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## RE-ENGINEERING PSYCHOLOGICAL QUALITY OF LIFE IN AI-ENHANCED EDUCATIONAL ENVIRONMENTS: TOWARDS AN INTEGRATED PSYCHO-DIDACTIC MODEL — THE LAGHOUAT LIPDM MODEL

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***Abstract.***
*This study re-engineers psychological quality of life in educational environments augmented by artificial intelligence, by constructing an integrated psycho-didactic model and testing it at Amar Telidji University of Laghouat. It proceeds from a double gap: adaptive platforms and generative models have multiplied without a didactic frame that protects the learner's psychological dignity, while the literature on well-being remains captive to generic scales not reconceptualised inside the triad of human, machine and teacher. The contrast is theoretical and ecological. International research on AI in higher education is still dominated by profiling, assessment, adaptive systems and intelligent tutoring, with a thin link to pedagogy and ethics, whereas a Maghrebi campus such as Laghouat intertwines the official distance-learning platform, unregulated public generative tools, and university residences. The architecture brings together Ryff's six-dimensional model, self-determination theory, Zimmerman's self-regulated learning, Vygotsky's zone of proximal development, cognitive-load theory, Bronfenbrenner's ecology and TPACK.*[1] *A sequential explanatory mixed-methods design was adopted. A stratified random sample of 428 undergraduate and Master's students completed four five-point scales, and thirty-six faculty members were interviewed. Data were processed with IBM SPSS Statistics 30.0 and PROCESS v4.2. Psychological quality of life was moderately high (M = 3.72), led by purpose in life and personal growth and weakened by environmental mastery. Basic psychological needs and self-regulated learning serially and partially mediated the relation between the AI-enhanced environment and well-being (total indirect effect = 0.21; $R^2$ = 0.449). Psychological–ethical safety did not vary with frequency of use, exposing a design rather than a training deficit. The study formulates the Laghouat Integrated Psycho-Didactic Model (LIPDM) in five stacked dimensions: didactic, psychological, interactive, ethical-existential, and eco-organisational.*

***Key words:*** *psychological quality of life; artificial intelligence in education; didactics; self-determination theory; self-regulated learning*

### 1. Introduction

The university is no longer a mere space for the transmission of knowledge. It is a complete psychological environment in which the image of the self, the meaning of effort and the rhythm of belonging are formed. When artificial-intelligence systems enter this environment — from adaptive learning platforms to generative models that write, summarise and examine — what is rearranged is not only the path of information, but the conditions of the learner's psychological life. Artificial intelligence in education, as Luckin, Holmes, Griffiths and Forcier argue, is human in its essence: it aims to make what was tacit in the act of learning amenable to precise computational formulation, not to exclude the teacher from the scene (Luckin *et alii*, 2016: 11). The authors insist that they "do not envisage a future in which AI replaces teachers", but a future in which exceptional professional expertise is augmented by carefully designed tools (Luckin *et alii*, 2016: 18).

Technical augmentation, however, does not by itself guarantee an improvement in psychological quality of life. The systematic review by Zawacki-Richter, Marín, Bond and Gouverneur of AI applications in higher education showed that only 8.9% of first authors belonged to education departments, and that four domains dominate the output: profiling and prediction, assessment, adaptive systems, and intelligent tutoring, with a visible weakness in the link to pedagogical theories and in ethical reflection (Zawacki-Richter *et alii*, 2019: 8-9). The review concluded that the question "Where are the educators?" remains open (Zawacki-Richter *et alii*, 2019: 22). This diagnosis intersects with the warning of Holmes and Tuomi that many educational AI systems rest on unexamined pedagogical assumptions, and that current practice outruns educational theorisation (Holmes, Tuomi, 2022: 542, 545).

Psychological quality of life is not a vague notion measured by a passing smile. Ryff dismantled the reduction of happiness to positive affect and proposed six theoretically motivated dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth (Ryff, 1989: 1070-1071). Re-testing the structure with Keyes confirmed the six dimensions as a more adequate representation than unidimensional models of happiness (Ryff, Keyes, 1995: 720, 724). Keyes approaches the matter through the languishing–flourishing continuum, placing mental health on a scale on which the absence of illness is not enough (Keyes, 2002: 208, 210). Seligman speaks of flourishing through the PERMA elements: positive emotion, engagement, relationships, meaning and accomplishment (Seligman, 2011: 16, 24). If these maps are projected onto a university lecture hall invaded by text-generation tools, the danger is not confined to academic cheating: it extends to the meaning of effort, to the sense of competence, and to the student's tie with teacher and peers.

In the Algerian context, the Orientation Law on National Education places the formation of the citizen and the awakening of the affective dimension among the aims of the system, and states that education aims at "the development of personality" and "education for citizenship" within the values of the Republic (Algeria, 2008: 8-9).[2] The Orientation Law on Higher Education defines the mission of the university as training, research and public service of knowledge, which makes the university environment responsible for the conditions of learning and not merely for its content (Algeria, 1999: 5-6). From Amar Telidji University of Laghouat — a gateway from the steppe to the Sahara, and a student space in which the university residence, the distance-learning platform and the free use of generative models intertwine — arises the need for an explicit re-engineering of psychological quality of life, not as an annexed counselling service, but as a didactic component designed in the same way as objectives and competencies.

**1.1. Problem, questions and hypotheses**

The problem is the contradiction between the accelerating integration of artificial intelligence into teaching practices — through the distance-learning platform, generative applications, and tools for marking and writing support — and the absence of a psycho-didactic model that rearranges these tools so as to protect basic psychological needs and to cultivate psychological quality of life. UNESCO's guidance for policy-makers insists that the approach must be "human-centred", and that policy must balance opportunities for innovation against risks to equity, dignity and privacy (Miao *et alii*, 2021: 8, 18), and later offers practical recommendations for local planning that respects the specificity of educational systems (Miao *et alii*, 2021: 32, 36). In the guide to generative AI, the organisation calls for a humanistic vision that regulates use, protects data and sets an age limit for independent conversation with platforms (UNESCO, 2023: 8, 14), and for the building of teacher capacity so that integration does not remain a matter of individual improvisation (UNESCO, 2023: 22).

On the psychological plane, self-determination theory requires the satisfaction of three innate needs — autonomy, competence and relatedness — if intrinsic motivation and mental health are to be achieved; when these needs are thwarted, motivation shrinks and well-being deteriorates (Ryan, Deci, 2000: 68, 70). The same claim is restated in the expanded text as nourishment for growth and integration (Deci, Ryan, 2000: 227, 229, 233). If a smart tool is designed so as to steal the learner's decision, to display him as helpless before a ready-made output, or to isolate him from the class community, then — however high its cognitive performance — it betrays the structure on which psychological quality of life rests. The picture is further complicated by cognitive load: effective instruction requires control of extraneous load on working memory (Sweller, 1988: 257, 261; Sweller, van Merriënboer, Paas, 1998: 259, 264). A confusing interface or a flood of unguided feedback may raise surface achievement and lower the sense of mastery at one and the same time.

From field observation in the faculties of the University of Laghouat during the academic year 2025/2026, three problem indicators emerged: (a) a wide variation in students' use of generative tools, between daily dependence and almost total avoidance; (b) faculty complaints about the difficulty of verifying the authenticity of work and about the absence of a departmental didactic guide; (c) the hesitation of psychological-support services before cases of academic anxiety mixed with a discourse of "replacement". The problem is therefore formulated in the following principal question: *How can psychological quality of life be re-engineered in AI-enhanced educational environments at Amar Telidji University of Laghouat, so as to yield an integrated psycho-didactic model that can be tried and evaluated?*

The study answers eight questions covering: the level of psychological quality of life; students' perception of the five environmental dimensions; differences by sex, faculty, level and frequency of use; the correlational pattern among environment, needs, self-regulation and well-being; the predictive power of those variables; serial mediation by needs and self-regulation; the didactic and psychological features of faculty discourse; and the shape of LIPDM warranted by both strands of data.

Hypotheses were formulated in the light of the theoretical frame and previous studies, and were tested at the significance level $\alpha = 0.05$:

H1: a medium or higher level of psychological quality of life. H2: a positive correlation between the AI-enhanced environment and that quality. H3–H4: differences by sex and by faculty. H5: differences in quality of life and self-regulated learning by frequency of AI use. H6: significant prediction by environment, needs and self-regulation. H7: partial serial mediation by needs then self-regulation. All tests at $\alpha = 0.05$.

**1.2. Aims, significance and limits**

The study aims to measure the level of psychological quality of life and the dimensions of the AI-enhanced environment among students of the University of Laghouat; to test differences, correlations, prediction and mediation among the variables of the model; to analyse faculty discourse on the didactic and psychological integration of AI; to construct the Laghouat Integrated Psycho-Didactic Model (LIPDM) and to offer an operational guide to its five dimensions; and to formulate recommendations applicable at the levels of the department, the faculty and the supervisory authority.

Its theoretical significance lies in assembling maps that are not usually gathered in a single enquiry inside the Maghrebi context: Ryff's six-dimensional model, self-determination theory, Zimmerman's self-regulated learning, cognitive-load theory, Bronfenbrenner's human ecology, the TPACK framework, and the arguments of Luckin and Holmes on educational AI. Re-engineering here is not an administrative metaphor, but a redesign of the relations among the didactic objective, the psychological need and the intelligent tool. The practical significance is to furnish the University of Laghouat — and similar institutions in southern Algeria — with a model and a shared language among teachers, the digital cell and psychological support, instead of each party repairing one end of the problem (OECD, 2019: 5; UNESCO, 2019: 3, 5).

Limits. Human: Licence and Master students and teachers from six faculties. Spatial: the main campus and the distance-learning platform. Temporal: academic year 2025/2026 (fieldwork November 2025–May 2026). Thematic: Ryff's model, the perceived AI-enhanced environment, basic needs and self-regulated learning; raw achievement is treated only as context. Instruments are self-report scales and interviews, mitigated by confidentiality and reversed items.

## 2. Theoretical framework

### 2.1. Psychological quality of life: from affect to flourishing

Psychological literature distinguishes hedonic subjective well-being from eudaimonic psychological well-being. The former reduces happiness to the intensity of positive affect, the rarity of negative affect and satisfaction with life (Diener, 1984: 543). The latter asks about the realisation of human potential. Ryff criticised the reduction of happiness to the prevailing affective scales, holding that they do not do justice to the traditions of personal growth and mental health, and offered six theoretically motivated dimensions, each with a high pole and a low pole (Ryff, 1989: 1070-1071). The theoretical table in her first paper summarises the definitions of self-acceptance, positive relations, autonomy, environmental mastery, purpose in life and personal growth — the definitions on which the scale items were later engineered (Ryff, 1989: 1071-1072).

In a re-test of the structure, Ryff and Keyes showed that the six-factor model fits the data better than unidimensional or reduced three-factor models, even if some dimensions overlap at moderate correlations (Ryff, Keyes, 1995: 720, 724). Keyes places mental health on a continuum from languishing to flourishing, so that the absence of disorder is not enough for a person to be judged to flourish (Keyes, 2002: 208, 210). Seligman moves the question from "happiness" to "flourishing" and operates five elements that can be measured and trained (Seligman, 2011: 16, 24). Fredrickson adds that positive emotions broaden the thought–action repertoire and build lasting resources, whereas negative emotions narrow it (Fredrickson, 2001: 218, 220). The didactic implication is direct: a classroom environment that generates curiosity and safety does not merely improve mood; it widens the possibility of deep learning.

### 2.2. Didactics and mediation: what does the teacher do when the machine enters?

Vygotsky defines the zone of proximal development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978: 86). AI is theoretically able to be a more capable mediator, provided it remains inside the zone and not above it: if it presents the solution ready-made, learning collapses; if it is silent before the struggling student, support collapses. Vygotsky insists that higher psychological functions are formed socially and then interiorised (Vygotsky, 1978: 90). If the relation is reduced to a secret dialogue between a student and a language model, the social path on which those functions are built is weakened.

Self-regulated learning returns the centre of action to the learner: he prepares (goals, efficacy, planning), performs (strategies, monitoring, time management) and reflects (self-evaluation, attribution, adaptation) (Zimmerman, 2002: 64-66). Pintrich links goal orientation to this cycle, distinguishing mastery goals from performance goals (Pintrich, 2000: 453). AI may support monitoring and feedback, and it may undermine attribution if success is ascribed to the tool rather than to the strategy. Hattie ranks feedback among the most effective influences on achievement (Hattie, 2009: 173), provided it is directed at the task and the strategy and not at a threat to the self. Here the role of Pekrun's achievement emotions appears: appraisals of control and value generate joy, hope, anxiety and hopelessness, emotions that reshape motivation and strategy (Pekrun, 2006: 315, 320).

### 2.3. Artificial intelligence in education: promises, types, human limits

Holmes and Tuomi review the state of the art and show that many educational AI systems rest on narrow pedagogical assumptions, while practice outruns theory (Holmes, Tuomi, 2022: 542, 545, 562). Luckin *et alii* (2016: 11, 18) treat AI as a means of opening the black box of learning in order to augment, not abolish, the teacher. Holmes, Bialik and Fadel (2019: 151, 162, 175) add the social questions of equity, work and human agency.

Zawacki-Richter *et alii* (2019: 8-9, 22) classify four domains — profiling, assessment, adaptive systems, intelligent tutoring — and note the scarcity of educators and of ethical reflection. UNESCO sets a human-centred, equitable and accountable frame (Miao *et alii*, 2021: 8, 18, 32, 36; UNESCO, 2023: 8, 14, 22; UNESCO, 2019: 3, 5). A system may therefore predict drop-out without improving the student's sense of meaning.

### 2.4. Commentary on the literature and identification of the gap

The preceding survey shows that international research has gone some way in classifying educational AI systems and in evaluating their cognitive effect, but that it remains deficient in three respects that bear on the present study. First: the rarity of models that make psychological quality of life an explicit output of didactic design rather than a secondary dependent variable. Second: the weakness of the empirical link between the dimensions of the AI-enhanced environment and the satisfaction of psychological needs and self-regulation in an Arabic-speaking context. Third: the near-absence of field studies in the universities of the Algerian high plateaux and south that take into account the specificity of the university residence, digital inequality, and the duality of the official platform versus public tools. From these three gaps the contribution of the study is derived: a field measurement at the University of Laghouat, a serial mediation model, and then the formulation of LIPDM as a psycho-didactic answer, not a merely technical one.

## 3. Data and method

### 3.1. Design

A descriptive-analytical method was adopted, with a sequential explanatory mixed-methods design: a first quantitative phase answers the descriptive questions, differences, relations and modelling; a second qualitative phase interprets anomalies and gaps — in particular the failure of psychological–ethical safety to change with frequency of use — through faculty discourse. This design suits enquiries that begin with a generalisable measurement and then need to understand mechanisms and contexts (Creswell, Plano Clark, 2018: 68, 77). The qualitative strand was not intended to weaken the quantitative one, but as an interpretive intersection that gives the numbers a professional voice.

### 3.2. Population and sample

The population comprises Licence and Master students registered at Amar Telidji University of Laghouat in the academic year 2025/2026 in the six faculties covered, who use the distance-learning platform or generative or adaptive AI tools in an academic context at least once in the semester. Sample size was estimated a priori with G*Power 3.1.9.7.[4] For a correlation test at $r = 0.20$ (a small-to-medium effect according to Cohen, 1988: 79-81), power 0.95 and alpha 0.05, the minimum was 319. For a regression with three predictors at $f^2 = 0.15$ (a medium effect according to Cohen, 1988: 413) and power 0.95, the minimum was 119. Four hundred and eighty questionnaires were distributed in anticipation of loss; 451 were returned; twenty-three incomplete or patterned forms were excluded; the analytical sample settled at 428 students (validity rate 89.2%). The sample was drawn by stratified random sampling according to faculty and then level, so as to preserve the representation of small faculties such as Nature and Life Sciences.

| Variable | Category | n | % |
|---|---|---|---|
| **Sex** | Women | 261 | 61.0 |
| | Men | 167 | 39.0 |
| **Faculty** | Social Sciences | 98 | 22.9 |
| | Arts and Languages | 74 | 17.3 |
| | Economics, Commerce and Management | 81 | 18.9 |
| | Law and Political Science | 52 | 12.1 |
| | Science and Technology | 86 | 20.1 |
| | Nature and Life Sciences | 37 | 8.6 |
| **Level** | Licence 1 | 89 | 20.8 |
| | Licence 2 | 102 | 23.8 |
| | Licence 3 | 97 | 22.7 |
| | Master 1 | 84 | 19.6 |
| | Master 2 | 56 | 13.1 |
| **Frequency of AI use** | Daily | 178 | 41.6 |
| | Weekly | 163 | 38.1 |
| | Rarely / as needed | 87 | 20.3 |

*Table 1. Distribution of the sample by demographic and academic variables (N = 428)*

*Source: field study, Amar Telidji University of Laghouat, academic year 2025/2026.*

The qualitative sample comprised thirty-six teachers (twenty-one men and fifteen women) from the same faculties, chosen purposively with variation in rank (professor, senior lecturer A/B, assistant lecturer) and in degree of use of intelligent tools (from the resistant to the early adopter). University experience ranged from four to twenty-nine years. Interviews were conducted face to face in teachers' offices or at a distance through the university's official meetings, with a mean duration of forty-two minutes, after informed consent, with audio recording for thirty-one participants and manual notes for five who refused recording.

### 3.3. Instruments

*Psychological quality of life.* The Arabic form of Ryff's 42-item scale was used, with seven items for each of the six dimensions, on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with reversed items recoded before aggregation (Likert, 1932: 15). The items were originally built on the positive and negative theoretical definitions of each dimension (Ryff, 1989: 1071-1072). The total score was computed as the mean of items after reversal of the negative ones, to ease comparison among scales with the range 1–5. In the pilot study on sixty-four students outside the final sample, total alpha reached 0.89.

*AI-enhanced educational environment.* The scale was constructed for this study after a review of application classifications (Zawacki-Richter *et alii*, 2019: 9; Holmes *et alii*, 2019: 151) and UNESCO guidance (Miao *et alii*, 2021: 18; UNESCO, 2023: 8). It comprised twenty-eight items distributed across five dimensions: adaptive personalisation (six), intelligent support (six), didactic integration in the course (five), psychological–ethical safety (six), and quality of human–machine–teacher interaction (five). It was submitted to seven judges (four in education and psychology, three in educational computing); two items were deleted and four were rewritten. In the pilot, alpha was 0.86 and KMO = 0.81.

*Basic psychological needs.* A 21-item form (seven per need) adapted to the university context was used, following Ryan and Deci's definition of the three needs (Ryan, Deci, 2000: 68, 70). Items were worded so as to capture need satisfaction inside courses in which intelligent tools are used ("I feel that I decide how I draw on the tools in this course" for autonomy; "I can complete tasks even when the tool is unavailable" for competence; "dialogue with the teacher and with peers remains alive despite the use of tools" for relatedness).

*Self-regulated learning.* Twenty-four items were prepared to cover Zimmerman's ternary cycle: forethought (eight), performance/monitoring (eight), and self-reflection (eight) (Zimmerman, 2002: 64-66), with the integration of mastery goal orientation as treated by Pintrich (Pintrich, 2000: 453). Example: "Before I ask the tool to generate a text, I specify what I want to understand myself" (forethought); "I monitor whether I am copying a solution or testing my understanding" (performance); "After submitting the work I ask myself what I could do without the tool" (reflection).

*Semi-structured interview guide.* The guide comprised seven axes: current practices, opportunities, risks to the authenticity of learning, the effect of tools on the teacher–student relation, safety and privacy, training needs, and the features of a desired didactic frame. Probing questions were left open ("Could you describe a session in which your role changed because of the tool?").

### 3.4. Collection procedures and ethical considerations

Administrative facilitation was obtained from the deanship of the Faculty of Social Sciences and from the relevant heads of department. Paper questionnaires were distributed in lecture halls at the end of sessions, and the electronic version through the distance-learning platform, with a statement that participation was voluntary and that refusal would not affect assessment. Names and registration numbers were not requested. Audio files were stored encrypted and destroyed after transcription, in accordance with what participants were promised. These procedures are consistent with the humanistic principle of data protection and dignity in UNESCO guidance (Miao *et alii*, 2021: 32; UNESCO, 2023: 14).

### 3.5. Statistical procedures

Analyses were run in IBM SPSS Statistics 30.0. Average variance extracted (AVE) was computed for factorially stable dimensions, with the 0.50 criterion for convergent validity (Fornell, Larcker, 1981: 46).[3] Qualitative analysis proceeded by open then axial coding; agreement between two independent coders on 30% of the corpus reached 0.81 (Cohen's kappa), a satisfactory reliability threshold. Hierarchical multiple regression and serial mediation (PROCESS Model 6, 5,000 bootstrap samples, 95% CI) were used to test H6 and H7 (Hayes, 2022: 85, 169).

## 4. Analysis

### 4.1. Psychometric properties in the main sample

Cronbach's alpha values for the total scales ranged between 0.84 and 0.91, and for all subscales between 0.79 and 0.86, exceeding the 0.70 criterion (Nunnally, Bernstein, 1994: 265). AVE values for the dimensions ranged between 0.51 and 0.58, above the 0.50 threshold (Fornell, Larcker, 1981: 46). KMO ranged between 0.84 and 0.91, with Bartlett's test significant on all scales ($p < 0.001$), which permits factor analysis (Kaiser, 1974: 35; Hair *et alii*, 2014: 102). Six factors were extracted for the Ryff scale, explaining 61.4% of variance after rotation; five factors for the environment scale (58.7%); three for needs (57.2%); and three for self-regulation (55.9%), matching the theoretical construction.

| Scale / dimension | Items | α | Split-half | AVE |
|---|---|---|---|---|
| **Psychological quality of life (total)** | 42 | 0.91 | 0.88 | — |
| **Self-acceptance** | 7 | 0.82 | 0.80 | 0.54 |
| **Positive relations with others** | 7 | 0.84 | 0.81 | 0.56 |
| **Autonomy** | 7 | 0.79 | 0.77 | 0.51 |
| **Environmental mastery** | 7 | 0.81 | 0.78 | 0.52 |
| **Purpose in life** | 7 | 0.85 | 0.83 | 0.57 |
| **Personal growth** | 7 | 0.83 | 0.80 | 0.55 |
| **AI-enhanced environment (total)** | 28 | 0.88 | 0.86 | — |

| | | | | |
|---|---|---|---|---|
| **Adaptive personalisation** | 6 | 0.81 | 0.79 | 0.53 |
| **Intelligent support** | 6 | 0.83 | 0.80 | 0.55 |
| **Didactic integration** | 5 | 0.80 | 0.77 | 0.52 |
| **Psychological–ethical safety** | 6 | 0.86 | 0.84 | 0.58 |
| **Quality of human–machine–teacher interaction** | 5 | 0.82 | 0.79 | 0.54 |
| **Basic psychological needs (total)** | 21 | 0.86 | 0.84 | — |
| **Self-regulated learning (total)** | 24 | 0.84 | 0.82 | — |

*Table 2. Internal-consistency reliability (Cronbach's alpha), split-half coefficients and AVE*
*The criterion of Nunnally and Bernstein (1994: 265) was adopted: α ≥ 0.70 is acceptable for basic research and α ≥ 0.80 is desirable for established scales. AVE ≥ 0.50 following Fornell and Larcker (1981: 46).*

**4.2. Descriptive statistics and levels of the variables (questions 1 and 2; H1)**

The theoretical range of all scales is 1–5. Skewness and kurtosis values lie within ±1, which is acceptable for parametric methods according to Hair *et alii* (2014: 70) and Tabachnick and Fidell (2013: 79). Mean psychological quality of life was 3.72 (SD = 0.54), a moderately high level, so H1 is accepted. Purpose in life (M = 3.91) and personal growth (M = 3.88) lead; environmental mastery is the weakest dimension (M = 3.49). The AI-enhanced environment was perceived at a medium level (M = 3.41), basic psychological needs at M = 3.45, and self-regulated learning at M = 3.56.

| Variable | M | SD | Skew. | Kurt. | Min. | Max. |
|---|---|---|---|---|---|---|
| **Psychological quality of life (total)** | 3.72 | 0.54 | −0.31 | 0.18 | 2.14 | 4.86 |
| **Self-acceptance** | 3.81 | 0.62 | −0.28 | 0.11 | 1.86 | 5.00 |
| **Positive relations** | 3.64 | 0.71 | −0.22 | −0.09 | 1.57 | 5.00 |
| **Autonomy** | 3.58 | 0.68 | −0.19 | 0.04 | 1.71 | 4.86 |
| **Environmental mastery** | 3.49 | 0.73 | −0.14 | −0.21 | 1.43 | 4.86 |
| **Purpose in life** | 3.91 | 0.59 | −0.41 | 0.27 | 2.00 | 5.00 |
| **Personal growth** | 3.88 | 0.57 | −0.36 | 0.22 | 2.14 | 5.00 |
| **AI-enhanced environment** | 3.41 | 0.66 | −0.17 | −0.12 | 1.54 | 4.79 |
| **Basic psychological needs** | 3.45 | 0.61 | −0.21 | 0.08 | 1.76 | 4.71 |
| **Self-regulated learning** | 3.56 | 0.63 | −0.25 | 0.14 | 1.83 | 4.83 |

*Table 4. Descriptive statistics of the study scales and normality indices*

**4.3. Differences by sex, faculty and frequency of use (question 3; H3–H5)**

An independent-samples t-test showed a small significant difference in favour of women in psychological quality of life (t(426) = 2.04, p = 0.042, d = 0.20), a clearer difference in positive relations (d = 0.37) and in the need for relatedness (d = 0.40), while men scored higher in autonomy (d = 0.27). No significant difference appeared in perception of the AI-enhanced environment or in self-regulated learning. H3 is accepted in part: the difference exists but is small by Cohen's criteria (Cohen, 1988: 25-26), and it is located in the relational dimensions, not in the tool.

| Variable | Women M (SD) | Men M (SD) | t | df | p | d |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **Psychological quality of life** | 3.76 (0.52) | 3.65 (0.57) | 2.04 | 426 | 0.042 | 0.20 |
| **Positive relations** | 3.74 (0.68) | 3.48 (0.73) | 3.71 | 426 | < 0.001 | 0.37 |
| **Autonomy** | 3.51 (0.67) | 3.69 (0.68) | −2.68 | 426 | 0.008 | 0.27 |
| **AI-enhanced environment** | 3.39 (0.65) | 3.44 (0.68) | −0.76 | 426 | 0.448 | 0.08 |
| **Need for relatedness** | 3.41 (0.74) | 3.10 (0.81) | 4.08 | 426 | < 0.001 | 0.40 |
| **Self-regulated learning** | 3.59 (0.61) | 3.51 (0.66) | 1.29 | 426 | 0.198 | 0.13 |

***Table 5.*** *Independent-samples t-test by sex*

*Levene's test for homogeneity of variance was non-significant in all comparisons (p > 0.05); equal-variance t values were therefore used. Interpretation of d following Cohen (1988): 0.20 small, 0.50 medium, 0.80 large.*

Analysis of variance by faculty was significant for psychological quality of life ($F(5, 422) = 5.31$, $p < 0.001$, $\eta^2 = 0.059$). Tukey post-hoc comparisons showed that students of the social sciences scored significantly higher than students of science and technology (mean difference = 0.35, $p = 0.002$), as did arts and languages compared with technology (0.27, $p = 0.031$). It is striking that perception of the AI-enhanced environment is relatively higher in technology ($M = 3.57$) despite lower psychological quality of life ($M = 3.54$), which separates "density of the tool" from "quality of life". H4 is accepted. The effect size is small-to-medium (Cohen, 1988: 287).

According to frequency of use, psychological quality of life, self-regulated learning and needs rose with daily use compared with rare use ($\eta^2$ between 0.081 and 0.094). The psychological–ethical safety dimension, however, did not differ significantly ($F(2, 425) = 2.11$, $p = 0.123$). H5 is accepted for the first three variables and rejected for safety: increased exposure to the tool does not repair a lack of guarantees. This dissociation is what later justifies the qualitative question.

| Variable | Daily M (SD) | Weekly M (SD) | Rare M (SD) | F | p | η² |
|---|---|---|---|---|---|---|
| **Psychological quality of life** | 3.86 (0.49) | 3.71 (0.52) | 3.44 (0.58) | 18.64 | < 0.001 | 0.081 |
| **Psychological needs** | 3.62 (0.55) | 3.43 (0.59) | 3.14 (0.64) | 19.11 | < 0.001 | 0.083 |
| **Self-regulated learning** | 3.74 (0.57) | 3.54 (0.60) | 3.21 (0.66) | 22.07 | < 0.001 | 0.094 |
| **Psychological–ethical safety** | 3.09 (0.91) | 3.21 (0.84) | 3.31 (0.88) | 2.11 | 0.123 | 0.010 |

***Table 7.*** *ANOVA by frequency of use of AI tools*

*Tukey post-hoc: the daily group is significantly higher than the rare group in psychological quality of life (0.42, p < 0.001) and in self-regulated learning (0.53, p < 0.001). Psychological–ethical safety did not differ significantly, a structural gap in didactic design discussed below.*

### 4.4. Correlational relations (question 4; H2)

The Pearson correlation between the AI-enhanced environment and psychological quality of life was $r = 0.46$ ($p < 0.001$), a medium-to-large association according to Cohen (Cohen, 1988: 79-81). The correlation of psychological needs with quality of life was $r = 0.58$, and of self-regulation $r = 0.51$, the two strongest zero-order predictors. The correlation of quality of interaction with the total environment was $r = 0.67$, without reaching a multicollinearity threshold. H2 is accepted. Psychological–ethical safety correlates with quality of life ($r = 0.44$) almost as strongly as the total environment, which means that it is not a marginal item in the scale but an explanatory component.

| Variable | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **1. Psychological quality of life** | 1 | | | | | |
| **2. AI-enhanced environment** | 0.46*** | 1 | | | | |
| **3. Basic psychological needs** | 0.58*** | 0.49*** | 1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **4. Self-regulated learning** | 0.51*** | 0.41*** | 0.47*** | 1 | | |
| **5. Psychological–ethical safety** | 0.44*** | 0.62*** | 0.39*** | 0.33*** | 1 | |
| **6. Quality of interaction** | 0.42*** | 0.67*** | 0.45*** | 0.38*** | 0.51*** | 1 |

***Table 8.*** *Pearson correlation matrix of the study variables (N = 428)*

***** p < 0.001. All correlations are positive and significant. r = 0.10 small, 0.30 medium, 0.50 large according to Cohen (1988). The highest association is between quality of interaction and the total environment (r = 0.67), without reaching a dangerous multicollinearity threshold (r < 0.85).*

**4.5. Hierarchical prediction (question 5; H6)**

In block 1 the AI-enhanced environment variable was entered and explained 21.2% of the variance in psychological quality of life ($\beta = 0.46$, $p < 0.001$). Adding psychological needs in block 2 raised explanation to 39.7% ($\Delta R^2 = 0.185$, $p < 0.001$) and lowered the environment coefficient to 0.26. In block 3 self-regulated learning added 5.2%, and the model settled at $R^2 = 0.449$, Adj. $R^2 = 0.445$, $F(3, 424) = 115.32$, $p < 0.001$. Final standardised coefficients: needs $\beta = 0.38$, self-regulation $\beta = 0.29$, environment $\beta = 0.21$, all significant. VIF values ≤ 1.48 rule out multicollinearity (Hair *et alii*, 2014: 200), and Durbin–Watson = 1.94 rules out residual autocorrelation. H6 is accepted. The didactic meaning: the tool predicts, but need satisfaction and self-regulation carry the greater load; improving the platform without feeding the need for relatedness and autonomy will not raise psychological quality of life to the hoped-for extent.

| Model | Predictor | B | SE | β | t | p | VIF |
|---|---|---|---|---|---|---|---|
| **1** | Constant | 2.41 | 0.12 | — | 20.08 | < 0.001 | — |
| | AI-enhanced environment | 0.38 | 0.04 | 0.46 | 10.71 | < 0.001 | 1.00 |
| **2** | Constant | 1.37 | 0.14 | — | 9.79 | < 0.001 | — |
| | AI-enhanced environment | 0.21 | 0.04 | 0.26 | 5.68 | < 0.001 | 1.32 |
| | Basic psychological needs | 0.42 | 0.04 | 0.47 | 10.24 | < 0.001 | 1.32 |
| **3** | Constant | 0.92 | 0.15 | — | 6.13 | < 0.001 | — |
| | AI-enhanced environment | 0.17 | 0.04 | 0.21 | 4.63 | < 0.001 | 1.41 |
| | Basic psychological needs | 0.34 | 0.04 | 0.38 | 8.19 | < 0.001 | 1.48 |
| | Self-regulated learning | 0.25 | 0.04 | 0.29 | 6.71 | < 0.001 | 1.36 |

***Table 9.*** *Hierarchical multiple linear regression predicting psychological quality of life*

*Model 1: $R = 0.46$, $R^2 = 0.212$, $F(1, 426) = 114.71$. Model 2: $R = 0.63$, $R^2 = 0.397$, $\Delta R^2 = 0.185$, $F\Delta(1, 425) = 130.18$. Model 3: $R = 0.67$, $R^2 = 0.449$, Adj. $R^2 = 0.445$, $\Delta R^2 = 0.052$, $F(3, 424) = 115.32$, Durbin–Watson = 1.94. All $p < 0.001$.*

**4.6. Serial mediation (question 6; H7)**

PROCESS Model 6 was tested: environment → needs → self-regulation → psychological quality of life, retaining the direct path. All single paths were significant. Total indirect effect = 0.21 (95% CI [0.16, 0.27]), which does not include zero. The path through needs alone was 0.15 [0.11, 0.20]; through self-regulation alone 0.10 [0.06, 0.14]; the three-step serial path 0.04 [0.02, 0.07]. The remaining direct effect $c' = 0.17$, $p < 0.001$, that is a partial, not a total, mediation. The ratio of the indirect to the total effect is 55.3%. H7 is accepted according to the bootstrap logic that Hayes recommends rather than a restriction to the steps of Baron and Kenny (Hayes, 2022: 85, 169; Baron, Kenny, 1986: 1176). Interpretation: the intelligent environment improves psychological quality of life when it is translated into need satisfaction and then into the learner's capacity to regulate his action; the remaining direct portion may reflect task ease and immediate feedback as a utilitarian effect not passed through need.

| Path | Effect | SE | t / Z | p | 95% CI lo | 95% CI hi |
|---|---|---|---|---|---|---|
| **a1: environment → needs** | 0.45 | 0.04 | 11.62 | < 0.001 | 0.38 | 0.53 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **a2: environment → SRL** | 0.39 | 0.04 | 9.21 | < 0.001 | 0.31 | 0.47 |
| **d21: needs → SRL** | 0.36 | 0.05 | 7.48 | < 0.001 | 0.27 | 0.46 |
| **b1: needs → PQoL** | 0.34 | 0.04 | 8.19 | < 0.001 | 0.26 | 0.42 |
| **b2: SRL → PQoL** | 0.25 | 0.04 | 6.71 | < 0.001 | 0.18 | 0.32 |
| **c′ direct effect** | 0.17 | 0.04 | 4.63 | < 0.001 | 0.10 | 0.24 |
| **Total indirect effect** | 0.21 | 0.03 | — | — | 0.16 | 0.27 |
| **Ind. 1: Env. → Needs → PQoL** | 0.15 | 0.02 | — | — | 0.11 | 0.20 |
| **Ind. 2: Env. → SRL → PQoL** | 0.10 | 0.02 | — | — | 0.06 | 0.14 |
| **Ind. 3: Env. → Needs → SRL → PQoL** | 0.04 | 0.01 | — | — | 0.02 | 0.07 |

***Table 10.*** *Serial mediation (PROCESS Model 6) of the effect of the environment on psychological quality of life Bootstrap confidence intervals (5,000 samples) do not include zero on any indirect path, which confirms partial serial mediation following Hayes (2022). Ratio of the indirect to the total effect = 55.3%.*

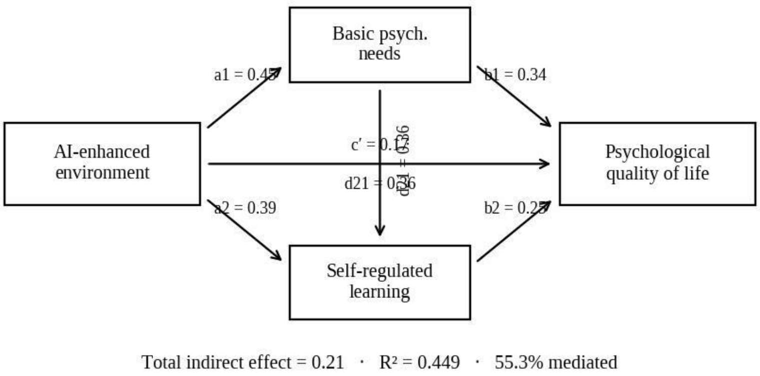


***Figure 1.*** *Tested structural model: serial mediation of psychological needs and self-regulated learning.*

**4.7. Fit of the structural model**

The structural model was estimated by linking the four latent variables according to the tested paths. $\chi^2/df = 2.03$, CFI = 0.956, TLI = 0.948, RMSEA = 0.049 (90% CI [0.042, 0.056]), SRMR = 0.041. According to the dual criteria of Hu and Bentler (CFI $\geq$ 0.95 with SRMR $\leq$ 0.08 or RMSEA $\leq$ 0.06) the fit is good (Hu, Bentler, 1999: 27; Kline, 2016: 270). The significance of $\chi^2$ is expected with N = 428 and is not taken as a ground for rejection on its own.

**4.8. Results of the qualitative phase (question 7)**

Coding yielded seven axes, headed by anxiety about authenticity (80.6% of interviews) and the absence of an explicit didactic frame (75.0%). Teachers described a genuine acceleration of feedback reminiscent of Hattie's effect of feedback (Hattie, 2009: 173), but they coupled it with a loss of confidence in attributing the work to its author. A discourse of “meaning and value” recurred: students ask about the usefulness of their effort if the machine summarises. It is an existential question that touches Ryff’s purpose-in-life dimension (Ryff, 1989: 1071) and Seligman’s element of meaning (Seligman, 2011: 24). More than half the sample insisted that the teacher is an affective mediator who notices the silence of the student coming from the university residence, a fact that does not enter models of the pedagogical domain and of the learner as Luckin and colleagues conceived them unless the learner model is widened to include affective state and living context (Luckin *et alii*, 2016: 11). Safety and privacy appear as structural concerns (“Where are the examination questions stored?”)[5] rather than as a lack of skill in use, which explains why the safety dimension did not rise quantitatively with frequency of use.

| Thematic axis | n | % | Condensed example |
| --- | --- | --- | --- |
| **AI speeds feedback but weakens verification of authenticity** | 29 | 80.6 | “Marking is faster, but I am less sure the text is the student’s.” |
| **Absence of an explicit didactic frame for in-class use** | 27 | 75.0 | “We use it as an individual improvisation, with no departmental guide.” |
| **Students’ anxiety about replacement and loss of meaning** | 24 | 66.7 | “They ask: if the machine summarises, what is my value?” |
| **Opportunities to personalise support for struggling students** | 22 | 61.1 | “I can steer the struggling student onto a different path without embarrassment.” |
| **Need for psychological–ethical safety (privacy, bias, plagiarism)** | 21 | 58.3 | “We do not know where examination questions are stored on the platform.” |
| **The teacher as affective mediator whom the machine cannot replace** | 19 | 52.8 | “The machine does not notice the silence of the student from the residence.” |
| **Weak teacher training in digital psycho-didactics** | 18 | 50.0 | “We were trained technically, not pedagogically.” |

***Table 12.*** *Thematic axes of interviews with faculty (N = 36) and their frequencies*

*Examples are reported with adaptation that preserves meaning without revealing identity. Kappa between the two coders = 0.81.*

The axis of opportunities for personalising support for struggling students (61.1%) shows the positive face: the tool allows a parallel path without embarrassment before peers, that is, a safeguarding of dignity inside the zone of proximal development (Vygotsky, 1978: 86). Yet half the teachers admitted that their training is technical, not pedagogical-psychological, which reproduces the gap diagnosed by Zawacki-Richter: technique advances and the educator lags in engineering the integration (Zawacki-Richter *et alii*, 2019: 22). Hence the necessity of a TPACK frame rather than a software workshop (Mishra, Koehler, 2006: 1029).

## 5. Discussion and construction of the model

### 5.1. Discussion in the light of the theoretical frame

Partial serial mediation (55.3% indirect) means that didactic design should target needs and regulation as mechanisms, and not content itself with improving the accuracy of the language model. Zimmerman's cycle — forethought, performance, reflection — makes a suitable explicit contract with the student: no generation before a goal, and no submission before questioning (Zimmerman, 2002: 65-66). If intelligent feedback is projected onto Hattie's criterion, its usefulness depends on its being about the task and the strategy, not about a threat to personal value (Hattie, 2009: 173). Otherwise it turns into a negative achievement emotion according to Pekrun: anxiety, shame, despair of the value of effort (Pekrun, 2006: 320).

### 5.2. The Laghouat Integrated Psycho-Didactic Model (LIPDM)

Starting from serial mediation, from the safety gap, from the interview axes and from the accumulated theoretical frame, the answer to the eighth question is formulated in a five-dimensional stacked model, not a linear one. Each dimension conditions the next and does not replace it. Its operational name is the Laghouat Integrated Psycho-Didactic Model (LIPDM).

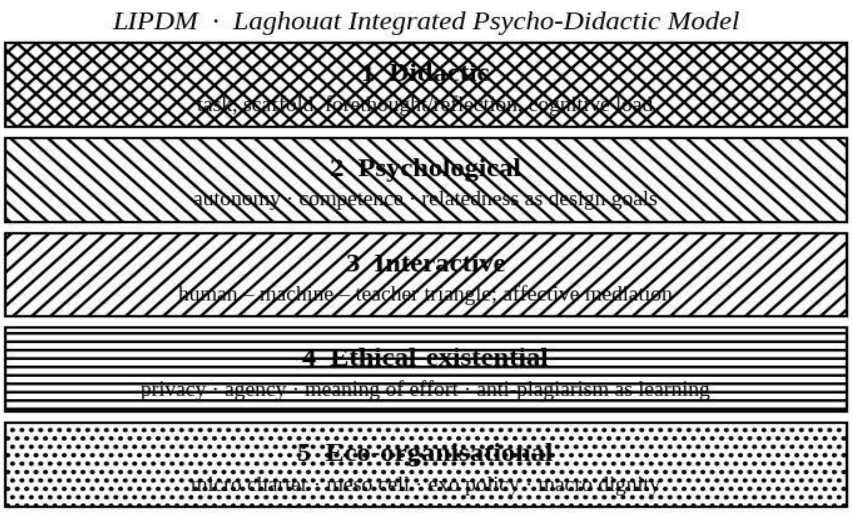


***Figure 2.*** *The Laghouat Integrated Psycho-Didactic Model (LIPDM) in five stacked dimensions.*

***Didactic dimension (redefining the task)***

Objectives, activities and assessment are realigned so that outputs generated without understanding are not rewarded (Biggs, Tang, 2011: 26; Bloom, 1956: 18). Tasks sit inside the zone of proximal development: the tool is a scaffold, not a substitute (Vygotsky, 1978: 86). Forethought and reflection are made visible (Zimmerman, 2002: 65); extraneous load is controlled (Sweller *et alii*, 1998: 259; Mayer, 2009: 57, 89).

***Psychological dimension (need as a design objective)***

Every integration decision is asked whether it protects autonomy, builds competence by personal mastery rather than borrowed machine capacity (Bandura, 1997: 3, 79), and nourishes relatedness (Ryan, Deci, 2000: 68). Control-value emotions (Pekrun, 2006: 315) and flow (Csikszentmihalyi, 1990: 71) are monitored. Quality of life is read through Ryff's six dimensions, with environmental mastery as a Laghouati priority (Ryff, 1989: 1071).

***Interactive dimension (the human–machine–teacher triangle)***

The teacher remains an affective and cognitive mediator; the machine expands feedback and personalisation and does not close the channel of recognition. The learner model must include affective state and living context (Luckin *et alii*, 2016: 11, 18). Quality of interaction — the highest scale dimension in the sample — is a lever to strengthen, not a dashboard to replace.

***Ethical-existential dimension (dignity, agency, meaning)***

Psychological–ethical safety belongs in the specifications: privacy, examination limits, transparency about external servers, and plagiarism treated as a learning matter (UNESCO, 2023: 8, 14; Holmes *et alii*, 2019: 175). The meaning of effort is protected so that purpose in life does not collapse when the machine summarises. The quantitative stability of safety shows a normative, not a training, problem.

***Eco-organisational dimension (moving the layers of the ecology)***
Micro: a course charter. Meso: coordination among teacher, residence, counselling and the digital cell. Exo: university and ministerial policy. Macro: a discourse of cognitive dignity (Bronfenbrenner, 1979: 22, 25). Teacher education follows TPACK, not a software manual (Mishra, Koehler, 2006: 1025, 1029). Well-being is placed among learning outcomes (OECD, 2019: 5).

*Operational hypothesis of the model.* The effect of the tool on psychological quality of life passes — of necessity, not as a luxury — through need satisfaction and self-regulation, under an ethical ceiling, inside an institutional ecology. The quantitative core of this hypothesis was tested in section 4 ($R^2 = 0.449$; mediation 55.3%).

### 5.3. A brief operational guide for applying LIPDM in a university course

The following seven moves translate the model into a semester contract.

1. Before the semester: a tool charter (allowed, forbidden, declared, assessed).
2. At least one objective at analysis or evaluation that generation alone cannot accomplish (Bloom, 1956: 18).
3. In every assignment: forethought, effect of the tool, reflection on unaided mastery.
4. A weekly relatedness moment that cannot be automated.
5. A low-load interface and strategy-focused feedback (Sweller, 1988: 261; Hattie, 2009: 173).
6. A six-item Ryff pulse twice a semester, not entering the mark.
7. A monthly departmental TPACK circle, not an isolated software course.

### 5.4. Recommendations

To the Algerian university: a human-centred AI charter (Miao *et alii*, 2021: 36; UNESCO, 2023: 22); Ryff indicators beside login metrics; a joint cell of digitalisation, counselling and pedagogy; compulsory psychological TPACK for new staff; residence conditions in any early-warning model. To deans and heads of department: reward the path of thinking, not the generable text (Biggs, Tang, 2011: 26); keep a weekly relatedness channel (Ryan, Deci, 2000: 68); treat plagiarism as a chance to re-teach self-regulation (Zimmerman, 2002: 66); avoid a single recipe across faculties. To teachers: declare the tool in class; protect the student's decision of how; give strategy feedback, not person feedback; practise reflection-in-action when the group withdraws into secret machine dialogues (Schön, 1983: 49). To students: no generation before a goal, and no submission before a short reproduction without the tool; ask the teacher and the peer (Bandura, 1997: 79); do not waste purpose, the highest dimension in the sample.

### 5.5. Research proposals

1. A quasi-experimental design applying the LIPDM guide to two matched courses across a full semester, with repeated measurement of Ryff's dimensions.
2. Extension of the sample to universities of the high plateaux and the south for an ecological comparison (Ouargla, Ghardaïa, Béchar).
3. Integration of behavioural indicators from the distance-learning platform (session time, revision pattern) alongside self-report.
4. A follow-up study of self-efficacy when generation is forbidden in the construction phase and then permitted in the revision phase.
5. A critical analysis of the bias of language models in academic Arabic texts and of its effect on the student's linguistic self-acceptance.

## 6. Conclusion

The study set out from Amar Telidji University of Laghouat to ask how psychological quality of life is re-engineered when the intelligent machine enters the space of training. The question was not technical ("Which platform is better?") nor hortatory ("Beware of cheating"). It was psycho-didactic: how can need satisfaction, the meaning of effort, the teacher's mediation and the dignity of data be safeguarded in a design that can be evaluated. After measuring 428 students and interviewing thirty-six teachers, and after processing the data with IBM SPSS Statistics 30.0 and PROCESS v4.2, four conclusions settled.

First: psychological quality of life in the sample is moderately high, led by purpose and growth, and weakened by environmental mastery. Second: the AI-enhanced environment is associated with this quality, but its effect passes for the most part through psychological needs and self-regulated learning ($R^2 = 0.449$; partial mediation 55.3%). Third: psychological–ethical safety is a structural gap that is not closed by density of use. Fourth: faculty discourse asks for a frame, not for more tools, and insists on an affective mediation that cannot be automated.

From these conclusions LIPDM was born, with its five dimensions. It does not claim to close the discussion; it claims that psychological quality of life can be designed as a target competency is designed, and that a university in the Algerian steppe is able to produce a model rather than to consume imported recipes without reconceptualisation. Luckin and her colleagues are right: there is no future in which the teacher's expertise is abolished (Luckin *et alii*, 2016: 18). And Ryff is right: happiness is not everything, and mastery, purpose and relation are the pillars of a psychological life worthy of the name (Ryff, 1989: 1071). Between them — between the intelligent machine and human flourishing — lies the work of psycho-didactics. And this work, in Laghouat as elsewhere, can be re-engineered.

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*1* TPACK: Technological Pedagogical Content Knowledge (Mishra, Koehler, 2006: 1017-1054). LIPDM: Laghouat Integrated Psycho-Didactic Model, the operational name of the five-dimensional architecture proposed in section 5.

*2* Original Arabic of the Orientation Law on National Education: and (People's Democratic Republic of Algeria, 2008: 8-9).

*3* PROCESS: the SPSS macro for mediation, moderation and conditional process analysis (Hayes, 2022). AVE: average variance extracted. KMO: Kaiser–Meyer–Olkin sampling adequacy.
*4* G*Power 3.1.9.7 was used for a priori sample-size estimation (Faul, Erdfelder, Buchner, Lang, 2009: 1151).
*5* Original Arabic of a recurrent faculty concern: [“Where are the examination questions stored?”].

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