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PEDAGOGICAL MECHANISMS FOR ENHANCING STUDENTS' LEARNING COGNITIVE ACTIVITY IN THE CREDIT MODULE SYSTEM: A THREE-YEAR QUASI EXPERIMENTAL STUDY IN UZBEK HIGHER EDUCATION

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Abstract

Background. Uzbekistan completed the formal transition of its state universities to the credit–module system in 2021/2022, yet the reform was implemented primarily as an organisational and regulatory measure. Whether the architecture of modules, credits and rating-based assessment translates by itself into deeper learning–cognitive activity — the conscious, self-directed and motivationally grounded participation of the student in knowledge construction — has remained an open empirical question.

Purpose. The study developed, theoretically grounded and empirically tested an integrated system of pedagogical mechanisms designed to convert the didactic potential of the credit–module system into measurable growth in students' learning–cognitive activity.

Method. A three-year longitudinal quasi-experiment (pre-test — interim — post-test, non-equivalent control group design) was conducted between 2023 and 2026 at three Uzbek higher education institutions with 430 pre-service teachers (experimental group, EG, n = 220; control group, CG, n = 210) within the five-credit course Pedagogy of Primary Education (150 hours). Five clusters of mechanisms — motivational, organisational–didactic, technological, assessment-and-monitoring, and reflective–developmental — were implemented in the EG as a single package inside four pedagogical conditions. Activity was assessed on motivational, cognitive and activity-based criteria using six instruments

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(Cronbach's α = .76–.86) and a multi-source design combining student self-report, expert observation and objective performance data. Analysis used independent-samples t tests, Pearson's χ^2, Cohen's d and a relative efficiency coefficient.

Results. The groups were statistically equivalent at baseline (t = 0.30, p = .77; χ^2 = 0.12, p = .94; d = −0.03). By the final phase the EG mean had risen from 3.74 to 4.25 on the five-point scale while the CG remained essentially unchanged (3.76 → 3.78). The final between-group difference was significant and practically meaningful (t(428) = 6.97, p < .001; $\chi^2(2)$ = 47.86, p < .001; d = 0.67; efficiency coefficient E = 12.4%). The share of high-activity students in the EG grew from 15.9% to 37.3% and the low-activity share fell from 42.3% to 12.2%. Gains were uniform across all three criteria (+0.51 points each) and stable across all three institutions (+0.50 to +0.54 points). Qualitative data converged with the quantitative findings: analytical entries in reflective journals rose from 18% to 61% and constructive or creative portfolio products from 36% to 79%.

Conclusion. The credit–module system creates an institutional platform for learning–cognitive activity but does not generate it automatically. Activity grows when mechanisms are deployed as a coherent package rather than in isolation; the synergy of at least three mechanism clusters, anchored in transparent criteria, choice and timely formative feedback, accounts for the observed effect. The mechanisms proved compensatory rather than stratifying, benefiting the most at-risk students most.

Keywords: learning–cognitive activity; credit–module system; student engagement; self-regulated learning; formative assessment; ICAP framework; pedagogical mechanisms; higher education in Uzbekistan.

1. Introduction

The quality of higher education is increasingly understood as a property of what the student does rather than of what the institution delivers. International policy analyses converge on the view that a contemporary graduate must be able to direct their own learning, navigate information flows independently, and treat knowledge acquisition as a designed, reflective process rather than the reception

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of finished content (OECD, 2018; UNESCO, 2021). This shift places the learner's own cognitive work at the centre of quality assurance and makes the measurement and cultivation of that work a strategic problem for pedagogy.

In the post-Soviet didactic tradition, this property is captured by the category of learning–cognitive activity (Uzbek: o'quv-bilish faolligi): a complex integrative quality expressing the student's conscious, independent, motivationally grounded and goal-directed participation in the acquisition of knowledge. It is not reducible to attendance or to answering in class. It comprises a motivational component (stable cognitive interest and the predominance of intrinsic over extrinsic regulation), a cognitive component (systematic, deep rather than surface understanding), an operational component (the ability to organise and execute independent academic work), and a reflective component (self-monitoring and self-correction). The construct thus overlaps substantially with, but is not identical to, the Anglophone notion of student engagement.

Anglophone research has approached the same territory through three partially independent traditions. The first is the engagement tradition, which developed from Astin's (1984) theory of involvement through the tripartite behavioural–emotional–cognitive model of Fredricks et al. (2004), the institutional measurement work of Coates (2007), the sociocultural framings of Kahu (2013) and Kahu and Nelson (2018), and the synthesising reviews of Trowler (2010) and Torres Castro (2024), and the action-oriented proposals of Zepke and Leach (2010). The second is the self-regulated learning tradition, whose roots lie in Knowles's (1975) account of self-directed learning, which is grounded theoretically in Zimmerman's (2000) cyclical model and Pintrich's (2004) framework (consolidated in Zimmerman & Schunk, 2011), and which has been supported empirically by meta-analyses and systematic reviews showing consistent associations between self-regulatory strategy use and academic performance in online and blended higher education (Broadbent & Poon, 2015; Cheng et al., 2025; Luo & Zhou, 2024; Zhao et al., 2025). The third is the active-learning tradition, which links instructional design to the depth of cognitive processing: Marton and Säljö's (1976) deep–surface distinction, Biggs and Tang's (2011) principle of constructive alignment, Ramsden's (2003) account of teaching

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for understanding, and Chi and Wylie's (2014) ICAP framework, which orders modes of participation as interactive > constructive > active > passive.

These traditions supply complementary levers. Problem-based learning raises cognitive engagement by forcing the learner to work from an ill-structured situation rather than a finished exposition (Barrows, 1986; Hmelo-Silver, 2004; Rotgans & Schmidt, 2011; Savery, 2006). Project-based learning extends the same logic across longer time horizons and into collaborative production (Guo et al., 2020; Kokotsaki et al., 2016; Thomas, 2000). Blended and digital environments can sustain continuity of independent work and accelerate feedback, although reviews consistently caution that the technology itself guarantees nothing without pedagogical design (De Bruijn-Smolders & Prinsen, 2024; Halverson & Graham, 2019; Heilporn et al., 2021). Formative assessment and feedback occupy a special place: they are among the strongest single influences on learning outcomes (Black & Wiliam, 1998; Hattie, 2009; Hattie & Timperley, 2007), and their effect is realised only when the grade functions as guidance rather than as a verdict.

The credit–module system is the institutional architecture within which these levers must operate in Uzbekistan. Historically rooted in the Bologna Declaration and in the European Credit Transfer and Accumulation System, it segments content into relatively autonomous modules, measures workload in credits, assesses outcomes against competences, and permits individualised learning trajectories (European Commission, 2023; Gaebel & Zhang, 2018). Its didactic promise is fourfold: the systematic organisation of independent work, individualisation of pace and pathway, competence-based and criterion-referenced assessment, and natural feedback points at the close of each module.

Uzbekistan has pursued this architecture deliberately. The Concept for the Development of the Higher Education System through 2030, approved by Presidential Decree PF-5847 of 8 October 2019, set the phased transition to the credit–module system as a priority and projected that 85% of institutions would have completed it by 2030. The legal and organisational framework was fixed by Cabinet of Ministers Resolution No. 824 of 31 December 2020, and from the 2021/2022 academic year the system was formally introduced in all state higher education institutions, supported by the national HEMIS platform. In this course

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of reform, however, the transition was realised predominantly as an organisational and normative measure: credits were recalculated, modules were declared, rating scales were installed. Whether the didactic content of teaching changed accordingly is a separate question, and it is the question this study addresses.

A review of the literature reveals an asymmetry that defines the research gap. International studies investigate engagement and self-regulation mainly in Western universities and mainly at the level of individual interventions — one technology, one method, one assessment format. National research in Uzbekistan and neighbouring systems concentrates on the organisational and normative implementation of the credit–module system, on credit accounting, and on the regulation of independent study. What has not been developed and tested as a monographic object is an integrated system of pedagogical mechanisms that converts the structural affordances of the credit–module system into growth in learning–cognitive activity, together with a diagnostic apparatus capable of detecting that growth across all its components.

Accordingly, the study pursued three aims: (a) to design and justify a system of pedagogical mechanisms and the conditions under which they operate; (b) to construct a multi-source diagnostic system for learning–cognitive activity in its motivational, cognitive and activity-based dimensions; and (c) to test the effectiveness of the system in a three-year longitudinal quasi-experiment. The working hypothesis was that learning–cognitive activity increases significantly if motivational, organisational–didactic, technological, assessment-and-monitoring and reflective–developmental mechanisms are introduced as a single system rather than separately; if independent-study assignments carry problem-based, project-based and case-based content; if assessment becomes formative and supplies regular feedback; and if reflective activity is made a compulsory element at the close of every module. Formally, the null hypothesis H_0 stated that there is no statistically reliable difference between the experimental and control groups in the level of learning–cognitive activity, and the alternative hypothesis H_1 stated that the experimental group attains a reliably higher level.

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2. Materials and Methods

2.1. Research design

The study employed a quasi-experimental pre-test — post-test non-equivalent control group design, extended longitudinally over three academic years so that the same student cohorts were followed through three measurement points. The design therefore supports both between-group comparison (experimental versus control) and within-group comparison (baseline versus final), which is essential when the dependent variable is a slowly forming personal quality rather than a short-term performance indicator (Korhonen et al., 2024). The independent variable was the system of pedagogical mechanisms and its implementation technology; the dependent variable was the level of learning–cognitive activity expressed through motivational, cognitive and activity-based criteria. Year of study, field of study, course volume in credits, teaching staff experience and baseline attainment were held constant across conditions. The overall structure is shown in Figure 1.

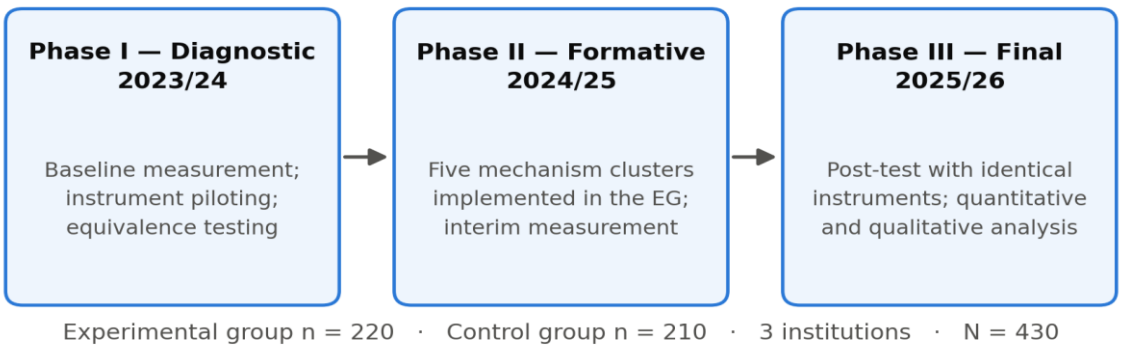

Figure 1. Three-phase longitudinal quasi-experimental design.

2.2. Participants and setting

The experiment was carried out at three institutions located in three different regions of Uzbekistan: Gulistan State Pedagogical Institute, Alfraganus University, and the University of Economics and Pedagogy (Karshi). In total 430 undergraduate students of pedagogical programmes took part, 220 of them assigned to the experimental group (EG) and 210 to the control group (CG). Because individual random assignment is not feasible inside the real timetable of

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an operating university, groups were formed as intact academic clusters. Equivalence was therefore secured in two steps: groups were drawn from the same programme, the same year of study and the same curriculum, and their baseline statistical equivalence was tested explicitly (Section 3.1). The composition of the sample remained stable across all three measurement points, which is a precondition for interpreting change as an effect of the intervention rather than of cohort turnover (Table 1).

Table 1 Distribution of participants by site, group and academic year.

Institution	2023/24 EG	2023/24 CG	2024/25 EG	2024/25 CG	2025/26 EG	2025/26 CG	Total
Gulistan State Pedagogical Institute	78	79	78	79	78	79	157
Alfraganus University	45	43	45	43	45	43	88
University of Economics and Pedagogy	97	88	97	88	97	88	185
Total	**220**	**210**	**220**	**210**	**220**	**210**	**430**

Note. EG = experimental group; CG = control group. The same students were followed through all three phases.

2.3. The intervention: five clusters of pedagogical mechanisms

The intervention consisted of five clusters of pedagogical mechanisms introduced in the experimental groups as a single package. In the control groups teaching continued in the conventional format prescribed by the existing curriculum. Each cluster was bound to concrete forms of pedagogical activity and to the criterion it was expected to influence most strongly, so that the theoretical model and the empirical test remained directly connected (Table 2).

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Table 2 Clusters of pedagogical mechanisms, their realisation in the experiment, and target criteria.

Mechanism cluster	Forms of pedagogical activity implemented	Primary target criterion
Motivational	Goal-setting session at the start of each module; freedom of choice among assignments; deliberate creation of success situations; full transparency of the rating scheme; module-level re-submission of academic debt	Motivational
Organisational–didactic	Assignment passport for every independent-study task (objective, deadline, rubric, output format); individual learning trajectory; collaborative learning with explicit role distribution	Activity-based, cognitive
Technological	Problem-based learning; case study; project-based learning; blended and flipped-classroom formats; digital learning resources and the HEMIS platform	Cognitive, activity-based
Assessment and monitoring	Formative assessment; criterion-referenced rubrics; peer assessment; systematic written feedback at the close of each module	Cognitive, motivational
Reflective–developmental	Weekly reflection journal; end-of-module self-assessment sheet; portfolio defence; mentoring consultations	Activity-based, motivational

The mechanisms operated inside four pedagogical conditions, each with a defined organisational solution and a monitoring indicator: an interactive learning environment (at least one paired or small-group task per session; role distribution; discussion protocol — monitored by the share of students participating in discussion); a digital learning environment (electronic course, platform-hosted assignments, online feedback, uninterrupted access to materials — monitored by platform activity statistics); independent-study technologies (assignment passport, assessment rubric, interim checkpoints, portfolio — monitored by on-time submission rate); and conditions for reflective activity (weekly journal, end-of-module self-assessment sheet, mentoring session — monitored by the analytical depth of reflective entries).

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2.4. Instructional dose and the assignment bank

The intervention was delivered within the five-credit course Pedagogy of Primary Education (150 hours), divided into five modules. Approximately 70 hours were allocated to contact teaching and 80 hours to independent study, consistent with the national requirement that 50–60% of undergraduate workload be assigned to independent work. Every module was redesigned around the mechanism clusters and closed with a reflective session. The principal instrument of implementation was a purpose-built bank of six assignments, sequenced so as to move the learner up the ICAP hierarchy from active through constructive to interactive modes of participation (Chi & Wylie, 2014). Assignments 1–3 were completed collaboratively in class and assignments 4–6 within independent study; each was graded against a rubric published in advance and returned with written feedback (Table 3).

Table 3 The assignment bank and its pedagogical orientation.

№	Assignment	Content	Competence targeted	Criterion
1	Analysis of a problem situation	Identify the causes of a given pedagogical situation, propose three solutions and justify them	Problem-oriented thinking; pedagogical analysis	Cognitive
2	Designing a credit–module course	Divide a one-semester course into modules, allocate credits, develop independent-study assignments	Instructional design; systems thinking	Cognitive, activity-based
3	Case study	Analyse a case of low classroom activity, develop two alternative lesson models and justify the more effective one	Analytical reasoning; decision-making	Cognitive
4	Reflection journal	Observe one's own learning across a week, record difficulties, self-assess against three questions	Reflective thinking; self-regulation	Activity-based, motivational
5	Group project	Design an innovative lesson model on "Creating an active learning environment" and present it (groups of 4–5)	Collaboration; communication; creativity	Activity-based
6	Test construction and revision	Write five test items, analyse them against pedagogical criteria and correct the flaws	Assessment literacy; critical analysis	Cognitive, activity-based

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2.5. Measures

Learning–cognitive activity was assessed on three leading criteria derived from the theoretical structure of the construct. The motivational criterion captures the internal source of activity, the cognitive criterion its substantive depth, and the activity-based criterion its externally observable expression. The reflective component was not separated as a fourth criterion but incorporated into the activity-based criterion as one of its indicators (self-assessment and the keeping of a reflective journal), because in real instructional settings reflection becomes measurable only through activity (Table 4).

Table 4 Criteria, indicators and diagnostic methods.

Criterion	Indicators	Diagnostic methods
Motivational	Stability of cognitive interest; predominance of intrinsic motivation; independent goal-setting; academic buoyancy in the face of difficulty	Questionnaire; motivation scale; interview; classroom observation
Cognitive	Completeness and systematicity of knowledge; depth of understanding (deep rather than surface approach); critical analysis and generalisation; information search and processing	Achievement test; written module assignments; case analysis
Activity-based	Timely and high-quality completion of independent-study tasks; active participation in discussion and projects; transfer of knowledge to practical situations; self-assessment and reflective journaling	Portfolio analysis; project defence; expert rating; reflective journals; LMS activity statistics

Each student's standing on each criterion was recorded on a five-point scale and converted into a level of formation: "5" = high, "4" = medium, "3" = low. The generalised indicator was the arithmetic mean across the three criteria. At the high level, the student approaches learning with stable interest, seeks knowledge independently, performs tasks creatively and on their own initiative, plans their academic work, and analyses their results reflectively. At the medium level, attitude to learning is positive but activity is unstable and situation-dependent, partial readiness for independent work persists, and creative elements appear only episodically. At the low level, interest is weak, independent-study skills are

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insufficiently formed, participation is passive and constant external support is required.

Six instruments were used, following a multi-source principle whereby the same phenomenon was measured simultaneously from the perspective of the student (self-report), the teacher (expert rating) and objective performance (test scores, portfolio products, platform statistics). This triangulated design materially reduces the single-source bias that affects self-report-only engagement studies (Bergdahl et al., 2024). Internal consistency was examined with Cronbach's alpha; all instruments exceeded the .70 threshold conventionally regarded as acceptable for pedagogical measurement (Table 5).

Table 5 Diagnostic instruments and their reliability.

№	Instrument	Construct measured	Items	α
1	Motivation questionnaire	Cognitive motivation; ratio of intrinsic to extrinsic regulation	24	.84
2	Achievement test	Cognitive criterion: completeness and depth of knowledge	40	.81
3	Case and problem assignments	Analysis, decision-making, application skills	6	.78
4	Portfolio assessment rubric	Quality of independent-study products	5 criteria	.80
5	Expert observation sheet	Type and level of classroom participation	12	.86
6	Reflective journal analysis	Depth of self-assessment and reflection	3 questions × 15 weeks	.76

2.6. Data analysis

Group means were computed as $\bar{X} = (\Sigma f_i x_i)/n$, where x_i is the score value (5, 4, 3), f_i the frequency of that score and n the group size. Sample variance and

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standard deviation were obtained as $S^2 = \Sigma f_i(x_i - \bar{X})^2/(n-1)$ and $S = \sqrt{S^2}$, and the standard error of the mean as $m = S/\sqrt{n}$. Independent-samples comparison used Student's t statistic in the form $t = |\bar{X}_1 - \bar{X}_2| / \sqrt{(m_1^2 + m_2^2)}$ with $df = n_1 + n_2 - 2 = 428$; for $\alpha = .05$ the critical value is $t_{cr} = 1.97$. Ninety-five per cent confidence intervals were constructed as $CI_{95} = \bar{X} \pm t_{cr} \cdot m$.

Because the response scale is ordinal, the parametric result was corroborated non-parametrically with Pearson's $\chi^2 = \Sigma (O - E)^2/E$ on the three-level distribution, with $df = 2$ and $\chi^2_{cr} = 5.99$. Practical significance was estimated with Cohen's d as the difference between the group means divided by the pooled standard deviation. Finally, a relative efficiency coefficient $E = ((\bar{X}_1 - \bar{X}_2)/\bar{X}_2) \times 100\%$, where $\bar{X}_1$ is the experimental and $\bar{X}_2$ the control mean, expressed the advantage of the experimental group in percentage terms. All computations were verified independently against the raw frequency distributions.

2.7. Ethics and validity safeguards

Participation was voluntary and informed. All students were briefed in advance on the aims of the study, the handling of their data and the anonymity of results; questionnaires were collected in coded form without personally identifying information. Control-group students were deprived of no instructional opportunity, and the methodological materials developed in the study were made available to their teachers once the experiment had concluded.

Internal validity was protected by four measures: groups were drawn from the same year and programme (selection threat); all measurements used identical instruments under identical conditions (instrumentation threat); the teaching experience and qualification level of instructors in both conditions were equalised (teacher effect); and control-group students were not informed of the content of the intervention (diffusion threat). External validity was strengthened by covering three institutions in three different regions.

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3. Results and Discussion

3.1. Baseline equivalence

At the diagnostic phase (2023/24) the two groups were almost indistinguishable. In the experimental group 15.9% of students were at the high level, 41.8% at the medium level and 42.3% at the low level; in the control group the corresponding shares were 17.1%, 41.4% and 41.4% (Table 6). Group means were M = 3.74 (SD = 0.72, SE = 0.048) in the EG and M = 3.76 (SD = 0.73, SE = 0.050) in the CG, and the difference was not significant, $t(428) = 0.30$, $p = .77$. The 95% confidence intervals — [3.64, 3.83] for the EG and [3.66, 3.86] for the CG — overlapped almost entirely. The χ^2 test on the three-level distribution returned the same verdict, $\chi^2(2) = 0.12$, $p = .94$, and the effect size was effectively zero, $d = -0.03$. The efficiency coefficient of −0.6% indicates that, if anything, the experimental group started marginally behind. H_0 was therefore retained at baseline, which is the condition that licenses attributing subsequent differences to the intervention.

The baseline result is also substantively informative. In both groups more than 83% of students were at the medium or low level, even though all three institutions had already operated the credit–module system for at least two academic years. Activity-based indicators were the weakest: most students completed independent-study tasks formally, "in order to submit them", participated passively in discussion, and did not analyse their own learning. This is the empirical expression of the theoretical problem that motivated the study — the gap between the organisational installation of a system and its saturation with pedagogical content.

3.2. Formative phase

After one year of systematic implementation the experimental group had moved appreciably. The share of high-level students rose from 15.9% to 28.2% (+12.3 percentage points) and the share of low-level students fell from 42.3% to 20.5% (−21.8 percentage points). In the control group the change was negligible: the high level moved from 17.1% to 17.6% and the low level from 41.4% to 41.0%. Group means were M = 4.08 (SE = 0.047) in the EG and M = 3.77 (SE = 0.050) in the CG, and the difference had become significant, $t(428) = 4.51$, $p < .001$,

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with $\chi^2(2) = 22.30$, $p < .001$, $d = 0.44$ and $E = 8.2\%$. The confidence intervals [3.99, 4.17] and [3.67, 3.87] no longer overlapped.

Criterion-wise means at this phase were 4.07 (motivational), 4.07 (cognitive) and 4.09 (activity-based) in the EG, against 3.77, 3.76 and 3.77 in the CG. The fastest movement in the first year occurred on the activity-based criterion. This ordering is theoretically expected rather than incidental: pedagogical intervention first alters the learner's externally observable conduct — completing tasks, entering discussion, using the platform — while motivational and cognitive change consolidates later. The sequence is consistent with activity-theoretical accounts in which consciousness is formed through activity (Vygotsky, 1978) and with self-regulation models in which strategic behaviour precedes durable shifts in motivational belief (Wolters, 2003; Zimmerman, 2000). At the same time, one student in five in the experimental group remained at the low level, which set the agenda for deepening the intervention in the final year.

3.3. Final phase

At the final measurement (2025/26) the share of high-level students in the experimental group reached 37.3% — 2.3 times the baseline figure — while the low-level share fell to 12.2%, 3.5 times lower than at baseline. The control group showed no meaningful movement over three years: 18.1% high and 40.0% low (Table 6, Figure 2).

Table 6 Distribution of learning–cognitive activity levels across the three phases

Phase	Level	EG n	EG %	CG n	CG %	Difference, pp
Diagnostic	High	35	15.9	36	17.1	−1.2
	Medium	92	41.8	87	41.4	+0.4
	Low	93	42.3	87	41.4	+0.9
Formative	High	62	28.2	37	17.6	+10.6
	Medium	113	51.4	87	41.4	+10.0

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Phase	Level	EG n	EG %	CG n	CG %	Difference, pp
	Low	45	20.5	86	41.0	−20.5
Final	High	82	37.3	38	18.1	+19.2
	Medium	111	50.5	88	41.9	+8.6
	Low	27	12.2	84	40.0	−27.8
Mean score	—	**3.74 → 4.25**	**+0.51**	**3.76 → 3.78**	**+0.02**	**+0.49**

Note. EG n = 220, CG n = 210. pp = percentage points. Percentages are computed within group.

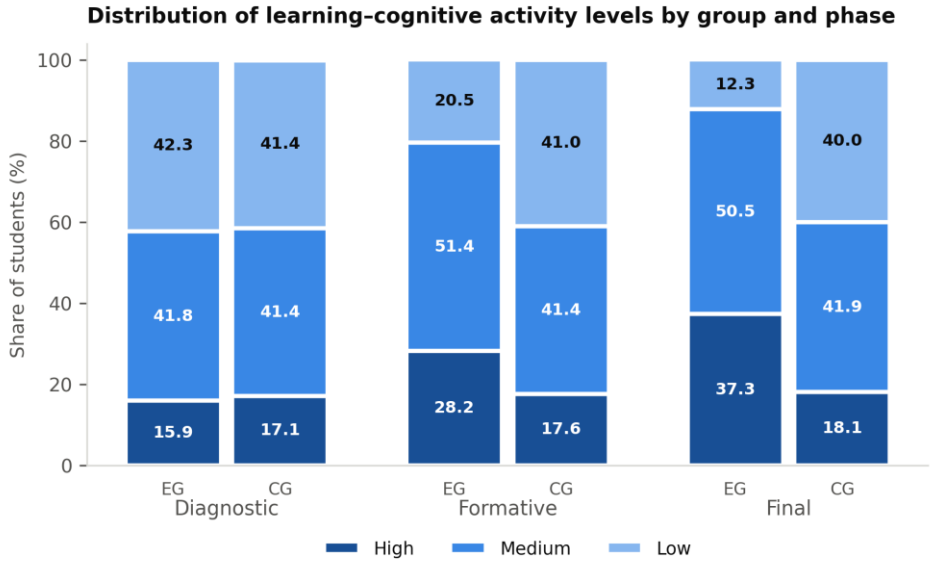

Figure 2. Distribution of learning–cognitive activity levels by group and phase.

Descriptively, the EG reached M = 4.25 (SD = 0.66, SE = 0.045) against M = 3.78 (SD = 0.73, SE = 0.051) in the CG. Student's t reached 6.97 against a critical value of 1.97, so H_0 was decisively rejected at $p < .001$. The confidence intervals [4.16, 4.34] and [3.68, 3.88] are separated by 0.28 points, which renders the difference visible geometrically as well as statistically (Figure 3). The χ^2 test on the final distributions independently confirmed the parametric result, $\chi^2(2) = 47.86$, $p < .001$, and Cohen's d = 0.67 places the effect above the median for educational interventions. The efficiency coefficient was E = 12.4%.

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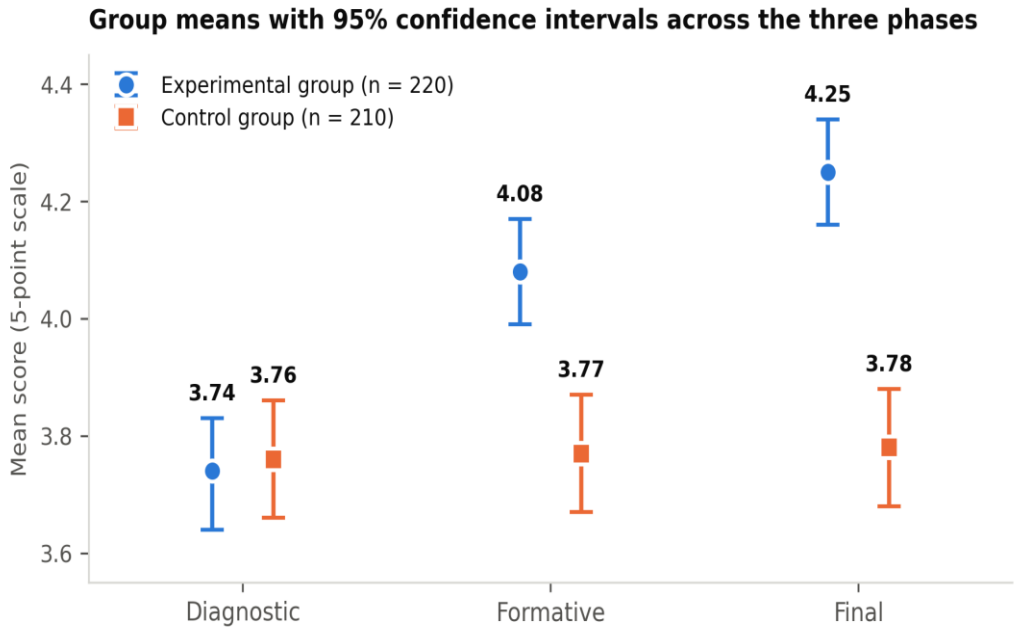

Figure 3. Group means with 95% confidence intervals across the three phases.

A result of particular practical importance concerns the lower tail of the distribution. The number of low-level students in the experimental group fell from 92 to between 25 and 30 depending on the criterion. In a credit–module system it is precisely this group that is exposed to academic debt and to the accumulation of unmet module requirements. The mechanisms therefore proved compensatory rather than stratifying: they did not merely lift already strong students but materially improved the position of those most in need of support. This distinguishes the present findings from interventions whose gains concentrate among high achievers, and aligns with evidence that scaffolding effects in higher education are largest where prior self-regulatory capacity is weakest (Doo et al., 2020).

The full statistical picture across the three phases is summarised in Table 7. Two patterns stand out. First, the experimental mean rose monotonically (3.74 → 4.08 → 4.25) while the control mean was effectively static (3.76 → 3.77 → 3.78). Second, the t statistic and the efficiency coefficient both increased from phase to phase (0.30 → 4.51 → 6.97 and −0.6% → 8.2% → 12.4%), indicating that the pedagogical effect is cumulative: the longer and the more consistently the mechanisms operate, the larger the advantage they generate.

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Table 7 Summary descriptive and inferential statistics by phase.

Indicator	Diagnostic EG	Diagnostic CG	Formative EG	Formative CG	Final EG	Final CG
Mean ($\bar{X}$)	**3.74**	**3.76**	**4.08**	**3.77**	**4.25**	**3.78**
Variance (S^2)	0.515	0.529	0.483	0.534	0.435	0.536
Standard error (m)	0.048	0.050	0.047	0.050	0.045	0.051
95% CI, lower	3.64	3.66	3.99	3.67	4.16	3.68
95% CI, upper	3.83	3.86	4.17	3.87	4.34	3.88
t (df = 428)	0.30		4.51		6.97	
p	> .05		< .001		< .001	
Efficiency E, %	**−0.6**		**8.2**		**12.4**	

Note. Critical value $t_{cr} = 1.97$ for $\alpha = .05$, df = 428. Blank cells indicate statistics computed on the group comparison rather than within a single group.

3.4. Criterion-wise dynamics

Disaggregating by criterion shows that growth was balanced rather than concentrated. Across the three years the experimental group gained +0.51 points on each of the motivational, cognitive and activity-based criteria, whereas control-group gains ranged from +0.01 to +0.03 points (Table 8, Figure 4). The uniformity of the gain is itself a finding: it indicates that the mechanism system does not privilege one facet of activity — knowledge, or motivation, or behaviour — but develops the components of learning–cognitive activity jointly. This is the empirical signature of the synergy assumption underlying the model, and it is consistent with theoretical accounts in which engagement is a multidimensional construct whose dimensions reinforce one another rather than substitute for one another (Fredricks et al., 2004; Kahu & Nelson, 2018).

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Table 8 Criterion-wise mean scores across the three phases.

Criterion	Group	Diagnostic	Formative	Final	Gain (Δ)
Motivational	EG	3.74	4.07	4.25	+0.51
	CG	3.76	3.77	3.79	+0.03
Cognitive	EG	3.73	4.07	4.24	+0.51
	CG	3.75	3.76	3.78	+0.03
Activity-based	EG	3.75	4.09	4.26	+0.51
	CG	3.76	3.77	3.77	+0.01
All criteria	**EG**	**3.74**	**4.08**	**4.25**	**+0.51**
	CG	**3.76**	**3.77**	**3.78**	**+0.02**

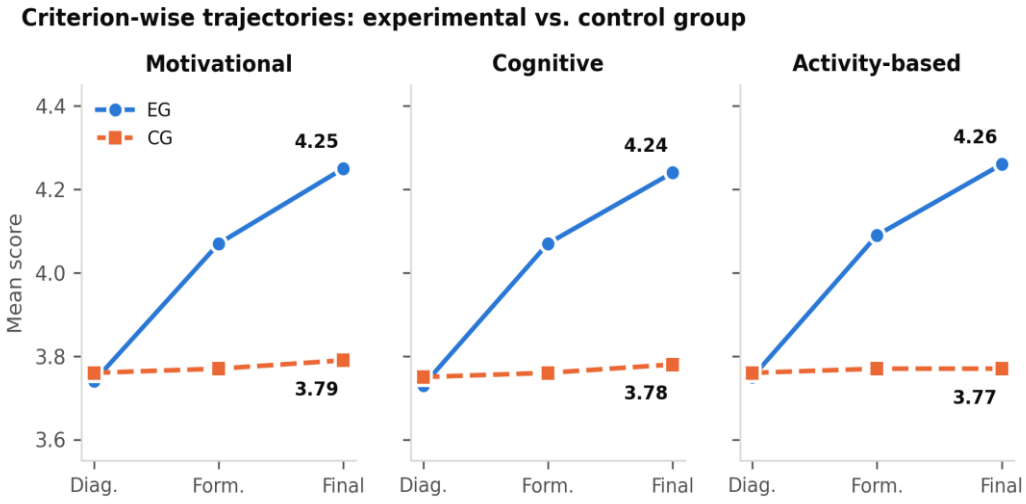

Figure 4. Criterion-wise trajectories of the experimental and control groups.

Three independent statistical criteria — the parametric t test, the non-parametric χ^2 test and the effect size — converge on the same conclusion at every phase (Table 9). Such convergence is a stronger warrant than any single test, since it shows that the inference does not depend on the distributional assumptions of a particular procedure.

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Table 9 Statistical reliability and effect size by phase

Phase	t	χ^2	Cohen's d	E, %	Statistical decision
Diagnostic	0.30	0.12	−0.03	−0.6	H_0 retained
Formative	4.51	22.30	0.44	8.2	H_1 accepted, $p < .001$
Final	6.97	47.86	0.67	12.4	H_1 accepted, $p < .001$
Critical values	**1.97**	**5.99**	—	—	**$\alpha = .05$; df = 428 / 2**

3.5. Robustness across sites

For a pedagogical finding to be more than a local artefact, it must reproduce in different institutional settings. Final results were therefore recomputed separately for each of the three experimental sites. Gains in the experimental subgroups ranged narrowly from +0.50 to +0.54 points and efficiency coefficients from 11.2% to 13.0%, while control subgroups gained between 0.00 and +0.09 points (Table 10, Figure 5). The consistency of the pattern across three institutions in three regions indicates that the effect depends on the mechanisms rather than on the particular conditions of any one university, and strengthens the external validity of the conclusions.

Table 10 Stability of final results across the three experimental sites.

Site	Group (n)	Diagnostic $\bar{X}$	Final $\bar{X}$	Gain Δ	E, %
Gulistan State Pedagogical Institute	EG (78)	3.75	4.25	+0.50	13.0
	CG (79)	3.76	3.76	0.00	—
Alfraganus University	EG (45)	3.73	4.27	+0.54	11.2
	CG (43)	3.75	3.84	+0.09	—
University of Economics and Pedagogy	EG (97)	3.73	4.24	+0.51	12.5
	CG (88)	3.76	3.77	+0.01	—
Overall	**EG (220)**	**3.74**	**4.25**	**+0.51**	**12.4**
	CG (210)	**3.76**	**3.78**	**+0.02**	—

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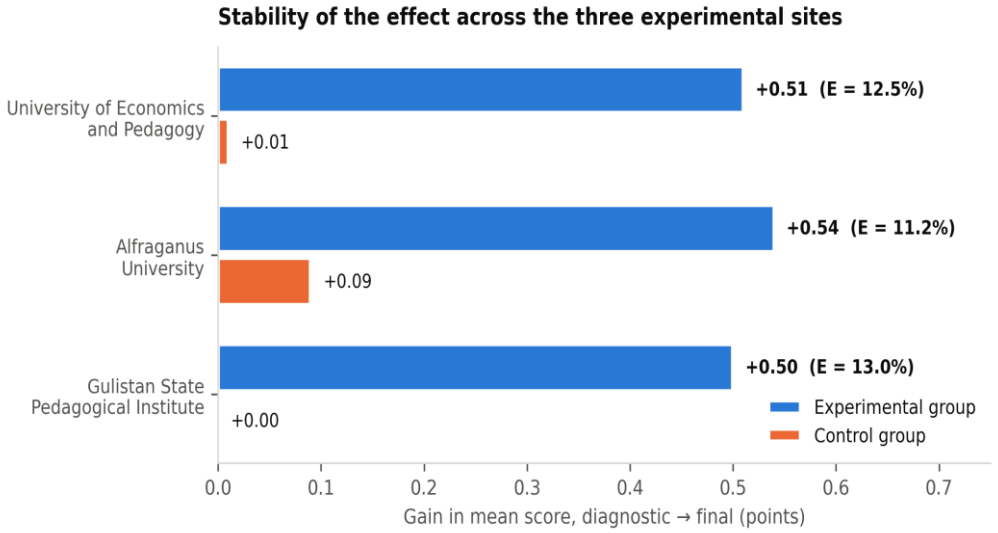

Figure 5. Stability of the effect across the three experimental sites.

3.6. Qualitative corroboration

Quantitative findings were triangulated against four streams of qualitative evidence collected throughout the experiment (Figure 6). Reflective journals changed in register rather than merely in volume: narrative entries ("today I attended the lecture") gave way to analytical ones ("in this task I chose the wrong strategy; next time I will select the sources first"). At baseline only 18% of entries in the experimental group were analytical in character; by the final phase 61% were. Portfolio analysis showed a parallel shift in the nature of independent-study products: reproductive work (transcription, compilation essays) fell from 64% to 21%, while constructive and creative work (projects, small-scale inquiries, original lesson designs) rose from 36% to 79%. The control group showed almost no change on either indicator.

Expert observation, coded against the ICAP taxonomy, recorded a change in the structure of classroom participation: the shares of passive and active modes declined and the shares of constructive and interactive modes increased, which is precisely the movement the intervention was designed to produce (Chi & Wylie, 2014). Platform statistics corroborated the activity-based criterion from an independent source: regular access to the electronic course (at least three times a week) rose from 41% to 78%, and on-time submission of assignments from 63%

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to 91% — behavioural trace data of the kind increasingly used as an unobtrusive proxy for self-regulation in digital environments (Viberg et al., 2020). Finally, interviews identified three drivers of change named repeatedly by students: the advance transparency of assessment criteria, freedom of choice among assignments, and regular, specific feedback from the teacher — the three elements that had been designated in the model as the core of the motivational and assessment-and-monitoring clusters.

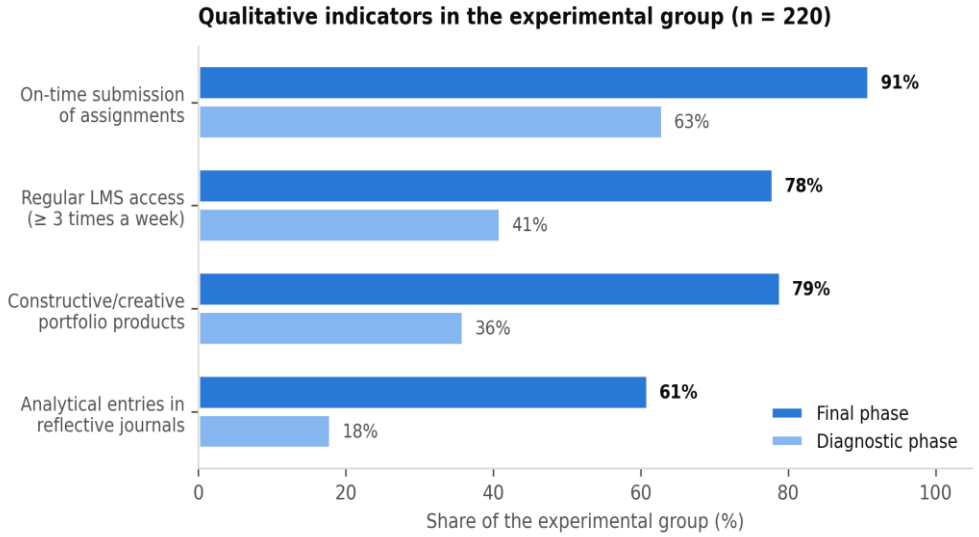

Figure 6. Qualitative indicators in the experimental group at the diagnostic and final phases.

3.7. Discussion

The growth of the experimental group was uneven across the two intervention years: +0.34 points in the formative year (3.74 → 4.08) and +0.17 points in the final year (4.08 → 4.25). The first-year shift was thus twice the second. This "initial leap" is a familiar pattern: the move into a qualitatively new instructional environment releases the largest immediate reserve, after which growth slows and deepens qualitatively. Practically, it argues against confining such interventions to a single semester; the mechanisms need to be distributed across the whole degree programme if the second, slower, consolidating phase is to be realised at all.

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The findings align with the international evidence base at several points. The obtained effect size, d = 0.67, falls within the range reported by meta-analyses of active learning in higher education, where instructional designs that require the learner to construct rather than receive consistently outperform conventional lecturing (Freeman et al., 2014; Hattie, 2009). The ICAP hierarchy I > C > A > P (Chi & Wylie, 2014) was reproduced in the expert observation data, with the shift toward constructive and interactive participation accompanying the measured gains. Zimmerman's (2000) cyclical model of self-regulation was visible in the reflective journals, where the capacity to run the plan — perform — self-assess cycle independently increased markedly; this is consistent with reviews showing that self-regulatory strategy use is the most consistent behavioural correlate of achievement in technology-rich higher education (Broadbent & Poon, 2015; Cheng et al., 2025; Luo & Zhou, 2024).

The single most important theoretical implication concerns the role of feedback. Students themselves identified regular, specific and timely feedback as the principal cause of their own change, which converges with the long-standing finding that feedback is among the most powerful influences on achievement (Black & Wiliam, 1998; Hattie & Timperley, 2007) and with more recent work on the evolution of feedback practice in higher education (Masoumian Hosseini et al., 2026). For the credit–module system specifically this is a structural point: the modular architecture creates natural feedback points at the close of each module, but that affordance is realised only when assessment is formative. Where it remains summative, the end-of-module grade becomes a verdict that the student can no longer act upon, and the structural advantage of modularity is forfeited.

Reading the clusters individually clarifies how the package worked. Motivational mechanisms performed the ignition function. The experiment showed that the credit–module system as such — point accumulation and rating — does not automatically produce intrinsic motivation; a purely points-oriented environment can in fact reward a surface approach, exactly as the deep–surface literature predicts (Biggs & Tang, 2011; Marton & Säljö, 1976). Intrinsic motivation was formed through freedom of assignment choice, goal-setting sessions and engineered success situations, which corresponds to the autonomy need in self-determination theory (Reeve, 2012; Ryan & Deci, 2000). Organisational–didactic

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mechanisms regulated independent study. Since more than half the workload in the credit–module system falls to independent work, this cluster fills the system's structural void: the assignment passport — objective, deadline, rubric, output format — converted an ill-defined requirement into a manageable pedagogical process, an instance of the scaffolding logic documented in online and blended settings (Dabbagh & Kitsantas, 2012; Doo et al., 2020).

Technological mechanisms raised the level of participation. Problem-based learning, case study and project work moved students into the constructive and interactive bands of the ICAP hierarchy (Guo et al., 2020; Hmelo-Silver, 2004; Savery, 2006; Thomas, 2000), while the digital environment supplied continuity of independent work and speed of feedback; in flipped formats specifically, self-regulatory capacity is the variable that most reliably separates students who profit from the format from those who do not (Sun et al., 2018). The experiment also confirmed the caution repeatedly voiced in the blended-learning literature: platforms deliver nothing on their own and function only when filled with pedagogical content (De Bruijn-Smolders & Prinsen, 2024; Halverson & Graham, 2019; Heilporn et al., 2021). Assessment-and-monitoring mechanisms emerged as one of the strongest clusters, for the reason given above. Reflective–developmental mechanisms served as the consolidating link: without reflection, gains remain episodic; the reflection journal and the self-assessment sheet allowed students to view and steer their own activity from the outside, which is why reflection was treated as a compulsory rather than an optional element.

The behaviour of the control group deserves comment in its own right. Over three years its mean moved from 3.76 to 3.78. At first sight this is surprising, since those students advanced through the programme and their stock of knowledge grew. But the construct measured here is not the volume of knowledge; it is learning–cognitive activity — the capacity to organise one's own cognitive work and the internal disposition toward it. Under reproductive, control-oriented teaching this quality does not form by itself: the student acquires new knowledge while the manner of acquiring it remains unchanged. This is the most persuasive available evidence for the study's founding premise that the organisational introduction of the credit–module system does not by itself guarantee activity.

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What distinguishes this study from prior work in the region is that it tested not individual elements — independent study, digital tools, differentiation, assessment — but their integrated system, and demonstrated statistically that systemic deployment outperforms piecemeal deployment. The experiment indicated that applying a single mechanism, such as the digital platform alone or the project method alone, yields no appreciable result, and that the synergy effect appears when at least three mechanism clusters operate together. This is a practically consequential finding for institutions planning reform: the unit of implementation should be the module-level package, not the individual technique.

Limitations

Five limitations bound the conclusions. First, groups were formed from intact academic classes rather than by individual randomisation, so a selection effect cannot be fully excluded; the statistically demonstrated baseline equivalence substantially mitigates but does not eliminate this concern. Second, activity was rated on a three-point ordinal scale (5–4–3), which may not capture fine-grained change; this is why every parametric result was verified with χ^2. Third, the experiment was conducted within pedagogical disciplines, and transfer of the findings to the natural sciences and engineering requires caution. Fourth, a teacher effect (including a Hawthorne effect) cannot be entirely ruled out, although the experience and qualification of instructors were equalised across conditions. Fifth, the observation window was three years; the longer-term influence of the mechanisms on graduates' professional practice remains a separate research question. These limitations do not weaken the conclusions but define the boundaries within which they apply.

Implications for practice

Three levels of recommendation follow. For teaching staff: design every module on the triad of learning outcomes — assignment — assessment criterion (constructive alignment); equip every independent-study task with a passport and a rubric; plan at least one constructive or interactive task per class session; provide written feedback at the close of each module; and make the reflection

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journal a compulsory element. The practical algorithm is five steps: (1) state in explicit verbs what the student should know and be able to do at the end of the module; (2) select for each outcome a task that makes it visible — a test for knowledge, a case for analysis, a project for application; (3) construct and publish the rubric in advance; (4) plan a mid-module feedback point; (5) require a reflection sheet at the close.

For departments and institutional leadership: incorporate active-learning and formative-assessment sections into course documentation; activate the independent-study and feedback modules of the HEMIS platform; organise a continuing-professional-development module on active learning and formative assessment; and introduce systematic monitoring of learning–cognitive activity as an object of quality management. For students: record a personal learning goal at the start of each module, keep a weekly reflection journal, maintain the portfolio continuously, participate actively in peer assessment, and use feedback to adjust their own strategy.

4. Conclusion

This study set out to determine whether the credit–module system, once installed, produces the learning–cognitive activity it is expected to produce, and if not, what pedagogical work is required to make it do so. The three-year quasi-experiment answers both parts of the question clearly.

First, the organisational introduction of the credit–module system does not by itself generate learning–cognitive activity. At baseline, in three institutions that had already operated the system for at least two years, more than 83% of students stood at the medium or low level of activity, and over three years of conventional teaching the control group moved by 0.02 points. Modules, credits and rating scales are an institutional platform; they are not a pedagogy.

Second, activity grows substantially when that platform is filled with a coherent system of pedagogical mechanisms. Implementing motivational, organisational–didactic, technological, assessment-and-monitoring and reflective–developmental mechanisms as a single package raised the experimental mean from 3.74 to 4.25 on the five-point scale, increased the share of high-activity students from 15.9% to 37.3% and reduced the share of low-activity students

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from 42.3% to 12.2%. The difference was confirmed by three independent statistical criteria ($t(428) = 6.97$; $\chi^2(2) = 47.86$; $d = 0.67$, all $p < .001$), with an efficiency coefficient of 12.4%, and it reproduced across three institutions in three regions.

Third, the effect has three properties that matter for practice. It is cumulative: the advantage grew from phase to phase, so interventions confined to one semester will under-realise their potential. It is balanced: gains were identical (+0.51 points) on the motivational, cognitive and activity-based criteria, indicating that the mechanisms develop the components of activity jointly rather than trading one against another. And it is compensatory: the sharpest improvement occurred in the low-activity group, precisely the students most exposed to academic debt in a modular system.

Fourth, the mechanisms work as a system rather than as a list. A single technique — a platform, a project method, a rubric — produced no appreciable effect on its own; the synergy appeared when at least three clusters operated together, anchored by three elements that students themselves identified as decisive: transparent assessment criteria known in advance, freedom of choice among assignments, and regular, specific, timely feedback. The practical corollary is that the unit of implementation should be the module-level package.

The study contributes a validated multi-source diagnostic system for learning–cognitive activity ($\alpha = .76–.86$), an integrative model linking the goal, content, process-technological and outcome-assessment components of module design, and empirical evidence from a national context in which the credit–module reform is still being pedagogically consolidated. Future work should extend the test to natural-science and engineering programmes, refine the measurement scale beyond three ordinal levels, and follow graduates into professional practice to establish whether the activity formed under these conditions persists beyond the degree.

References

1. Astin, A. W. (1984). Student involvement: A developmental theory for higher education. Journal of College Student Personnel, 25(4), 297–308.

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 2, Issue 5, May, 2026
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

2. Barrows, H. S. (1986). A taxonomy of problem-based learning methods. Medical Education, 20(6), 481–486. https://doi.org/10.1111/j.1365-2923.1986.tb01386.x
3. Bergdahl, N., Bond, M., Sjöberg, J., Dougherty, M., & Oxley, E. (2024). Unpacking student engagement in higher education learning analytics: A systematic review. International Journal of Educational Technology in Higher Education, 21, Article 63. https://doi.org/10.1186/s41239-024-00493-y
4. Biggs, J., & Tang, C. (2011). Teaching for quality learning at university (4th ed.). McGraw-Hill/Open University Press.
5. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice, 5(1), 7–74. https://doi.org/10.1080/0969595980050102
6. Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. The Internet and Higher Education, 27, 1–13. https://doi.org/10.1016/j.iheduc.2015.04.007
7. Cheng, Z., Zhang, Z., Xu, Q., Maeda, Y., & Gu, P. (2025). A meta-analysis addressing the relationship between self-regulated learning strategies and academic performance in online higher education. Journal of Computing in Higher Education, 37, 195–224. https://doi.org/10.1007/s12528-023-09390-1
8. Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. Educational Psychologist, 49(4), 219–243. https://doi.org/10.1080/00461520.2014.965823
9. Coates, H. (2007). A model of online and general campus-based student engagement. Assessment & Evaluation in Higher Education, 32(2), 121–141. https://doi.org/10.1080/02602930600801878
10. Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. The Internet and Higher Education, 15(1), 3–8. https://doi.org/10.1016/j.iheduc.2011.06.002

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 2, Issue 5, May, 2026
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

11. De Bruijn-Smolders, M., & Prinsen, F. R. (2024). Effective student engagement with blended learning: A systematic review. Heliyon, 10(23), Article e39439. https://doi.org/10.1016/j.heliyon.2024.e39439
12. Doo, M. Y., Bonk, C. J., & Heo, H. (2020). A meta-analysis of scaffolding effects in online learning in higher education. The International Review of Research in Open and Distributed Learning, 21(3), 60–80. https://doi.org/10.19173/irrodl.v21i3.4638
13. European Commission. (2023). ECTS users' guide. Publications Office of the European Union.
14. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. Review of Educational Research, 74(1), 59–109. https://doi.org/10.3102/00346543074001059
15. Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences, 111(23), 8410–8415. https://doi.org/10.1073/pnas.1319030111
16. Gaebel, M., & Zhang, T. (2018). Trends 2018: Learning and teaching in the European Higher Education Area. European University Association.
17. Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. International Journal of Educational Research, 102, Article 101586. https://doi.org/10.1016/j.ijer.2020.101586
18. Halverson, L. R., & Graham, C. R. (2019). Learner engagement in blended learning environments: A conceptual framework. Online Learning, 23(2), 145–178. https://doi.org/10.24059/olj.v23i2.1481
19. Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge.
20. Hattie, J., & Timperley, H. (2007). The power of feedback. Review of Educational Research, 77(1), 81–112. https://doi.org/10.3102/003465430298487
21. Heilporn, G., Lakhal, S., & Bélisle, M. (2021). An examination of teachers' strategies to foster student engagement in blended learning in higher

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 2, Issue 5, May, 2026
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

education. International Journal of Educational Technology in Higher Education, 18, Article 25. https://doi.org/10.1186/s41239-021-00260-3

22. Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational Psychology Review, 16(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3
23. Kahu, E. R. (2013). Framing student engagement in higher education. Studies in Higher Education, 38(5), 758–773. https://doi.org/10.1080/03075079.2011.598505
24. Kahu, E. R., & Nelson, K. (2018). Student engagement in the educational interface: Understanding the mechanisms of student success. Higher Education Research & Development, 37(1), 58–71. https://doi.org/10.1080/07294360.2017.1344197
25. Knowles, M. S. (1975). Self-directed learning: A guide for learners and teachers. Association Press.
26. Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. Improving Schools, 19(3), 267–277. https://doi.org/10.1177/1365480216659733
27. Korhonen, V., Ketonen, E., & Toom, A. (2024). Student engagement and its development in university education: A three-year follow-up study. Learning and Individual Differences, 113, Article 102465. https://doi.org/10.1016/j.lindif.2024.102465
28. Luo, R.-Z., & Zhou, Y.-L. (2024). The effectiveness of self-regulated learning strategies in higher education blended learning: A five years systematic review. Journal of Computer Assisted Learning, 40(6), 3005–3029. https://doi.org/10.1111/jcal.13052
29. Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I — Outcome and process. British Journal of Educational Psychology, 46(1), 4–11. https://doi.org/10.1111/j.2044-8279.1976.tb02980.x
30. Masoumian Hosseini, M., Qayumi, K., & Zolfaghari, M. (2026). Unleashing the potential of education: Embracing a new era of learning through feedback evolution. Discover Education, 5, Article 121. https://doi.org/10.1007/s44217-026-01110-y

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 2, Issue 5, May, 2026
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

31. OECD. (2018). The future of education and skills: Education 2030. OECD Publishing.
32. Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. Educational Psychology Review, 16(4), 385–407. https://doi.org/10.1007/s10648-004-0006-x
33. Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, 82(1), 33–40. https://doi.org/10.1037/0022-0663.82.1.33
34. Ramsden, P. (2003). Learning to teach in higher education (2nd ed.). RoutledgeFalmer.
35. Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), Handbook of research on student engagement (pp. 149–172). Springer. https://doi.org/10.1007/978-1-4614-2018-7_7
36. Rotgans, J. I., & Schmidt, H. G. (2011). Cognitive engagement in the problem-based learning classroom. Advances in Health Sciences Education, 16(4), 465–479. https://doi.org/10.1007/s10459-011-9272-9
37. Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68
38. Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. Interdisciplinary Journal of Problem-Based Learning, 1(1), 9–20. https://doi.org/10.7771/1541-5015.1002
39. Sun, Z., Xie, K., & Anderman, L. H. (2018). The role of self-regulated learning in students' success in flipped undergraduate math courses. The Internet and Higher Education, 36, 41–53. https://doi.org/10.1016/j.iheduc.2017.09.003
40. Thomas, J. W. (2000). A review of research on project-based learning. The Autodesk Foundation.
41. Torres Castro, U. E. (2024). Toward a unified framework: The intellectual lineage of student engagement in higher education (1999–2024). Cogent

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Education, 11(1), Article 2369002. https://doi.org/10.1080/2331186X.2024.2369002

42. Trowler, V. (2010). Student engagement literature review. The Higher Education Academy.
43. UNESCO. (2021). Reimagining our futures together: A new social contract for education. UNESCO Publishing.
44. Viberg, O., Khalil, M., & Baars, M. (2020). Self-regulated learning and learning analytics in online learning environments: A review of empirical research. In Proceedings of the 10th International Conference on Learning Analytics and Knowledge (pp. 524–533). ACM. https://doi.org/10.1145/3375462.3375483
45. Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.
46. Wolters, C. A. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-regulated learning. Educational Psychologist, 38(4), 189–205. https://doi.org/10.1207/S15326985EP3804_1
47. Zepke, N., & Leach, L. (2010). Improving student engagement: Ten proposals for action. Active Learning in Higher Education, 11(3), 167–177. https://doi.org/10.1177/1469787410379680
48. Zhao, Y., Li, Y., Ma, S., Xu, Z., & Zhang, B. (2025). A meta-analysis of the correlation between self-regulated learning strategies and academic performance in online and blended learning environments. Computers & Education, 230, Article 105279. https://doi.org/10.1016/j.compedu.2025.105279
49. Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7
50. Zimmerman, B. J., & Schunk, D. H. (Eds.). (2011). Handbook of self-regulation of learning and performance. Routledge. https://doi.org/10.4324/9781315697048