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Promoting Students' Intrinsic Motivation to Learn: A Review of Different Types of Interventions

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Abstract. Students differ in whether they learn for the sheer joy of learning or primarily to avoid failure. The difference can be partly explained by intrinsic motivation—a driver of engagement, persistence, and psychological well-being that is not fixed but shaped by the learning environment itself. Drawing on Self-Determination Theory (SDT), this review synthesizes research on educational interventions designed to cultivate students' intrinsic motivation, spanning five categories: need-supportive teaching, competence-supportive practices such as structure and feedback, instructional-method redesigns such as problem- and project-based learning, technology-based approaches such as gamification, and teacher-focused interventions targeting teachers' own behavior and motivation. Across these approaches, one pattern stands out: need-supportive interventions—particularly autonomy support combined with structure—carry the strongest theoretical and empirical support, while other interventions succeed only insofar as they satisfy students' psychological needs within a given context. Autonomy, competence, and relatedness thus provide a common framework for understanding how diverse educational practices influence motivational outcomes. Yet the evidence base remains fragmented: inconsistent conceptualizations of intrinsic motivation, considerable heterogeneity across intervention designs, and a scarcity of long-term data limit what can be concluded with confidence.

Keywords: intrinsic motivation, Self-Determination Theory, autonomy support, learning motivation

1. Introduction

Insufficient learning motivation remains a prominent challenge in secondary education: despite substantial investment in improving academic achievement, many students show declining engagement and increasing reliance on examination pressure and external rewards rather than autonomous engagement. Yet such external controlling factors are unlikely to sustain stable, enduring motivation, making the cultivation of intrinsic motivation a pressing concern for educational research and practice. The question of why students choose to learn and why they sustain effort once they begin is central in educational psychology: motivation shapes not only whether students engage in a task but also the effort, persistence, and depth of processing they bring to it [1]. Research has increasingly emphasized motivational quality [2].

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Self-Determination Theory (SDT), the dominant framework for understanding motivational quality in education, distinguishes intrinsic motivation—engaging in an activity for its inherent interest, enjoyment, or satisfaction—from extrinsic motivation, which depends on separable outcomes such as grades or approval. Intrinsic motivation is theorized to flourish when three basic psychological needs are satisfied: autonomy (volition and self-endorsement), competence (effectiveness and growth), and relatedness (connection with others), thereby providing a framework for linking educational practice to learning outcomes: educational intervention → psychological need satisfaction → intrinsic motivation → engagement and learning [1]. Establishing the importance of motivation, however, does not by itself guide teaching practice; educators need concrete, actionable strategies spanning teachers' classroom behavior, instructional redesign, and educational technology. Based on SDT, this review systematically synthesizes existing studies on intrinsic motivation-promoting interventions, focusing on three core research questions: the main types of effective interventions, their underlying mechanisms, and their differential effectiveness under different conditions. The findings can guide teachers' instructional practices and help improve students' sustained academic learning and comprehensive development.

2. Method

This review follows a theory-driven, integrative approach—using SDT to classify and compare heterogeneous intervention research—rather than a formal systematic review protocol. Relevant literature was identified from major education and psychology databases (Web of Science, Scopus, ERIC, PsycINFO, and Google Scholar) using combinations of search terms including "intrinsic motivation," "student motivation," "intervention," "autonomy support," "competence support," "relatedness," "self-determination theory," "feedback," "gamification," "problem-based learning," and "project-based learning." Studies were prioritized for inclusion if they were peer-reviewed empirical studies or meta-analyses involving student or learner samples in formal or informal educational settings, targeting motivation-relevant learning environments, and measuring intrinsic motivation or closely related autonomous-motivation constructs; experimental, quasi-experimental, and longitudinal designs were given priority. Excluded were purely theoretical reviews, studies without empirical data, studies measuring only extrinsic motivation, and studies conducted in non-educational contexts. Because intrinsic motivation is conceptually distinct from broader constructs such as academic motivation or engagement, studies reporting only generic "motivation" gains without clarifying the construct measured were treated cautiously in the synthesis.

3. Types of interventions promoting intrinsic motivation

3.1. Need-supportive interventions

Need-supportive interventions follow most directly from SDT, aiming explicitly to satisfy students' needs for autonomy, competence, and relatedness. Autonomy-Supportive Teaching. Autonomy-supportive teaching includes offering meaningful choices, adopting students' perspectives, explaining the rationale behind tasks, acknowledging negative feelings, and using informational rather than controlling language. Even brief exposure to such language can shift students' subjective experience of a task: Mendoza et al. found that embedding need-supportive statements into online task instructions significantly increased students' situational intrinsic motivation, which in turn predicted task performance indirectly through self-assessment practice [3]. Alrabai extended this finding to English-as-a-foreign-language (EFL) classrooms, showing that an autonomy-supportive

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teaching intervention increased learners' classroom autonomy, with perceived choice emerging as the strongest mediating predictor [4]. Psychological Need Satisfaction as a Mediating Mechanism. Autonomy support does not produce intrinsic motivation directly; rather, it operates through the pathway autonomy-supportive teaching → need satisfaction → intrinsic motivation. Together, these findings suggest that the motivational benefits of autonomy-supportive teaching may extend across different contexts, from general classroom and online learning settings to EFL classrooms and professional clinical education [3, 4]. For example, an analysis by Torbergsen et al. showed that perceived autonomy support directly predicted students' intrinsic motivation and academic achievement, and indirectly predicted academic effort through intrinsic motivation.

3.2. Competence-supportive interventions

Competence-supportive interventions represent a second major pathway to intrinsic motivation.

Structure. Instructional structure—clear goals, explicit expectations, staged guidance, timely assistance, progress monitoring, and specific feedback—helps students develop a sense of competence without undermining autonomy. In a systematic review and meta-analysis, Patzak and Zhang found that autonomy support and structure were positively rather than competitively related, each independently predicting motivation, engagement, and need satisfaction—evidence against the intuitive assumption that autonomy support requires less structure [5, 6]. An effective learning environment is therefore better characterized not as "learn however you like" but as "you may choose how to learn, but I will provide clear goals, methods, and feedback," reflecting a complementary rather than competing relationship between autonomy support and structure.

Feedback. Feedback functions as a key competence-supportive mechanism when it goes beyond confirming correctness and helps students understand where they stand, what they are doing well, and what to improve, following the pathway immediate feedback → perceived progress → competence satisfaction → intrinsic motivation. Its motivational value therefore depends less on timing per se than on whether it helps students perceive genuine improvement in their ability. Feedback can instead undermine intrinsic motivation when it is controlling in nature—pressuring students toward prescribed performance, emphasizing external evaluation and surveillance, or functioning as a means of control rather than guidance—because such feedback thwarts perceived autonomy and competence [1].

3.3. Instructional-method interventions

Beyond directly changing teacher behavior, redesigning instructional methods can also shape student motivation; three related, problem-driven approaches have received particular attention in the literature.

Problem-Based Learning. Problem-based learning (PBL) engages students with authentic, ill-structured problems that require searching for information, analyzing the problem, and proposing solutions, potentially following the pathway meaningful problem → autonomy → competence → intrinsic motivation. Because the problem itself—rather than a predetermined lecture sequence—drives the learning process, students retain considerable latitude over how they investigate and resolve it, which may support both autonomy and competence.

Project-Based Learning. Project-based learning (PjBL) engages students in longer-term projects requiring exploration, decision-making, and production, potentially supporting autonomy (through participation in decisions), competence (through solving complex problems), and relatedness (through peer collaboration) simultaneously. Because PBL unfolds over an extended period, it may

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also offer more opportunities than shorter interventions for students to experience cumulative, self-attributed progress. Case-Based Learning. Case-based learning (CBL) applies knowledge to real or simulated cases within a more structured format than PBL, making it particularly well suited to supporting competence: cases are typically scaffolded with clearer parameters and expected reasoning steps than the more open-ended problems used in PBL.

Wijnia et al. conducted a meta-analysis of PBL, PjBL, and CBL and found that these problem-driven approaches generally had positive effects on student motivation, though effect sizes were moderated by academic discipline and level of implementation—evidence that student-centered learning does not automatically translate into intrinsic motivation [7]. Whether an instructional method promotes motivation depends on whether it genuinely affords autonomy, competence, and meaningful engagement, not on its student-centered label alone; when scaffolding is insufficient or task design is vague, such teaching may instead fail to satisfy these needs and undermine rather than promote intrinsic motivation.

3.4. Technology-based interventions

Gamification. Gamification introduces game-like elements—points, challenges, levels, and badges—into the learning environment, potentially supporting motivation through the pathways challenge → competence, choice → autonomy, and interaction → relatedness. Yet these pathways do not operate uniformly: in a meta-analysis and systematic review, Li et al. found that gamification increased students' intrinsic motivation and perceived autonomy and relatedness, but had minimal impact on perceived competence [8]. This asymmetric pattern indicates that gamification's motivational value cannot be reduced to "games are more fun, so students try harder," but instead depends on whether gamified elements genuinely satisfy students' psychological needs. When gamification emphasizes competition, ranking, and external rewards without corresponding competence support, it risks reinforcing controlled rather than autonomous motivation.

3.5. Teacher-related interventions

Teachers are not only implementers of interventions but also a source of influence on student motivation, operating through two distinct pathways: changing teacher behavior (teacher training → autonomy-supportive teaching → student need satisfaction → intrinsic motivation), and addressing teachers' own motivational states, since teachers' intrinsic motivation to teach, self-efficacy, and attitudes toward students shape their instructional practices. Sustainably changing student motivation may therefore require supporting teachers as well as training students. Direct experimental evidence for the teacher-behavior pathway comes from a pilot study by Wang, Reeve, et al., who randomly assigned 20 Singaporean secondary STEM teachers to either a 20-week autonomy-supportive training program or a control condition [9]. Relative to students taught by control-group teachers (n = 251), those taught by teachers in the training condition (n = 295) showed sustained gains in perceived autonomy-supportive teaching, in more autonomous forms of motivation such as identified regulation, and in behavioral engagement in class—offering preliminary causal support for the training → teaching → motivation pathway, despite the small teacher sample. Evidence for the teacher-motivation pathway comes from Zou et al., who studied 44 secondary school teachers and their 2,461 students using multilevel structural equation modeling. Teachers' own intrinsic motivation for teaching was directly and positively associated with students' intrinsic motivation for learning, with this relationship further explained by a chain of mediators

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involving teachers' autonomy-supportive motivating style and the quality of teacher–student relationships [10].

4. Comparing interventions: mechanisms and strength of evidence

Across intervention types, the most consistent evidence points not to any single instructional technique but to learning environments that persistently satisfy students' basic psychological needs—among which the combination of autonomy support and structure stands out: Patzak and Zhang found that rather than competing, the two operate as mutually reinforcing resources [6].

This comparison also clarifies why effect sizes differ across intervention types: those that most directly target need satisfaction, such as autonomy-supportive teaching and structure, show the most consistent associations with intrinsic motivation because they align more closely with the motivational processes proposed by SDT.

Broader instructional redesigns—PBL, PjBL, CBL, and gamification—may influence motivation less directly, through the extent to which a given implementation supports autonomy, competence, and relatedness, making their effects more variable and more sensitive to implementation fidelity. The evidentiary base for teacher-training interventions is likewise beginning to shift from indirect, associational evidence toward direct experimental support, with the pilot randomized intervention reported by Wang, Reeve, et al. marking an early but important step. Its characterization in Table 1 as "indirect but important" reflects an evidence base still dominated by quasi-experimental or correlational studies, with high-quality randomized controlled trials remaining scarce [9].

Table 1. synthesizes the intervention types reviewed above, comparing their primary targets, core mechanisms, and the relative strength of evidence for promoting intrinsic motivation

Intervention Type	Primary Target	Core Mechanism	Evidence for Intrinsic Motivation
Autonomy support	Autonomy	Choice / rationale / respect	Strong
Structure	Competence	Guidance / clarity / feedback	Strong
Feedback	Competence	Perceived progress / competence satisfaction	Promising
PBL / PjBL / CBL	Autonomy + competence + meaning	Meaningful, problem-driven learning	Moderate
Gamification	Autonomy + relatedness	Interest / interaction	Small positive
Teacher training	Learning environment	Need-supportive teaching	Indirect but important

Note. Evidence-strength judgments in Table 1 rest on three criteria: the number of meta-analyses and randomized controlled experiments available for each intervention type, and the consistency of findings across studies.

5. Discussion

The integrative answer to RQ1 can be stated directly: no single instructional technique is decisive—what matters most is whether an intervention persistently satisfies students' basic psychological needs. The comprehensive answer to Research Question 1 (RQ1) can be stated simply: no single teaching technique is decisive—what matters most is whether the intervention consistently meets students' basic psychological needs. Among the various types of interventions examined, needs-based interventions—particularly those combining support for autonomy with structure—have the

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clearest theoretical basis and the strongest empirical support. The most compelling explanation for why these interventions are effective lies in the fulfillment of psychological needs, through the following pathway: intervention → autonomy/competence/social connection → intrinsic motivation—with competence and autonomy appearing to have a particularly significant influence. The effectiveness of interventions is moderated by factors such as duration, student age, subject area, implementer, online versus in-person settings, and fidelity of implementation—suggesting that there is no single "best" intervention applicable to all students, subjects, and contexts.

Several limitations constrain the current evidence base. First, conceptualizations and measures of intrinsic motivation remain inconsistent: studies variously report intrinsic motivation, autonomous motivation, academic motivation, engagement, or interest as outcomes, and although these constructs are related, they are not interchangeable—an improvement in general motivation cannot be equated with an improvement in intrinsic motivation. Reviews that pool findings across differently labeled outcomes therefore risk overstating the consistency of evidence for intrinsic motivation specifically. Second, much research relies on self-report questionnaires, which are convenient but susceptible to social desirability and situational bias, and single-timepoint surveys cannot easily distinguish a stable increase in intrinsic motivation from a transient boost in task interest. Future work would benefit from triangulating self-reported changes with behavioral measures (e.g., voluntary engagement with optional learning activities), teacher reports, classroom observations, and longitudinal data. Third, considerable heterogeneity across studies in intervention duration, intensity, sample characteristics, provider, learning context, and measurement instruments complicates direct comparison: a brief, single-session manipulation and a multi-week teacher-training program are rarely comparable, even when both are labeled "autonomy-supportive." Fourth, evidence on long-term effects remains limited, as most studies rely on pretest–intervention–posttest designs; van der Sande et al. explicitly called for further research examining whether motivational gains persist rather than dissipate after the intervention ends. Fifth, mechanism-focused research remains underdeveloped: much of the literature asks whether an intervention works, but comparatively little tests why [11].

Future research should move from asking whether autonomy support works toward asking which intervention works better, for whom, and under what conditions—for example, by directly comparing autonomy support, immediate feedback, gamification, and PBL within the same design. Greater attention should also go to mediating mechanisms, particularly the pathway from immediate feedback through perceived progress and competence satisfaction to intrinsic motivation, given its relevance for distinguishing feedback that motivates from feedback that merely evaluates. Rather than searching for a single optimal intervention, researchers might examine combined approaches—such as autonomy support paired with structure and feedback—consistent with Patzak and Zhang's finding that the two function as complementary rather than competing resources [6].

6. Conclusion

Together, this evidence indicates that students' intrinsic motivation to learn is not a fixed trait but is shaped by the learning environment, teacher behavior, and instructional design. Although multiple types of intervention can promote intrinsic motivation, their effects are not equivalent: the most consistent support belongs to need-supportive teaching, particularly the combination of autonomy support and structure. Teachers can support autonomy by offering choice, explaining the rationale for tasks, and respecting students' perspectives; support competence through clear goals, guidance, and feedback; and support relatedness through positive teacher–student interaction—together fostering more autonomous forms of learning motivation. Instructional methods such as PBL, PjBL,

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and CBL, as well as technology-based approaches such as gamification, can also promote students' motivation, but their effectiveness depends heavily on context and on whether they genuinely satisfy students' psychological needs. Rather than searching for a single "best" intervention applicable to all students, a more productive direction is to determine what intervention, through what mechanism, works for which students, under what conditions—strengthened by direct comparisons across intervention types, closer attention to mediating mechanisms such as need satisfaction and perceived progress, and longitudinal, experimental designs that examine the durability of motivational change.

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