheral in our results), but rather a dynamic management tool. This requirement is in line with the work of Cisel and Baron (2019) on the need to track the dynamics of acquisition.

The ideal dashboard should act as a translator: it should convert raw "Performance" metrics (number of responses, time, etc.) into an intelligible "Profile" of competence (acquired, in the process of being acquired or not acquired). Finally, the implicit demand for "Positioning" (the comparison to the class) and the importance of visual cues (the color codes mentioned in the "Profile" dimension empirically validate the theories of educational visualization (Duval, 2011; Jivet *et al.*, 2017). In crowded classrooms, teachers need "visual intelligence" that signals learning friction at a glance. The simplicity of the graphical interface is therefore not an aesthetic choice, but an

essential prerequisite for the tool to move from being a technological gadget to a lever for pedagogical regulation.

6. Conclusion

At the end of this research, it appears that the digital transformation of the Moroccan education system, driven by the 2015-2030 Strategic Vision, cannot be reduced to infrastructural modernization. While the institution promotes a competence-based approach requiring detailed and differentiated monitoring of learning, teachers are faced with a massification of learning data. Our study addressed this paradox by questioning the relevance of management tools: how can eAssessment dashboards be designed that, beyond technological prowess, truly meet the "professional" needs of primary school teachers and ensure their adoption?

To answer this question, we deployed a mixed methodological protocol, combining quantitative analysis of adherence (N=61) with a lexicometric exploration of social representations. This approach revealed two counterintuitive results. First, statistical analysis revealed a "training paradox": contrary to expectations, teachers trained in eAssessment expressed greater skepticism (13.1% skeptical against 3.3% supportive) than their untrained colleagues. This result suggests that current training programs may increase the perceived complexity of the tool rather than facilitate its use. Second, the analysis of representations made it possible to move beyond the accounting-based view of eAssessment. Teachers are calling for a tool capable of articulating four dimensions, which we have theorized under the "4P" model: monitoring the "Process" (the progress), validating the "Profile" (the competence), objectifying the "Performance" (the raw data), and the contextual "Positioning" (within the whole class).

This research results have direct implications for the design of digital learning environments in primary education. They call for a paradigm shift in the design of dashboards: moving from a "reporting" approach that displays past scores to a "dynamic navigation" approach that visualizes the learning trajectory. The research also emphasizes that cognitive ergonomics is not an aesthetic option in eAssessment dashboards, but a condition for the adoption of these digital tools. The explicit demand for immediate visual cues (color codes, alerts, etc.) indicates that the tool should act as a "cognitive facilitator" reducing the teacher's mental load, rather than as a complex data analysis instrument that would further burden them.

However, these conclusions should be interpreted in light of the limitations of our research, including the small sample size and its geographical concentration in the Marrakech-Safi region, which call for caution in generalizing the results. Nevertheless, these limitations open up exciting avenues for further research. It would be useful to extend this investigation to the national level to verify the robustness of the "training paradox." More fundamentally, the logical next step in this work would be to prototype a dashboard based on our "4P" typology and test its real impact in the classroom. Such action research would make it possible to verify whether this tool, designed "by and for"

teachers, is effective in transforming educational decision-making and supporting student success.

Conflict of Interest Statement
The authors declare that there are no conflicts of interest regarding the publication of this article.

About the Author(s)
Abdelghani Es-sarghini holds a PhD in Educational Sciences. His research examines the integration of digital technologies and artificial intelligence in e-assessment and didactics, with a focus on adaptive systems, automated feedback, and pedagogical decision-support tools in online and hybrid learning environments.

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