

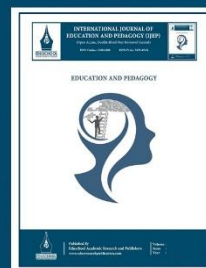


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Self-Regulated Learning and Academic Achievement among Secondary School Students: An Explanatory Sequential Mixed-Methods Study

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Abstract

Self-regulated learning, the capacity of students to plan, monitor, and evaluate their own learning, is increasingly recognised as a key determinant of academic success. This study examined the relationship between self-regulated learning and academic achievement among secondary school students in Kerala, India, and explored how students with differing levels of self-regulation experience the learning process. An explanatory sequential mixed-methods design was employed. In the quantitative phase, a validated self-regulated learning scale was administered to 260 ninth- and tenth-grade students, and its relationship with achievement, indexed by term examination marks, was analysed using Pearson correlation and multiple regression. In the qualitative phase, semi-structured interviews with sixteen purposively selected students were analysed thematically to explain and elaborate the quantitative findings. The quantitative results showed that self-regulated learning was significantly and positively related to achievement, with the metacognitive and effort-regulation components emerging as the strongest predictors. The qualitative findings illuminated these results, revealing that higher-achieving students described deliberate planning, self-monitoring, and persistence, whereas lower-achieving students reported reactive, unstructured approaches. Integration of the two strands produced a coherent account in which self-regulatory strategies underpin achievement through goal-directed, reflective study. The study recommends the explicit teaching of self-regulated learning strategies and discusses implications for classroom practice, teacher education, and curriculum design in the Indian context.

Keywords:- Self-Regulated Learning, Academic Achievement, Secondary Education, Mixed-Methods Research, Metacognition

I. INTRODUCTION

Why some students learn more effectively than others, even under similar conditions, is a question of enduring interest to educators. Part of the answer lies in the extent to which learners take active control of their own learning, setting goals, selecting strategies, monitoring progress, and adjusting their approach in response to feedback. This capacity, known as self-regulated learning, has become one of the most influential constructs in educational psychology, precisely because it is associated with achievement and because, unlike fixed traits, it can be developed through instruction (Zimmerman, 2002). As secondary schooling places growing demands on students to manage complex content and prepare for high-stakes examinations, the ability to regulate one's own learning assumes particular importance.

Self-regulated learning is generally understood as a cyclical process in which learners plan, perform, and reflect, drawing on cognitive strategies, metacognitive awareness, and motivational resources (Zimmerman, 2000). A considerable body of research links stronger self-regulation to higher achievement across subjects and age groups (Pintrich & De Groot, 1990; Dignath & Büttner, 2008). Yet correlational evidence alone cannot fully explain how self-regulation operates in the lived experience of students, nor why some learners deploy these strategies while others do not. Combining quantitative measurement with qualitative inquiry offers a fuller understanding than either can provide in isolation.

The Indian secondary context lends this question practical urgency. Examination pressure is intense, study is often equated with memorisation, and explicit instruction in how to learn is uncommon. Understanding the role of self-regulated

learning in this setting, and how students actually experience it, could inform efforts to move beyond rote approaches toward more strategic and reflective study. The National Education Policy 2020 similarly calls for a shift toward competencies such as critical thinking and learning to learn (Ministry of Human Resource Development, 2020), goals closely allied to self-regulation.

This study therefore examined the relationship between self-regulated learning and academic achievement among secondary school students in Kerala, and explored how students with differing levels of self-regulation experience learning. It addressed three questions: whether self-regulated learning is significantly related to achievement; which components of self-regulation most strongly predict achievement; and how students account for the ways in which they regulate, or fail to regulate, their learning. By pairing measurement with the students' own explanations, the study aims to provide both evidence of association and insight into process, of use to teachers, teacher educators, and curriculum designers.

The significance of the study is both scholarly and practical. Scholarly, it responds to calls for mixed-methods work capable of connecting the robust but abstract statistical associations of the self-regulation literature to the concrete experience of learners, and it does so in an Indian secondary setting that remains under-represented in that literature. Practically, if particular components of self-regulation prove especially consequential and if students' accounts reveal how those components operate, the findings can guide teachers toward the specific strategies most worth cultivating. In a system where students are often exhorted to work harder without being shown how to work more strategically, evidence of this kind has direct relevance for classroom practice.

II. LITERATURE REVIEW

2.1. Conceptualising Self-Regulated Learning

Self-regulated learning refers to the processes by which learners activate and sustain cognitions, behaviours, and emotions that are systematically oriented toward the attainment of goals. Zimmerman (2000) describes a cyclical model comprising forethought, performance, and self-reflection phases, in which learners set goals and plan, monitor and control their learning in action, and evaluate and adapt afterward. Boekaerts (1999) similarly situates self-regulation at the intersection of cognition, metacognition, and motivation, and Panadero (2017), reviewing the major models, notes their broad convergence on the centrality of goal-directed monitoring and adaptation. Comprehensive treatments of the field document both this convergence and the breadth of its applications across settings and age groups (Zimmerman & Schunk, 2011). These accounts frame self-regulation as an active, constructive, and cyclical enterprise rather than a static ability.

A key implication of these models is that self-regulation is domain-general in its principles yet enacted in domain-specific ways: the same cycle of planning, monitoring, and reflection applies across subjects, but its expression depends on the demands of the task at hand. This dual character helps explain why self-regulation can be taught as a set of transferable habits while still requiring adaptation to particular content. It also underscores that self-regulation is not merely a matter of intelligence or aptitude but of learnable process, a distinction central to the educational interest in the construct.

2.2. Components of Self-Regulated Learning

Self-regulated learning is multidimensional. Cognitive strategies include rehearsal, elaboration, and organisation of material; metacognitive regulation encompasses planning, monitoring, and evaluating one's understanding; and resource-management strategies include the regulation of effort, time, and environment (Pintrich, 2004). Motivation is integral rather than separate, since learners must be willing as well as able to regulate, and the regulation of motivation itself is an important and sometimes neglected component (Wolters, 2003). This componential view informs both the measurement of self-regulation and the interpretation of which aspects matter most for achievement.

Distinguishing these components is not merely a theoretical nicety, for they may differ in how strongly they relate to achievement and in how readily they respond to instruction. Cognitive strategies are relatively concrete and teachable, but their benefit depends on being deployed at the right moments, which is a metacognitive matter. Effort and motivation regulation, meanwhile, determine whether strategies are sustained in the face of difficulty. A componential analysis therefore allows a study to identify not only whether self-regulation matters but which facets of it carry the greatest weight, a question of direct relevance to the design of instruction.

2.3. Self-Regulated Learning and Academic Achievement

The association between self-regulation and achievement is well documented. Pintrich and De Groot (1990) found that self-regulation and motivational beliefs predicted classroom performance, and subsequent research has repeatedly confirmed the relationship. Meta-analytic evidence indicates that interventions fostering self-regulated learning can improve both strategy use and achievement, with effects that are stronger when metacognitive strategies are explicitly taught (Dignath & Büttner, 2008). Zimmerman and Martinez-Pons (1986) demonstrated early on that higher-achieving students report using a wider range of self-regulatory strategies, a pattern that has proved robust across contexts.

Importantly, the relationship appears to be reciprocal and developmental rather than fixed. Success achieved through effective strategy use reinforces the motivation and self-efficacy that sustain further self-regulation, while repeated failure can erode both. This dynamic suggests that early support for self-regulatory skill may yield compounding benefits, and that students who lack such skill are not simply less able but may be caught in a cycle that appropriate instruction could interrupt. The educational value of the construct rests substantially on this malleability.

2.4. Self-Regulated Learning in the Indian Context

Although self-regulated learning has been studied extensively worldwide, evidence from Indian secondary schools is comparatively limited. The prevailing emphasis on examinations and the widespread equation of study with repeated reading

and memorisation create a context in which strategic, reflective learning may be neither modelled nor rewarded. At the same time, the strong aspiration for academic success that characterises many Indian families provides motivational ground on which self-regulatory skill could be built if it were explicitly taught. Examining self-regulation in this setting is therefore of particular interest, both because the need may be acute and because the construct's assumptions, developed largely in Western contexts, warrant local examination.

2.5. Theoretical Framework

The study is grounded in the social cognitive perspective on self-regulation, which holds that learning results from the reciprocal interaction of personal, behavioural, and environmental factors (Bandura, 1986). Within this perspective, Zimmerman's cyclical phase model provides the organising framework, and Schunk and Zimmerman (1997) trace how self-regulatory competence develops through observation, emulation, and internalisation with the support of teachers and peers. This framing implies that self-regulation is both a predictor of achievement and a capacity that schooling can deliberately cultivate. The reciprocal interaction it posits also accommodates the developmental and motivational dynamics noted above, linking the individual learner to the instructional environment that shapes their growth.

2.6. Research Gap and Questions

Although the quantitative literature linking self-regulation to achievement is extensive, fewer studies, particularly in Indian secondary settings, combine measurement with in-depth exploration of how students experience self-regulation, and such integration is needed to interpret associations and inform practice. Accordingly, the study asked whether self-regulated learning relates to achievement, which components predict it most strongly, and how students themselves describe regulating their learning. A mixed-methods approach was chosen precisely to connect the what of association with the how of experience (Creswell & Plano Clark, 2018).

III. METHODS

3.1 Research Design

An explanatory sequential mixed-methods design was employed, in which a quantitative phase is followed by a qualitative phase that helps to explain the quantitative results (Creswell & Plano Clark, 2018; Tashakkori & Teddlie, 2003). This design was chosen because the quantitative phase could establish the strength and structure of the relationship between self-regulation and achievement, while the subsequent qualitative phase could illuminate the processes underlying that relationship by drawing on students' own accounts. Priority was given to the quantitative phase, with the qualitative phase serving an explanatory function, and the two strands were integrated at the interpretation stage.

3.2. Quantitative Phase

In the quantitative phase, a validated self-regulated learning scale measuring cognitive strategy use, metacognitive regulation, and effort regulation was administered to 260 ninth- and tenth-grade students selected through stratified random sampling from six secondary schools in the Malappuram district of Kerala. The scale used a five-point Likert format and demonstrated satisfactory internal consistency, with a Cronbach's alpha of .88 for the full scale. Academic achievement was operationalised as the percentage of aggregate marks in the most recent term examination, obtained from school records. Data were analysed using Pearson correlation and multiple linear regression, with the assumptions of the analyses examined and found tenable.

The stratified sampling procedure defined strata by school management type and gender to ensure that the sample reflected the broader student population, and the sample size comfortably exceeded the minimum required for stable estimation with three predictors. Prior to the main analyses, the data were screened for missing values and outliers, and the distributional assumptions of correlation and regression, together with the absence of problematic multicollinearity among the three components, were verified. This preparatory work provided a sound basis for interpreting the associations reported below.

3.3. Qualitative Phase

In the qualitative phase, sixteen students were purposively selected from the quantitative sample to represent contrasting profiles, comprising eight who scored high and eight who scored low on the self-regulated learning scale, with variation in gender and school. Semi-structured interviews explored how these students approached their studies, set goals, monitored their progress, and responded to difficulty. Interviews were audio-recorded with consent, transcribed verbatim, and analysed using reflexive thematic analysis following the six-phase approach of Braun and Clarke (2006), with coding conducted inductively and themes reviewed against the data.

3.4. Integration and Rigour

The strands were integrated through a joint display that juxtaposed the quantitative findings with the qualitative themes to produce an interpretation richer than either alone. Quality was pursued in both strands: the quantitative phase attended to reliability, valid measurement, and assumption checking, while the qualitative phase drew on member checking, an audit trail, and reflexive journaling to support trustworthiness. Attention was also given to the fit between the two strands, examining where they converged and where they added complementary insight.

The sequencing of the strands was deliberate. The qualitative participants were selected on the basis of their quantitative scores, so that the interviews could probe the contrasts the numbers had revealed, and the interview schedule was shaped by the quantitative findings, giving particular attention to the components that had emerged as strongest predictors. This

connection between the strands at the sampling and instrument stages, as well as at interpretation, is characteristic of a well-integrated explanatory sequential design and strengthens the coherence of the resulting account.

3.5. Ethical Considerations

Ethical approval was obtained from the institutional review committee. Informed consent was secured from parents or guardians and assent from the participating students, participation was voluntary, and confidentiality was maintained through the anonymisation of records and the use of pseudonymous identifiers. Achievement data were accessed only with appropriate authorisation.

IV. RESULTS

4.1. Quantitative Results

Self-regulated learning was significantly and positively correlated with academic achievement, $r = .49$, $p < .01$, indicating a moderate-to-strong association. Multiple regression of achievement on the three components of self-regulation is reported in Table 1.

Table 1. Correlations and Regression of Academic Achievement on Self-Regulated Learning Components

Predictor (SRL component)	r	B	β	t
Metacognitive regulation	.47**	4.82	.30	5.42**
Effort regulation	.44**	4.16	.27	4.88**
Cognitive strategy use	.36**	2.71	.18	3.21**

Note. N = 260. Overall SRL–achievement $r = .49$. Model $R^2 = .31$, $F(3, 256) = 38.4$, $p < .001$. ** $p < .01$.

As Table 1 shows, the three components together explained approximately 31 per cent of the variance in achievement, $R\text{-squared} = .31$, $F(3, 256) = 38.4$, $p < .001$. Metacognitive regulation was the strongest unique predictor ($\beta = .30$), followed closely by effort regulation ($\beta = .27$), while cognitive strategy use made a smaller but significant contribution ($\beta = .18$). These results indicate that the planning and monitoring of learning, together with the regulation of sustained effort, are especially consequential for achievement.

The relative weighting of the three components is itself informative. That metacognitive regulation and effort regulation outweighed cognitive strategy use suggests that knowing how to direct and sustain one's learning matters more than the mere possession of particular study techniques. In other words, students may know a range of techniques yet achieve poorly if they do not plan, monitor, and persist. This interpretation, generated by the quantitative strand, motivated the questions pursued in the follow-up interviews, which sought to understand how students actually enact, or fail to enact, these regulatory processes.

4.2. Qualitative Results

The interviews produced themes that explained the quantitative pattern. Higher-scoring students described deliberate, strategic approaches to study, characterised by planning, self-monitoring, and persistence. One such student explained: “Before an exam I make a plan and check myself as I go. If I do not understand something, I stop and find another way instead of just continuing.” (Student H3)

Lower-scoring students, by contrast, described reactive and unstructured approaches, often beginning to study only under pressure and rarely monitoring their understanding: “I usually study the night before. I just read again and again. I do not really check whether I have understood until the exam.” (Student L5)

Across the interviews, the difference between the two groups lay less in effort intended than in effort organised: higher-achieving students converted intention into structured, monitored action, whereas lower-achieving students expressed similar goals but lacked the strategies to pursue them systematically.

A further distinction concerned the regulation of motivation and setbacks. Higher-achieving students described strategies for maintaining focus and recovering from discouragement, treating difficulty as a signal to change approach rather than as a reason to stop. Lower-achieving students more often described being derailed by frustration or distraction, with few means of restoring their engagement. This pattern echoes the argument that the regulation of motivation is an integral yet frequently overlooked dimension of self-regulated learning, and it suggests that supporting students' volitional strategies may be as important as teaching cognitive ones.

4.3. Integration of Findings

Integrating the two strands through a joint display clarified how the measured associations play out in practice, as summarised in Table 2.

Table 2. Joint Display Integrating Quantitative Findings and Qualitative Themes

Quantitative finding	Qualitative theme	Integrated interpretation
Metacognition strongest predictor	Planning and self-monitoring	Deliberate goal-setting drives achievement
Effort regulation second predictor	Persistence through difficulty	Sustained effort converts intent to result
Lower SRL linked to lower marks	Reactive, unstructured study	Absence of strategy limits attainment

The joint display shows a coherent correspondence between the strands. The statistical prominence of metacognition matched the planning and self-monitoring described by higher achievers; the significance of effort regulation matched their accounts of persistence; and the lower marks associated with weaker self-regulation matched the reactive, unstructured study reported by lower achievers. The qualitative strand thus explained the quantitative results by showing the processes through which self-regulation supports, or its absence limits, achievement.

V. DISCUSSION

5.1. Self-Regulation as a Driver of Achievement

The findings confirm and extend the established link between self-regulated learning and achievement (Pintrich & De Groot, 1990; Dignath & Büttner, 2008). The moderate-to-strong correlation, together with the substantial variance explained by the regression model, situates self-regulation among the meaningful correlates of secondary achievement. The prominence of metacognitive and effort-regulation components is consistent with theoretical accounts that place monitoring, adaptation, and volition at the heart of effective learning (Zimmerman, 2002; Wolters, 2003), and with evidence that metacognitive strategies are especially responsive to instruction.

The finding that the regulatory and volitional components outweighed cognitive strategy use has a practical corollary. It implies that efforts to raise achievement by teaching study techniques in isolation may disappoint unless they also cultivate the overarching capacity to plan, monitor, and persist. The value of a technique depends on its strategic deployment, and it is this orchestrating function, rather than the inventory of techniques, that most distinguished higher from lower achievers in the present data.

5.2. Understanding the Process

The qualitative strand added explanatory depth that the quantitative results alone could not provide. By revealing that higher and lower achievers differed chiefly in whether effort was organised and monitored rather than merely intended, the interviews illuminated the mechanism implied by the statistics. This coherence between strands strengthens confidence in the interpretation and exemplifies the value of the mixed-methods design in connecting association with experience (Creswell & Plano Clark, 2018). The account aligns with Zimmerman's cyclical model, in which forethought and self-reflection distinguish skilled from unskilled learners (Zimmerman, 2000).

5.3. Implications

Because self-regulation is learnable, the findings carry clear implications for practice. Teachers can model and scaffold planning, monitoring, and evaluation, and can make strategy use an explicit object of instruction rather than leaving it to chance, an approach supported by the developmental account of self-regulatory competence (Schunk & Zimmerman, 1997). Teacher education should prepare teachers to foster these capacities, and curricula could incorporate learning-to-learn objectives consistent with the aims of the National Education Policy 2020 (Ministry of Human Resource Development, 2020). Such measures may be particularly valuable in examination-oriented settings where strategic, reflective study is often overshadowed by rote preparation.

Practical steps need not be elaborate. Brief routines in which teachers ask students to set a goal before a task, check their understanding partway through, and reflect afterward on what worked can embed the self-regulatory cycle within ordinary lessons. Making these processes visible and habitual, and gradually transferring responsibility for them to students, aligns with how self-regulatory competence is understood to develop. For students currently caught in reactive patterns of study, such structured support may offer a realistic route toward the strategic learning that the quantitative and qualitative findings alike associate with success.

5.4. Limitations and Future Research

Several limitations should be noted. The quantitative strand is correlational and cannot establish causation, and self-report measures of self-regulation may diverge from actual behaviour. The qualitative sample was small and drawn from a single district, and the study was cross-sectional. Future research could employ intervention designs to test whether teaching self-regulation raises achievement, use longitudinal and observational methods to capture development and behaviour, and extend the inquiry across regions and subjects. Studies examining how motivational and contextual factors shape the uptake of self-regulatory strategies would further enrich understanding.

It is also worth acknowledging the boundary conditions of the integration achieved here. The convergence between the strands lends confidence to the interpretation, but convergence is not proof, and alternative explanations, such as the influence of prior attainment or home circumstances on both self-regulation and achievement, cannot be excluded by the present design. Reporting the points of agreement between measurement and experience is a strength of the mixed-methods approach, yet the account remains, appropriately, a well-supported interpretation rather than a demonstrated causal chain.

VI. CONCLUSION

This mixed-methods study examined the relationship between self-regulated learning and academic achievement among secondary school students in Kerala and explored how students experience the regulation of their learning. Self-regulated learning was significantly related to achievement, with metacognitive and effort-regulation components the strongest predictors, and the qualitative findings explained this pattern by revealing the structured, monitored study of higher achievers against the reactive approaches of their lower-achieving peers. Integrating the two strands produced a coherent account in which self-regulatory strategies underpin achievement through goal-directed, reflective learning. Because these strategies can

be taught, the study points to the explicit cultivation of self-regulated learning as a promising avenue for improving secondary education.

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