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Modular Learning and Educational Inequality in Rural Philippine Secondary Education

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ABSTRACT

This study investigates modular learning, defined as self-paced, independent study using learning modules, as a dimension of educational inequality in rural Philippine secondary Education. It focuses on how students navigate learning amid limited instructional support, including direct guidance, feedback, and teaching interaction, as well as uneven access to resources. A qualitative descriptive design was employed. Data were collected through in-depth, face-to-face interviews with ten Grade 11 students at a geographically isolated public secondary school. Thematic analysis using QualCoder 3.8 identified patterns in learning strategies, instructional conditions, and affective responses. Students developed adaptive learning strategies, including repeated reading to reinforce understanding, incremental problem-solving by breaking complex problems into manageable steps, and selective help-seeking when necessary. These strategies partially compensated for reduced teacher mediation. Their effectiveness depended on instructional clarity, the availability and responsiveness of support, and students' affective states. Autonomy served as a conditional resource, providing flexibility but also increasing cognitive and emotional demands. Academic performance resulted from the interaction among learning strategies, instructional conditions, and affective responses, leading to uneven outcomes within the same modular system. This study is limited by its small sample size, single rural context, and reliance on self-reported data. Future research should examine the proposed interactional framework across diverse settings and assess interventions that enhance instructional support in modular learning environments. This study reframes modular learning as an equity-related issue, challenging learning-style explanations and proposing an interactional framework. In this framework, learning outcomes result from the dynamic interplay among strategy, context, and affect. The study provides a context-sensitive perspective for designing more equitable and sustainable modular learning systems in rural settings.

Keywords: *modular learning, educational inequality, rural Education, self-regulated learning, Philippines.*

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INTRODUCTION

Educational systems in geographically remote and resource-constrained contexts continue to face persistent challenges in ensuring equitable access to meaningful learning opportunities.[1] In such settings, disparities in infrastructure, availability of teachers, and access to instructional support shape not only participation in Education but also the quality of learning outcomes.[2] Instructional arrangements such as modular learning have been widely adopted as pragmatic responses to these conditions, particularly where consistent face-to-face teaching or reliable digital connectivity cannot be guaranteed.[3] By organizing content into self-contained modules, this approach is intended to sustain learning continuity while offering flexibility in pacing and task completion.[4] However, while modular learning is often presented as an inclusive solution, its implications for equity remain insufficiently examined.

Recent research underscores that educational modalities implemented in rural and underserved contexts cannot be separated from broader structural inequalities. A systematic review of rural schooling highlights how the digital divide and limited technological infrastructure contribute to persistent educational inequities, constraining both access and quality of learning.[5] Similarly, studies on social justice-oriented Education emphasize that instructional practices must be understood in relation to local contexts, structural constraints, and marginalized learner experiences.[6] These perspectives suggest that modular learning should not be viewed merely as a technical or pedagogical solution, but as part of a broader system in which access, support, and opportunity are unevenly distributed.

At a conceptual level, modular learning redistributes responsibility for learning from institutions to individual learners and their immediate environments. Students are expected to interpret instructional materials, manage their time, regulate their effort, and persist through challenges with limited direct teacher mediation. While this shift may enable flexibility, it also raises important questions about fairness and capacity. Learners with stronger self-regulatory skills or access to supportive home environments are more likely to succeed, whereas those facing limited support may encounter increased cognitive and emotional burden. In this sense, modular learning environments may unintentionally reproduce existing inequalities rather than mitigate them.

This tension reflects a broader issue in educational research concerning the relationship between autonomy and support. While autonomy is often associated with independence and self-directed learning, evidence from self-regulated learning (SRL) research indicates that

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[1] Ashley Gunter, "The Geography of Distance Education: Spatial Disparities, Accessibility, and Impact across Place," *South African Geographical Journal* 107, no. 4 (October 2, 2025): 498–516, https://doi.org/10.1080/03736245.2025.2472653; Saraswati Dawadi, Fereshte Goshtasbpour, and Agnes Kukulska-Hulme, "Equitable Access to Higher Education Learning and Assessment: Perspectives from Low-Resource Contexts," *Journal of Interactive Media in Education* 2024, no. 1 (February 15, 2024), https://doi.org/10.5334/jime.832.

[2] Yasir Riady et al., "The Implementation of Open and Distance Education to Advance Educational Access in Remote Areas," *FINGER : Jurnal Ilmiah Teknologi Pendidikan* 4, no. 2 (June 26, 2025): 141–49, https://doi.org/10.58723/finger.v4i2.387.

[3] Ysthr Rave Pe Dangle, "The Implementation of Modular Distance Learning in the Philippine Secondary Public Schools," in *Proceedings of The 3rd International Conference on Advanced Research in Teaching and Education* (GLOBALKS, 2020), https://doi.org/10.33422/3rd.icate.2020.11.132.

[4] Mary Chandra R. Hermosisima, Froilan D. Mobo, and Anesito L. Cutillas, "Enhanced Learning Continuity Framework Using Online Teaching as Alternative Delivery Modality," *International Journal of Multidisciplinary: Applied Business and Education Research* 4, no. 5 (May 20, 2023): 1521–34, https://doi.org/10.11594/ijmaber.04.05.14.

[5] Faisal Mustafa, Hoa Thi Mai Nguyen, and Xuesong (Andy) Gao, "The Challenges and Solutions of Technology Integration in Rural Schools: A Systematic Literature Review," *International Journal of Educational Research* 126 (2024): 102380, https://doi.org/10.1016/j.ijer.2024.102380.

[6] Nina Hosseini et al., "Practices of Social Justice-Oriented Teacher Education: A Review of the Literature," *Frontiers in Education* 9 (October 17, 2024), https://doi.org/10.3389/feduc.2024.1432617.

effective autonomy depends on structured guidance, feedback, and scaffolding. Studies have shown that processes such as goal setting, planning, monitoring, and reflection are central to successful learning in independent contexts.[7] Furthermore, teacher-focused interventions demonstrate that explicit support for SRL can significantly enhance students' capacity to manage their own learning.[8] These findings suggest that autonomy without adequate support may place disproportionate demands on learners, particularly in resource-constrained environments.

A related issue concerns the role of feedback and instructional clarity. In modular learning, where teacher interaction may be limited or delayed, feedback becomes a critical mechanism for guiding understanding and sustaining engagement. Recent evidence indicates that both teacher and peer feedback can significantly influence students' self-regulated learning processes, particularly when feedback is timely, specific, and aligned with learning goals.[9] In the absence of such feedback, students may experience uncertainty, reduced motivation, and weaker academic performance. This highlights the importance of considering not only the availability of instructional materials but also the quality of support structures surrounding them.

Within this broader debate, the concept of learning styles has frequently been used to explain differences in student engagement and performance. However, the validity of this framework remains highly contested. Recent work argues that the persistence of learning styles in educational discourse reflects a conflation between preferences, strategies, and cognitive processes, and that the widely accepted "matching hypothesis" lacks empirical support.[10] In modular learning contexts, where students must adapt to varying levels of instructional support, a focus on fixed learning styles may obscure more critical issues related to strategy use, environmental constraints, and access to support. Consequently, there is a need to move beyond static categorizations of learners and toward a more dynamic understanding of learning processes.

An alternative perspective is provided by research on self-regulated learning, which conceptualizes learners as active agents who adapt their strategies in response to contextual demands. From this viewpoint, learning is not determined by stable traits but emerges from the interaction between cognitive strategies, environmental conditions, and affective experiences. In modular learning environments, this interaction is particularly evident. Students rely on strategies such as repeated reading, note-taking, incremental problem-solving, and selective help-seeking to navigate instructional materials. These strategies are not simply expressions of preference but adaptive responses to the constraints and opportunities of the learning environment.

Importantly, these adaptive processes are closely linked to affective dimensions of learning. Students' motivation, confidence, and emotional responses influence their

[7] Yongzhan Li, "The Mechanism of Self-Regulated Learning among Rural Primary Middle School Students: Academic Delay of Gratification and Resilience," *Learning and Motivation* 87 (August 2024): 102013, https://doi.org/10.1016/j.lmot.2024.102013.

[8] Helen Stephenson et al., "Helping Teacher Education Students' Understanding of Self-Regulated Learning and How to Promote Self-Regulated Learning in the Classroom," *Frontiers in Education* 9 (October 1, 2024), https://doi.org/10.3389/feduc.2024.1451314.

[9] Mücahit Öztürk, Erkan Yüce, and Pınar Mıhcı Türker, "Online Peer Feedback Versus Online Teacher Feedback? Effect of Online Feedback on Students' Self-Regulated Learning," *Technology, Knowledge and Learning* 30, no. 2 (June 10, 2025): 769–87, https://doi.org/10.1007/s10758-024-09812-8.

[10] John Hattie and Timothy O'Leary, "Learning Styles, Preferences, or Strategies? An Explanation for the Resurgence of Styles Across Many Meta-Analyses," *Educational Psychology Review* 37, no. 2 (June 1, 2025): 31, https://doi.org/10.1007/s10648-025-10002-w.

persistence and engagement, particularly in contexts characterized by limited guidance and delayed feedback. Negative emotions such as frustration and anxiety may disrupt learning, while positive experiences of autonomy and accomplishment can reinforce engagement. Understanding modular learning, therefore, requires an integrated perspective that considers cognitive, contextual, and affective factors as interdependent components of the learning process.

Despite growing interest in modular and independent learning, there remains a lack of research that explicitly examines how these dimensions interact in shaping students' experiences in rural and resource-constrained contexts. Much of the existing literature focuses on isolated variables without capturing the dynamic relationships among strategy use, instructional conditions, and affective responses. This gap is particularly significant in public secondary schools where modular learning serves as a primary mode of instruction, amplifying both its potential benefits and its limitations.

The present study addresses this gap by examining the learning strategies and attitudes of Grade 11 students toward modular learning at Mayoyao National High School, a rural public secondary school in Ifugao, Philippines. In this context, students are required to manage learning tasks with limited direct teacher interaction and constrained access to resources. The study adopts a process-oriented perspective that explores how learners develop and apply strategies, how they negotiate autonomy and instructional constraints, how their affective responses fluctuate, and how these factors are perceived to influence academic performance.

This study offers three key contributions. First, it reframes modular learning as an issue of educational equity by demonstrating how limited instructional support and unequal access to resources shape students' learning experiences in rural contexts. Second, it challenges the explanatory value of learning styles by showing that students develop adaptive learning strategies in response to contextual constraints rather than relying on fixed preferences. Third, it proposes an interactional model in which academic performance emerges from the dynamic interplay between learning strategies, instructional conditions, and affective responses. These contributions provide a more context-sensitive and process-oriented understanding of learning in modular environments and align with broader efforts to advance social justice, community empowerment, and sustainable educational practices.

METHOD

This study employed a qualitative descriptive design to examine how Grade 11 students experience modular learning in a resource-constrained rural context. Recent methodological guidance describes qualitative description as an accessible but rigorous approach that remains close to participants' accounts, prioritizes direct description over extensive theorization, and is particularly useful when the aim is to represent lived experience in a context-sensitive manner rather than to test a pre-existing theory.[11] In the present study, this design was selected because the focus was on how students adapt to modular learning under structurally uneven conditions, not on measuring variable effects statistically.

[11] Steven Hall and Linda Liebenberg, "Qualitative Description as an Introductory Method to Qualitative Research for Master's-Level Students and Research Trainees," *International Journal of Qualitative Methods* 23 (January 25, 2024), https://doi.org/10.1177/16094069241242264; Princess Villamin et al., "A Worked Example of Qualitative Descriptive Design: A Step-by-Step Guide for Novice and Early Career Researchers," *Journal of Advanced Nursing* 81, no. 8 (August 9, 2025): 5181–95, https://doi.org/10.1111/jan.16481.

The study was guided by an interactional analytical framework grounded in self-regulated learning and equity-oriented perspectives. Within this framework, learning strategies were treated as adaptive cognitive processes, instructional conditions as contextual constraints and affordances, and affective responses as emotional dynamics that mediate engagement and persistence. Academic performance was not conceptualized as the direct result of any single factor, but as an emergent outcome of the interaction among these dimensions. This framework informed the interview protocol, coding strategy, and interpretation of findings. The methodological framework figure should be placed here.

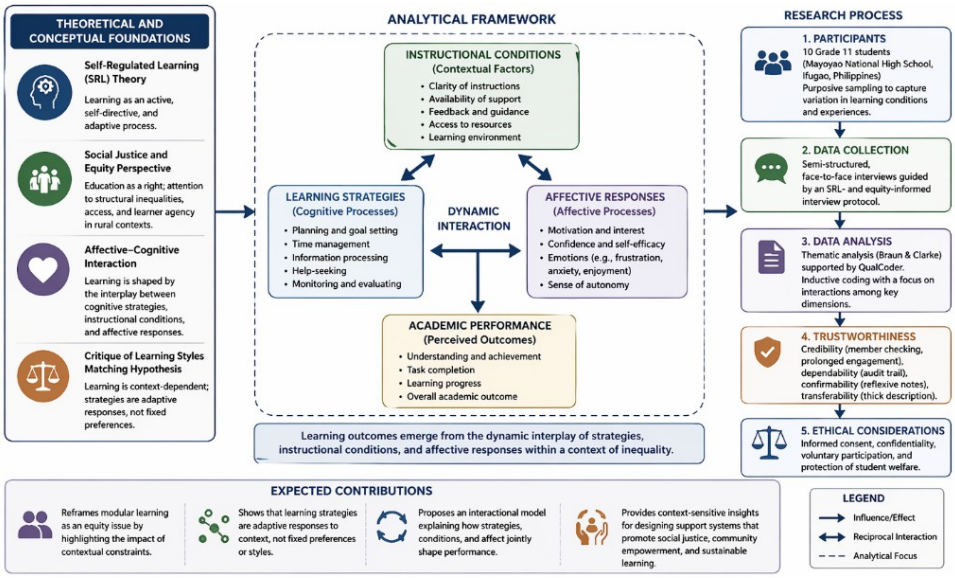

Figure 1. Methodological Framework of the Study.

Figure 1 illustrates the integrated methodological and analytical framework guiding the study. Grounded in self-regulated learning and a social justice perspective, the framework conceptualizes modular learning as an interactional process shaped by three core dimensions: learning strategies (cognitive processes), instructional conditions (contextual factors), and affective responses (emotional processes). These dimensions interact dynamically to influence students' perceived academic performance. The diagram also outlines the research process, including participant selection, data collection through in-depth interviews, thematic analysis using QualCoder 3.8, and procedures to ensure trustworthiness and ethical integrity.

The study was conducted at Mayoyao National High School, a rural public secondary school in Ifugao, Philippines, where modular learning remains a central instructional arrangement. Ten Grade 11 students participated in the study and were selected purposively to capture variation in learning conditions, including differences in access to support, study environment, and perceived academic performance. The sample was intentionally small because the study sought information-rich accounts and cross-case depth, consistent with qualitative interview research in which adequacy is judged in relation to the complexity of the topic, the structure of the interview guide, and the intended depth of analysis rather than numerical representativeness alone.[12]

[12] Claudia M Squire et al., "Determining an Appropriate Sample Size for Qualitative Interviews to Achieve True and Near Code Saturation: Secondary Analysis of Data," *Journal of Medical Internet Research* 26 (July 9, 2024): e52998, https://doi.org/10.2196/52998.

Data were collected through in-depth, semi-structured face-to-face interviews. This approach was selected because semi-structured interviews are well-suited to eliciting emic perspectives while still providing enough flexibility to probe for detail, clarification, and emerging meanings during the conversation.[13] Each interview was conducted individually in a quiet school setting to support open discussion and minimize interruption. The interview guide focused on four areas: learning strategies used in modular learning, experiences of autonomy and instructional constraints, affective responses to learning tasks, and perceived academic performance. The choice of face-to-face interviewing was intended to encourage dialogic interaction and richer narrative disclosure than a purely written format would allow. Data collection for this study was conducted between March and June 2025, during which all interviews were completed and subsequently transcribed for analysis.

The primary instrument was a semi-structured interview protocol developed from the study objectives and the relevant literature. The research adviser reviewed the protocol for clarity, relevance, and alignment with the research questions, and minor revisions were made to improve wording and sequencing. The final interview guide was designed to capture not only individual learning strategies, but also contextual conditions such as instructional clarity, access to support, and students' emotional responses during modular learning.

Data were analyzed using thematic analysis supported by QualCoder 3.8. Recent methodological writing describes thematic analysis as a structured yet flexible approach for identifying, organizing, and interpreting patterns of meaning in qualitative data. It emphasizes the importance of reflexivity, transparency, and iterative coding across the analytic process.[14] In this study, the analysis followed an inductive logic: transcripts were read repeatedly, initial codes were generated from participants' accounts, and candidate themes were progressively refined through comparison across cases. QualCoder 3.8 was used as an organizational tool to support coding, retrieval, and review of text segments; however, the interpretive work remained grounded in the researcher's close engagement with the data.[15] The analysis was intentionally oriented toward relational patterns connecting learning strategies, instructional conditions, and affective responses rather than toward isolated descriptive categories.[16]

To strengthen trustworthiness, the study drew on the core criteria commonly used in qualitative inquiry: credibility, transferability, dependability, and confirmability. Recent guidance notes that these criteria are supported through practices such as prolonged engagement, detailed contextual description, audit trails, member checking, and reflexive journaling, all of which enhance the transparency and reliability of qualitative findings.[17] In this study, credibility was supported through member checking, dependability through systematic documentation of analytic decisions, confirmability through reflexive memoing, and transferability through thick description of the school context and participant experiences.

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[13] Frances Junnier, "Action and Understanding in the Semi-Structured Research Interview: Using CA to Analyse European Research Scientists' Attitudes to Linguistic (Dis)Advantage," *Journal of English for Academic Purposes* 68 (March 2024): 101355, https://doi.org/10.1016/j.jeap.2024.101355.

[14] Sirwan Khalid Ahmed et al., "Using Thematic Analysis in Qualitative Research," *Journal of Medicine, Surgery, and Public Health* 6 (August 2025): 100198, https://doi.org/10.1016/j.glmedi.2025.100198.

[15] Alexios Brailas, Elena Tragou, and Konstantinos Papachristopoulos, "Introduction to Qualitative Data Analysis and Coding with QualCoder," *American Journal of Qualitative Research* 7, no. 3 (April 29, 2023): 19–31, https://doi.org/10.29333/ajqr/13230.

[16] Virginia Braun and Victoria Clarke, "Toward Good Practice in Thematic Analysis: Avoiding Common Problems and Be(Com)Ing a Knowing Researcher," *International Journal of Transgender Health* 24, no. 1 (January 25, 2023): 1–6, https://doi.org/10.1080/26895269.2022.2129597.

[17] Ahmed et al., "Using Thematic Analysis in Qualitative Research."

Ethical approval and permission to conduct the study were obtained from the school administration. All participants were informed of the study purpose and provided informed consent before participation. Confidentiality was maintained through the use of pseudonyms, and students were reminded that participation was voluntary and that they could withdraw at any point without penalty. Because the participants were students, particular care was taken to ensure that the interview process did not create any perception that their responses would affect academic standing.

RESULTS AND DISCUSSION

Results

The analysis generated four interrelated themes that together depict modular learning as an interactional system rather than a set of discrete factors. Across cases, students' engagement and performance were shaped by the alignment between adaptive learning strategies, instructional conditions, and affective responses. This pattern indicates that learning in modular contexts is not simply a function of individual effort, but emerges from how learners negotiate structurally uneven conditions of support. Table 1 summarizes the thematic structure derived from the coding process.

Table 1. Overview of themes and subthemes derived from qualcoder analysis

Theme	Subthemes	Core Meaning
Theme 1: Adaptive Learning Strategies in Self-Directed Contexts	Repetition and text-based processing; Incremental problem-solving; Strategic help-seeking	Students construct strategies to compensate for limited instructional guidance
Theme 2: Negotiating Autonomy and Instructional Constraints	Perceived flexibility; Instructional ambiguity; Self-discipline requirement	Autonomy is experienced as both enabling and constraining
Theme 3: Affective Responses and Motivational Fluctuations	Positive independence; Stress and frustration; Context-dependent motivation	Emotional engagement varies across tasks and conditions
Theme 4: Perceived Link Between Learning Processes and Academic Performance	Strategy-performance alignment; Affective disruption; Subject-specific variation	Performance emerges from the interaction of strategy, affect, and task demands

Adaptive Learning Under Constraint

Participants consistently described the development of learning strategies that enabled them to manage tasks independently in the absence of sustained teacher mediation. However, these strategies were not stable preferences; rather, they were situational adaptations to constrained instructional conditions.

Table 2. Evidence Structure for Adaptive Learning under Constraint

Subtheme	Observed Learning Behavior	Analytical Interpretation
Text-based intensification	Re-reading modules, annotating, and summarizing	Compensation for reduced instructional mediation through increased cognitive engagement with materials
Incremental task management	Starting with easier tasks, step-by-step progression	Regulation of cognitive load to sustain engagement under independent learning

Subtheme	Observed Learning Behavior	Analytical Interpretation
		conditions
Strategic help-seeking	Consulting family, peers, or online sources after initial attempts	Emergence of hybrid autonomy-support learning under constrained instructional environments

A recurring pattern involved intensified text-based engagement. Students reported repeatedly reading modules, annotating key points, and rewriting content in their own words to compensate for the absence of direct explanation. This suggests that modules were not passively consumed but actively transformed into primary cognitive resources. In parallel, students adopted incremental approaches to task completion, beginning with simpler items before progressing to more complex ones. This sequencing reflects an attempt to regulate cognitive load and maintain continuity in task engagement.

Strategic help-seeking further illustrates the adaptive nature of learning under constraint. Although modular learning emphasizes independence, students frequently relied on family members, peers, or online sources after initial attempts at self-completion. This indicates that autonomy operates in practice as hybrid learning, combining self-regulation with opportunistic access to external support. As shown in Table 2, these subthemes collectively indicate that learning strategies are not independently selected but structurally induced by limited instructional mediation. Importantly, variation in access to support meant that the effectiveness of these strategies differed across participants, introducing uneven learning trajectories within the same instructional model.

Autonomy as a Conditional Resource

Autonomy in modular learning was experienced as both enabling and constraining, functioning as a conditional resource shaped by instructional clarity and environmental support. While students valued the flexibility to regulate their study schedules, this benefit was contingent upon their ability to interpret and act upon instructional materials without direct guidance. Across participants, autonomy initially appeared as a form of agency, allowing learners to integrate academic tasks with domestic responsibilities. However, this agency was fragile. In contexts where instructions were unclear or insufficiently detailed, students shifted from structured engagement to trial-and-error strategies, indicating a breakdown in instructional mediation. This suggests that autonomy does not eliminate dependence on instruction but reconfigures it, making learners dependent on the clarity and accessibility of materials.

Table 3. Evidence Structure for Autonomy as a Conditional Resource

Subtheme	Observed Learning Behavior	Analytical Interpretation
Flexible self-regulation	Self-paced study, personalized scheduling	Autonomy as an enabling condition for temporal control over learning
Instructional ambiguity	Confusion in interpreting tasks, trial-and-error approaches	Reconfiguration of dependence from teacher guidance to material clarity
Self-discipline demands	Managing distractions, maintaining focus independently	Autonomy is cognitively and behaviorally demanding, requiring a strong self-regulation

capacity

The requirement for self-discipline further highlights the conditional nature of autonomy. Sustained engagement depended on students' ability to manage time, maintain focus, and resist distraction—capacities that were unevenly distributed and closely tied to home environments. Students with supportive learning conditions were better able to enact autonomous behaviors, whereas others experienced difficulty maintaining consistent engagement. As summarized in Table 3, autonomy simultaneously enables flexibility and amplifies the demands of self-regulation. Its benefits are therefore differentially realized, reinforcing disparities linked to variations in support and learning environments.

Affective Mediation of Learning Processes

Affective responses emerged as a central mechanism mediating the relationship between instructional conditions and strategy use. Students' emotional experiences were not peripheral but directly influenced their capacity to engage with learning tasks. Positive affect, particularly feelings of independence and accomplishment, was associated with successful task completion and reinforced continued engagement. These experiences indicate that effective navigation of modular learning can strengthen intrinsic motivation and support sustained strategy use. However, such positive states were often contingent upon manageable task demands and accessible support.

Table 4. Evidence Structure for Affective Mediation of Learning

Subtheme	Observed Learning Behavior	Analytical Interpretation
Positive affect reinforcement	Satisfaction after completing tasks independently	Positive affect supports persistence and reinforces strategy use
Affective disruption	Stress and frustration when facing unclear or difficult tasks	Negative affect interrupts cognitive engagement and reduces persistence
Context-dependent motivation	Fluctuating engagement based on task difficulty and environment	The interaction between task demands and contextual conditions situationally shapes motivation

In contrast, negative affect—most notably stress and frustration—was closely associated with instructional ambiguity and task difficulty. When students encountered unclear instructions or complex material without sufficient guidance, emotional strain disrupted cognitive engagement and reduced persistence. This pattern suggests that affect operates as a regulatory layer, influencing whether adaptive strategies can be effectively implemented. Motivation was also highly context-dependent. Participants described fluctuations in engagement based on the interaction between task difficulty, environmental distractions, and perceived competence. As shown in Table 4, affective responses are not stable traits but situational outcomes shaped by the interplay between instructional and contextual factors.

Academic Performance as an Emergent Outcome

Participants consistently framed academic performance as the product of interacting processes rather than a direct outcome of isolated factors. Effective performance was associated with the successful coordination of strategies, emotional regulation, and task

demands. Students linked repeated practice, careful reading, and structured engagement with improved understanding and higher academic outcomes. However, these benefits were contingent upon the stability of affective states and the clarity of instructional materials. Negative emotional experiences, particularly those arising from confusion or overload, were reported to disrupt task completion and reduce output quality.

Participants also identified subject-specific differences, noting that procedural subjects allowed for iterative practice and were therefore more manageable. In contrast, concept-heavy subjects required additional explanation and were more difficult to navigate under modular conditions. This highlights the role of task structure in shaping the interaction between strategy use and performance.

Table 5. Evidence Structure for Academic Performance as Emergent Outcome

Subtheme	Observed Learning Behavior	Analytical Interpretation
Strategy-performance alignment	Linking repeated practice and structured study to better outcomes	Performance contingent on effective deployment of adaptive strategies
Affective-performance linkage	Emotional states influencing task completion and quality	Performance mediated by the stability of affective regulation
Task-structure variation	Easier engagement in procedural vs. conceptual subjects	The interaction between strategy use and task characteristics shapes performance

As summarized in Table 5, academic performance emerges from the alignment—or misalignment—between cognitive effort, affective regulation, and instructional conditions. Differences in support and clarity contribute to variability in this alignment, resulting in uneven outcomes across learners.

Cross-Theme Interaction

To synthesize these patterns, a cross-theme interaction analysis was conducted (Table 6). The matrix reveals consistent relationships linking learning strategies, autonomy conditions, affective responses, and performance outcomes. Across participants, higher levels of self-regulation were associated with structured strategies, more effective management of autonomy, stable affective states, and higher perceived performance. In contrast, low instructional clarity was associated with trial-and-error strategies, heightened stress, and lower performance. Access to external support functioned as a moderating factor, reducing perceived constraints, stabilizing affect, and improving outcomes.

Table 6. Interactional pathways of learning in modular contexts

Instructional Condition	Strategy Configuration	Affective Response	Performance Outcome	Analytical Interpretation
High instructional clarity + available support	Structured strategies (repetition, incremental processing)	Stable motivation, confidence	Consistent and higher performance	Alignment between cognitive, contextual, and affective conditions enables effective self-regulated learning
Low instructional clarity + limited support	Trial-and-error strategies, fragmented	Stress, confusion, frustration	Lower and inconsistent performance	Misalignment across dimensions disrupts learning processes and

Instructional Condition	Strategy Configuration	Affective Response	Performance Outcome	Analytical Interpretation
	engagement			weakens outcomes
Moderate clarity + external support access	Hybrid strategies (self-regulation + help-seeking)	Improved confidence, reduced anxiety	Improved but variable performance	External support compensates for instructional gaps, partially stabilizing learning processes
High task difficulty under constrained support	Incremental strategies with repeated attempts	Frustration, fluctuating motivation	Variable performance depending on persistence	Affective instability mediates the effectiveness of cognitive effort under constraint
Strong self-regulation capacity across conditions	Adaptive and flexible strategy use	Regulated emotional responses	Relatively stable performance	Individual capacity moderates the interaction between context and learning processes

These patterns indicate that learning in modular environments is fundamentally interactional, shaped by the dynamic interplay between cognitive, contextual, and emotional dimensions. Students do not experience modular learning uniformly; instead, their trajectories depend on how effectively they can align strategy use with available support and manage the affective demands of independent learning.

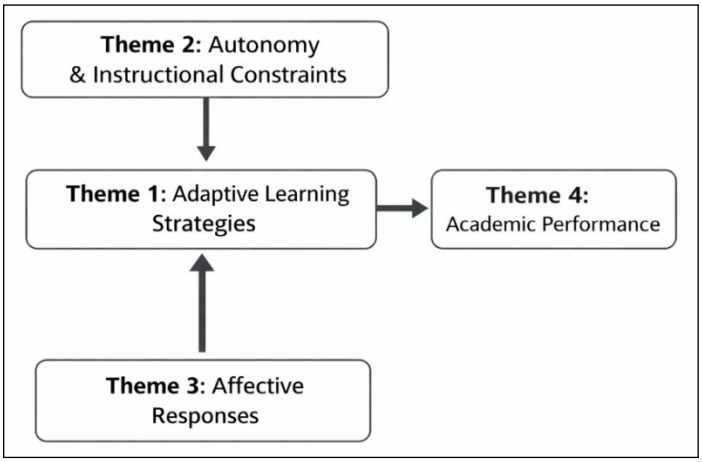

Figure 2. Cross-Theme Relationship Model

This interaction is represented in Figure 2, which illustrates the cross-theme relationship model. The model shows how instructional conditions influence the formation of learning strategies, while affective responses mediate their execution. Academic performance emerges as an outcome of these interacting processes. Importantly, the uneven distribution of support across learners introduces variability in this interaction, reinforcing the conclusion that modular learning operates as a system that can reproduce differential outcomes within the same educational setting.

Discussion

This study advances understanding of modular learning by demonstrating that isolated learner characteristics do not determine student performance but emerge from the interaction between adaptive learning strategies, instructional conditions, and affective

responses. These findings must be interpreted in relation to the study's rural and geographically isolated context, where access to instructional support, technological resources, and academic assistance is inherently limited. Research on rural Education consistently shows that structural constraints—particularly the digital divide and limited infrastructure—shape both access to and quality of learning.[18] Within such conditions, modular learning does not function merely as an instructional alternative but as a system that redistributes responsibility for learning to students and their immediate environments. As a result, learning outcomes reflect not only individual effort, but also the structural realities of access and support in geographically marginalized settings.

A central contribution of this study lies in its reinterpretation of students' learning strategies. Practices such as repeated reading, note-taking, and incremental problem-solving are often framed as individual preferences; however, the present findings indicate that these strategies are better understood as adaptive responses to reduced instructional mediation. In the rural context of this study, where immediate teacher feedback is limited and digital support is minimal, students intensify their engagement with textual materials and develop compensatory strategies to sustain comprehension. This finding extends research on self-regulated learning (SRL), which emphasizes that learners actively regulate cognition, motivation, and behavior in response to contextual demands.[19] It also reinforces the view that strategic learning is not purely internal but is shaped by environmental constraints.

These findings also challenge the continued reliance on learning styles as an explanatory framework. While students expressed preferences for certain approaches, these preferences were neither stable nor predictive of performance. Instead, strategy use varied according to task complexity, clarity of instruction, and availability of support. This aligns with recent critiques suggesting that the persistence of learning styles reflects a conflation of preferences and strategies rather than a valid basis for instructional design.[20] In rural and geographically isolated settings, where instructional scaffolding is uneven, an overemphasis on learning styles risks obscuring more consequential issues related to access, support, and adaptability.

The role of autonomy further complicates dominant interpretations of modular learning. Although students valued the flexibility to manage their own time, autonomy was consistently experienced as a conditional resource rather than an inherent advantage. In the absence of continuous teacher guidance, autonomy increased the cognitive and organizational demands placed on learners. This finding supports research indicating that effective self-regulated learning depends on structured support and explicit guidance rather than independence alone.[21] In the rural context examined in this study, autonomy functions as a form of responsibility transfer, shifting the burden of learning from institutions to

[18] Mustafa, Nguyen, and Gao, "The Challenges and Solutions of Technology Integration in Rural Schools: A Systematic Literature Review."

[19] Li, "The Mechanism of Self-Regulated Learning among Rural Primary Middle School Students: Academic Delay of Gratification and Resilience."

[20] Hattie and O'Leary, "Learning Styles, Preferences, or Strategies? An Explanation for the Resurgence of Styles Across Many Meta-Analyses."

[21] Stephenson et al., "Helping Teacher Education Students' Understanding of Self-Regulated Learning and How to Promote Self-Regulated Learning in the Classroom."

students and their households. Students' ability to benefit from autonomy is therefore contingent upon both their self-regulatory capacity and their access to supportive environments.

The rural and geographically isolated setting also amplifies the role of affective responses in learning. Students' emotional experiences were closely tied to the clarity of instructional materials and the availability of feedback. Under conditions of ambiguity or difficulty, students reported heightened stress and frustration, which disrupted cognitive engagement and reduced persistence. Conversely, positive experiences of understanding and task completion reinforced motivation. This pattern is consistent with findings that feedback plays a critical role in supporting self-regulated learning, particularly when it is timely, specific, and aligned with learners' needs.[22] In this sense, affect operates as a mediating mechanism that influences whether adaptive strategies can be effectively implemented.

From a theoretical standpoint, the present findings extend existing models of self-regulated learning by situating them within conditions of structural constraint and unequal resource distribution. While SRL has traditionally been conceptualized as an internally driven process involving the regulation of cognition, motivation, and behavior,[23] recent scholarship increasingly emphasizes its context-dependent nature, particularly in environments characterized by limited instructional support.[24] The findings of this study reinforce this shift by demonstrating that learning strategies are not simply self-selected but are adaptively constructed in response to instructional absence and environmental limitations. In rural and geographically marginalized settings, where access to feedback, guidance, and technological infrastructure is uneven, SRL processes are effectively redistributed across the learner–environment interface.[25] This aligns with equity-oriented perspectives that view learning as embedded within broader social and material conditions[26] and suggests that autonomy in modular learning contexts operates not as an inherent capability but as a resource contingent upon access to support systems. Furthermore, the findings underscore the role of affect as a mediating mechanism within SRL processes, consistent with research highlighting the regulatory function of emotion in sustaining engagement and strategy use under varying instructional conditions.[27] Taken together, these insights support a more integrated theoretical account in which learning outcomes emerge from the dynamic interaction

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[22] Yoshiyuki Nakata, W.L. Quint Oga-Baldwin, and Atsuko Tsuda, "Student Perceptions of Feedback and Self-Regulated Language Learning: A Mixed-Methods Investigation," *System* 131 (July 2025): 103654, https://doi.org/10.1016/j.system.2025.103654.

[23] Li, "The Mechanism of Self-Regulated Learning among Rural Primary Middle School Students: Academic Delay of Gratification and Resilience."

[24] Chunping Zheng et al., "Comparing High School Students' Online Self-Regulation and Engagement in English Language Learning," *System* 115 (July 2023): 103037, https://doi.org/10.1016/j.system.2023.103037; Liina Kersna et al., "Supporting Self-Regulated Learning in Primary Education: Using Written Learning Guides in the Lessons," *Education Sciences* 15, no. 1 (January 9, 2025): 60, https://doi.org/10.3390/educsci15010060.

[25] Mustafa, Nguyen, and Gao, "The Challenges and Solutions of Technology Integration in Rural Schools: A Systematic Literature Review."

[26] Hosseini et al., "Practices of Social Justice-Oriented Teacher Education: A Review of the Literature."

[27] Nakata, Oga-Baldwin, and Tsuda, "Student Perceptions of Feedback and Self-Regulated Language Learning: A Mixed-Methods Investigation."

between strategy, context, and affect, thereby extending SRL theory toward a more relational and context-sensitive framework.

From an educational inequality perspective, the findings can be interpreted as evidence of how instructional models such as modular learning interact with pre-existing disparities in access to resources, thereby shaping differentiated learning trajectories. Contemporary research on rural Education emphasizes that inequalities are structurally produced through uneven distributions of material, instructional, and social support.[28] In this study, the reliance on family members, peers, and locally available resources illustrates how learning extends beyond formal schooling and becomes embedded within household and community contexts. However, because such support is variably available, modular learning effectively externalizes part of the instructional process, transferring responsibility from institutions to learners' environments. This dynamic suggests that access to interpretive support, guidance, and emotional assistance functions as a critical but unevenly distributed resource. Under these conditions, autonomy is stratified, benefiting students with greater access to supportive networks while disadvantaging those in less resourced environments. Moreover, the findings indicate that inequality is reproduced not only through access to infrastructure but also through differences in the capacity to interpret, regulate, and sustain learning. Modular learning can therefore be understood as a mechanism of differential opportunity, where the same instructional model generates unequal outcomes depending on learners' positioning within broader social and material contexts. This perspective underscores the need to conceptualize instructional design as inherently linked to equity rather than as a neutral pedagogical choice.

The interactional model developed in this study provides an integrative framework for understanding these dynamics. It demonstrates that learning strategies are shaped by instructional conditions, that affective responses mediate the implementation of those strategies, and that academic performance emerges from the alignment of these factors. This model shifts the analytical focus from isolated variables to relational processes, offering a more comprehensive explanation of learning in modular environments and extending current understandings of self-regulated learning by incorporating structural and contextual dimensions.

This study contributes to the literature in three key ways. First, it reframes modular learning as an equity-related issue by demonstrating how learning outcomes are shaped by differential access to support in rural and geographically isolated settings. Second, it challenges learning-style explanations by showing that students construct adaptive strategies in response to contextual constraints rather than relying on fixed preferences. Third, it proposes an interactional model in which academic performance emerges from the dynamic interplay between strategy, context, and affect, thereby providing a more nuanced understanding of learning under constrained conditions.

[28] Mustafa, Nguyen, and Gao, "The Challenges and Solutions of Technology Integration in Rural Schools: A Systematic Literature Review"; Hosseini et al., "Practices of Social Justice-Oriented Teacher Education: A Review of the Literature."

These findings carry important implications for educational practice and policy. In rural and geographically isolated schools, modular learning should not be implemented as a stand-alone solution but must be supported by structured interventions that reduce instructional ambiguity and compensate for limited access to guidance.[29] This includes clearer instructional design, regular consultation opportunities, and feedback mechanisms that are responsive to students' needs. In addition, the role of community and family support should be formally recognized and integrated into instructional planning, given its significant influence on student outcomes in such contexts.[30]

Several limitations should be acknowledged. The study is based on a small sample within a single rural school, which may limit the transferability of findings. Furthermore, the reliance on self-reported data may introduce subjective bias. However, the study aimed to generate an in-depth, contextually grounded understanding of learning processes rather than to produce generalizable conclusions. Future research should extend this work by examining how the proposed interactional model operates across different contexts, including urban and digitally supported environments. Longitudinal and intervention-based studies may also provide insight into how structured support mechanisms can enhance the effectiveness and equity of modular learning systems.

This study demonstrates that effective engagement in modular learning depends not on fixed learner characteristics, but on the ability to navigate a complex interaction between cognitive strategies, instructional conditions, and affective responses within a context of limited support. Addressing this interaction is essential for developing modular learning systems that are not only effective but also equitable and sustainable.

CONCLUSION

This study demonstrates that modular learning in rural and geographically isolated contexts is not merely an instructional arrangement, but a contextually embedded system in which learning outcomes emerge from the interaction between adaptive strategies, instructional conditions, and affective responses. The findings show that students do not rely on fixed learning styles; instead, they construct strategies in response to constrained instructional environments, where clarity, feedback, and access to support are unevenly distributed. In this sense, academic performance is not an individual attribute but a relational outcome shaped by the alignment—or misalignment—between cognitive effort, contextual support, and emotional regulation. The study extends self-regulated learning theory by demonstrating that regulatory processes are not solely internal but are structurally mediated by unequal access to instructional and environmental resources, particularly in rural settings.

[29] Renelyn Rapal and Lutchie Ducot, "Effectiveness of the Implementation of Modular Distance Learning and Learners Achievement in Araling Panlipunan," *Psychology and Education: A Multidisciplinary Journal* 34, no. 10 (April 8, 2025): 1183–93, https://doi.org/10.70838/pemj.341002.

[30] Janet D. Barrera, Sweety Rose R. Megallon, and Aiwedeh B. Patadlas, "Managing Modular Instruction and Students' Learning Outcomes," *EduLine: Journal of Education and Learning Innovation* 4, no. 1 (February 13, 2024): 110–21, https://doi.org/10.35877/454RI.eduline1883.

From an equity perspective, the findings indicate that modular learning, when implemented without adequate scaffolding, operates as a mechanism that can reproduce and intensify existing educational inequalities. Students with access to supportive environments are better positioned to sustain effective learning processes, while those with limited support face increased cognitive and emotional burdens. This study, therefore, advances a process-oriented and equity-sensitive framework for understanding learning in modular environments, shifting the focus from individualistic explanations toward relational and contextually grounded models. Practically, this underscores the need for structured instructional support, accessible feedback systems, and the integration of community-based resources in rural Education. Without addressing the interaction between strategy, support, and affect, modular learning risks functioning not as a solution to educational access, but as a system that redistributes learning responsibility in unequal ways.

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