

Student Agency in Schools: A Systematic Review of Its Measurement and Operationalization in the Era of AI-Mediated Learning

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ABSTRACT

This systematic review synthesizes how student agency has been defined, operationalized, and measured across primary, secondary, and higher education, with particular attention to the adequacy of existing measures in AI-mediated learning. Using structured database searches and citation tracking, 45 empirical and conceptual studies were included in a thematic synthesis. Across the literature, student agency is most often operationalized as a multidimensional construct that combines personal, relational, and contextual resources, but measurement remains dominated by social-cognitive traditions, especially self-efficacy, motivation, self-regulation, and agentic engagement. Qualitative, critical, and emerging AI-related scholarship shows that these approaches only partially capture collective, resistant, relational, and structurally conditioned forms of agency. The review makes three contributions: it maps dominant measurement traditions across educational levels, clarifies the conceptual boundary between broader digital learning and AI-mediated learning, and shows that agency in AI-supported contexts cannot be interpreted in a single direction. Rather, AI may extend agency when it supports planning, reflection, and revision, but may also constrain agency when it reduces authorship, encourages uncritical reliance, or substitutes for judgment. The review therefore, outlines an integrative agenda for multi-method measurement that connects instruction, assessment, and school-based counselling. Future frameworks should assess not only productive engagement, but also authorship, responsible AI use, reflective judgment, and students'

capacity to negotiate support without surrendering autonomy.

Keywords

AI-Mediated Learning
Agency Measurement
Educational Assessment
School-Based Counselling
Student Agency

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Introduction

In educational research, student agency is generally understood as students' capacity to act intentionally, make decisions, and influence the course of their learning and participation in school life [1]–[3]. Across the literature, agency is rarely treated as a single trait. Rather, it is conceptualized as a multidimensional construct emerging through the interaction of personal resources, relational conditions, and contextual opportunities [1], [4],[5]. Yet the field still faces two unresolved problems. First, student agency is invoked across conceptually different traditions, but the links between these traditions and their measurement consequences are often left implicit. Second, most agency measures were developed for human-centered instructional settings and only recently have begun to confront the conditions of AI-mediated learning. Together, these problems create a measurement gap: the construct is theoretically rich, but its operationalization remains uneven across educational levels and insufficiently specified for contemporary learning ecologies.

Across educational levels, agency has been measured in markedly different ways. In primary education, instruments such as the Student Agency Profile (StAP) assess literacy agency through self-perceptions as readers and writers, intentionality, choice-making, persistence, and interactivity [6]. In secondary education, the dominant operationalization is agentic engagement, typically measured through students' proactive contributions to instruction, such as asking questions, expressing preferences, and shaping classroom conditions [7]. In higher education, broader resource-based measures such as the Agency of University Students (AUS) scale conceptualize agency through combinations of motivation, self-efficacy, support, trust, participation, and opportunities for influence [8]–[10].

A clearer conceptual boundary is also needed between AI-mediated learning and broader digital learning. Digital learning is a wider category that includes online platforms, learning management systems, digital resources, and communication tools. By contrast, AI-mediated learning refers more specifically to situations in which algorithmic systems generate content, rank options, recommend pathways, evaluate performance, or otherwise participate in shaping learner choices and judgments [11]–[13]. This distinction matters because AI does

not merely extend access to digital resources; it may also redistribute initiative, authorship, and responsibility within the learning process [14],[15].

These developments sharpen the need for a review that is not only descriptive but also analytically comparative. Existing reviews have examined particular dimensions of agency, single educational sectors, or adjacent constructs such as digital agency [16],[17]. What remains limited is a synthesis that maps how student agency has been operationalized and measured across the school continuum, clarifies the measurement assumptions behind dominant traditions, and examines whether those assumptions remain adequate when learning is increasingly shaped by AI-supported interaction.

Accordingly, this systematic review addresses two interrelated research questions: (1) How has student agency been operationalized and measured in school-based research across educational levels? and (2) To what extent do existing student agency measurements capture learners' intentionality, autonomy, and responsibility in AI-mediated learning environments? By answering these questions, the review seeks to identify dominant measurement approaches, clarify conceptual boundaries, and propose a more integrative agenda for future agency measurement and support.

Literature Review

The concept of student agency draws on several long-standing traditions that do not locate agency in the same place. Social-cognitive perspectives emphasize intentional action, forethought, self-regulation, and reflective self-influence [18], while sociological traditions emphasize the reciprocal relationship between action and structure, showing how agency is enabled and constrained by institutional, historical, and cultural conditions [19], [20],[21]. These traditions should not be treated as interchangeable. They differ in their unit of analysis, their assumptions about where agency resides, and the kinds of indicators they privilege.

In educational research, four broad traditions are especially visible. First, social-cognitive and engagement-oriented approaches frame agency as intentional, self-regulated participation directed toward learning goals [7], [22],[23]. Second, sociocultural and discursive approaches conceptualize agency as negotiated participation, voice, positioning, and meaning-making within social practice [24]–[26]. Third, critical and structural approaches emphasize how curriculum, language, class, race, and institutional opportunity structures shape whose agency is recognized, supported, or constrained [27]. Fourth, emerging digital and AI-related work reframes agency as human–technology negotiation involving authorship, selective reliance, responsibility, and reflective judgment in socio-technical environments [3], [15], [28],[29].

These traditions overlap, but they have different measurement consequences. Social-cognitive traditions lend themselves to scalable indicators such as self-efficacy, persistence,

self-regulation, and agentic engagement. Sociocultural and critical traditions more often identify agency through participation, co-creation, resistance, dialogic feedback, and situated negotiation. The methodological challenge, then, is not simply to choose one perspective over another, but to clarify which dimensions become visible, comparable, or marginalized under each measurement approach. For this reason, the present review adopts a synthetic rather than purely descriptive stance. It treats the literature as organized around competing but partially complementary traditions, and it compares them in terms of what they make measurable, what they leave under-measured, and how they travel into AI-mediated learning contexts. This positioning helps move the review beyond cataloguing definitions toward evaluating the adequacy and limits of current operationalizations.

Table 1. Integrative synthesis of student agency and its measurement implications

Tradition	Core view of agency	What measures usually emphasize	What remains under-measured
Social-cognitive/ engagement	Agency as intentional, self-regulated action toward learning goals.	Self-efficacy, motivation, self-regulation, initiative, persistence, and proactive contribution to learning.	Collective forms, resistance, structural constraint, and the meaning of agency beyond productive participation.
Sociocultural/ discursive	Agency as negotiated participation, voice, positioning, and meaning-making in social practice.	Participation, interaction, co-creation, dialogic feedback, situated decision-making, and voice.	Psychometric stability across contexts and fine-grained comparison of individual differences.
Critical/ structural	Agency as action is shaped by power, curriculum, language, class, race, and institutional opportunity structures.	How conditions enable or constrain action, including whose agency is recognized or marginalized.	Scalable indicators that can be used routinely in school-based assessment systems.
Digital/ AI-mediated	Agency as human–technology negotiation involving authorship, selective reliance, responsibility, and reflective judgment in socio-technical environments.	Behavioral traces, AI use patterns, negotiated control, responsible action, and hybrid human–AI measurement designs.	Ethical judgment, emotional dependence, long-term autonomy, and agency across changing AI-supported contexts.

Methods

A. Search Strategy

This review employed a structured literature search through several stages in order to identify studies discussing student agency in formal education, with particular attention to its measurement, operationalization, and relevance to AI-mediated learning, in line with PRISMA 2020 reporting guidance [30],[31]. The search was conducted through multiple rounds in

Semantic Scholar and PubMed, and was complemented by backward and forward citation tracking of highly relevant studies. To broaden the retrieval of conceptually relevant sources, the search process used grouped keywords related to student agency, educational level, measurement, digital learning, AI-mediated learning, and related constructs such as autonomy, self-regulation, intentionality, and responsibility. The reporting of the literature search strategy was also informed by PRISMA-S recommendations for systematic review searches [32].

To obtain studies closely aligned with the focus of this review, the search process did not rely on a single term only, but combined central expressions related to student agency and its measurement across formal educational settings. The keywords included terms such as *student agency*, *learner agency*, *agentic engagement*, *measurement*, *scale*, *instrument*, *operationalization*, *assessment*, *school*, *classroom*, *primary education*, *secondary education*, *higher education*, *artificial intelligence*, *generative AI*, *AI-mediated learning*, and *learning analytics*. These terms were adjusted to the indexing system and search features of each database so that the search remained broad enough to capture relevant studies while still being sufficiently focused on the topic under review [30], [32].

In addition, backward and forward citation tracking was used to identify relevant studies that might not have been captured in the initial database search but were closely connected to the topic through citation networks [31]–[32]. The search results were compiled into a working screening set. The initial search identified 1,041 records. After duplicate removal, 515 unique records remained for title and abstract screening. Of these, 391 records were retained for full-text review because they showed direct relevance to student agency, agency-related constructs, or measurement frameworks in formal educational settings. The final selection resulted in 45 studies included in the review. All studies retained in the final inclusion stage were used as the basis for the synthesis.

B. Selection Process

The next stage in this review was the selection of literature so that only studies most relevant to the objectives of the review were retained. The selection process was carried out manually in several stages, namely duplicate removal, title and abstract screening, and full-text assessment, following the logic of study identification, screening, eligibility assessment, and inclusion recommended in PRISMA 2020 [30]–[31]. Eligibility decisions were based on the predefined inclusion and exclusion criteria, with particular attention to conceptual relevance, methodological transparency, and explicit discussion of how student agency or closely related constructs were defined, operationalized, measured, or analytically interpreted in formal educational contexts.

Studies were included when they met the following criteria: (a) they explicitly conceptualized student agency or a closely related agency construct; (b) they described how agency was operationalized, measured, or analytically interpreted; and (c) they were situated in formal educational contexts at the primary, secondary, or higher education level. Both empirical and conceptual studies were included because the review was concerned not only with how student agency had been measured, but also with how the construct itself had been defined and translated into measurable domains. Studies were excluded when agency appeared only as a rhetorical background term, when the primary focus was teacher or institutional agency rather than student agency, when no clear operational or analytical treatment of agency was provided, or when the setting fell outside formal education. Following full-text assessment, 346 records were excluded because they did not meet the eligibility criteria. This process resulted in 45 studies included in the final synthesis. The overall process of identification, screening, eligibility assessment, and inclusion is summarized in Figure 1, consistent with PRISMA 2020 recommendations [30],[31].

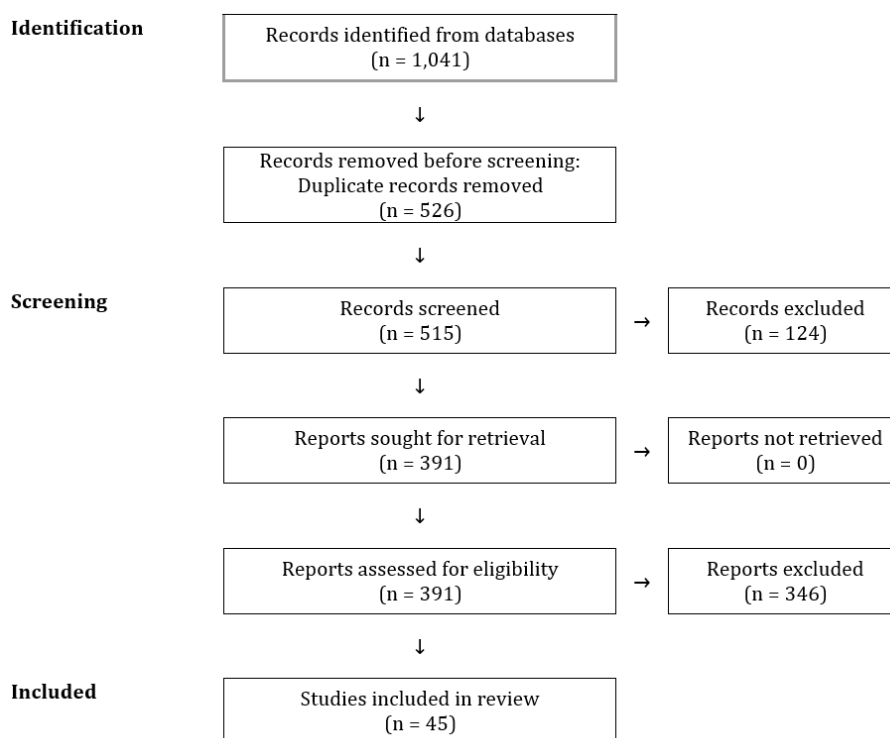


Fig. 1. PRISMA 2020 flow diagram of study selection

C. Inclusion and Exclusion Criteria

Studies were included when they met three criteria: (a) they explicitly conceptualized student agency or a closely related agency construct, (b) they described how agency was operationalized, measured, or analytically interpreted, and (c) they were situated in formal educational contexts at primary, secondary, or higher education levels, in line with the use of explicit eligibility criteria in systematic review reporting [30]–[31]. Both empirical and

conceptual studies were included deliberately. Empirical studies were necessary to examine instruments, designs, and observed uses of agency measures, whereas conceptual studies were required because the review focused not only on effect patterns but also on how the construct itself was defined and translated into measurable domains, consistent with review approaches that combine conceptual clarification with interpretive synthesis [33]–[34]. Studies were excluded when agency appeared only as a rhetorical background term, when the focus was teacher or institutional agency rather than student agency, when no clear operational or analytical treatment of agency was provided, or when the setting fell outside formal education. Studies in digital or technology-mediated environments were retained when they offered clear implications for measurement, including AI-mediated contexts. Full-text assessment was used to confirm eligibility and refine exclusion decisions, following recommendations that full-text screening is essential for accurate judgment in systematic reviews [35].

D. Data Extraction and Analysis

For each included study, data were extracted on definitions of student agency, theoretical orientation, educational level, measurement approach, instrument characteristics, and contextual focus. Thematic synthesis [34] proceeded in two stages. First, descriptive coding mapped how agency was defined and operationalized across studies. Second, analytical synthesis compared these patterns across theoretical traditions, educational levels, and AI-related contexts. This procedure enabled clearer separation between descriptive reporting and interpretive claims. It also supported identification of recurring blind spots in current measurement practice, especially the under-measurement of relational, structural, collective, and human–AI negotiated forms of agency.

Results

A. Dominant Conceptualizations of Student Agency

Across the 45 included studies, student agency was most commonly conceptualized as a multidimensional construct rather than a single trait. Three recurrent framings appeared: agency as personal regulation and initiative; agency as participation, voice, and negotiated action in relational settings; and agency as contextually enabled or constrained action across institutional conditions [7], [17], [22], [24], [27], [36]. Temporal framings distinguishing iterative, projective, and practical-evaluative dimensions also appeared, especially in work on teacher education and developmental trajectories [21], [37].

Although these framings overlapped, their measurement consequences differed. Social-cognitive and engagement-oriented studies most often translated agency into self-efficacy, intention, self-regulation, persistence, and proactive classroom contribution [7], [22],[23], [28]. Sociocultural, critical, and discursive studies more often identified agency through

participation, voice, resistance, co-creation, and situated negotiation within curricular or institutional structures [24]–[27], [39],[40].

B. Measurement Approaches Across Educational Levels

In primary education, agency measures were concentrated in literacy and general learning contexts. The Student Agency Profile (StAP) operationalized agency through self-perceptions as readers and writers, intentionality, choice, persistence, and interactivity, with evidence of cross-cultural stability [6], [41],[42]. Other measures for upper primary and lower secondary students combined motivation, self-efficacy, and strategic learning behaviors, and were often studied together with teacher and peer support [43].

In secondary education, the most frequently used operationalization was agentic engagement, defined as students' proactive contribution to instruction through questioning, expressing preferences, suggesting ideas, or negotiating classroom conditions [7], [23], [38]. A second cluster of studies used broader agency scales that combined initiative, self-reflection, self-regulation, communication, and community-oriented action, particularly in East Asian contexts [44],[45].

In higher education, multidimensional resource-based models were more prominent. The Agency of University Students (AUS) scale conceptualized agency through combinations of individual, relational, and contextual resources such as motivation, competence beliefs, participation, support, trust, and opportunities for influence [8]–[10]. The Agency for Learning framework and related measures emphasized intentionality, forethought, self-regulation, and self-efficacy [22].

Beyond standardized scales, a substantial body of research operationalized agency within domain-specific, policy, or participatory contexts. These studies examined agency through acceptance, resistance, strategic adaptation, co-creation, participatory budgeting, dialogic feedback, and forms of assessment resistance [39],[40], [46]–[51]. Mixed-methods designs commonly combine surveys with interviews, journals, or observations to connect measured dimensions with situated practice [43], [48].

C. Student Agency in AI-Mediated Learning Contexts

Digital and AI-related studies formed a smaller but distinct cluster within the review. In this cluster, agency measurement expanded beyond traditional self-report scales to include behavioral traces, AI-use patterns, and hybrid analytic designs. One strand of research focused on the development of context-specific agency scales tailored to generative AI-supported learning. The Student Learning Agency in Generative AI-supported Contexts (SLA-GAI) scale operationalized agency through self-cognition, goal setting, self-adjustment, self-reflection, selective action, responsible action, participative action, self-efficacy, and volition [29], [52],[53].

A second strand extended established agency instruments into AI-mediated learning contexts by integrating them with learning analytics. In higher education, data from multidimensional scales such as AUS were combined with clustering, supervised machine learning, and explainable AI techniques to generate agency profiles at the course or program level [9], [54],[55].

Several studies also operationalized agency through behavioral indicators, including the frequency of AI assistance requests, the ways students engaged with AI-generated feedback, and the strategies used to revise AI outputs during learning tasks [29], [53], [56]. Qualitative studies and conceptual papers added further categories such as receptive, resistive, resourceful, and reflective engagement with AI, along with concerns about epistemic judgment, emotional response, and ethical responsibility [15],[28],[29],[57],[58].

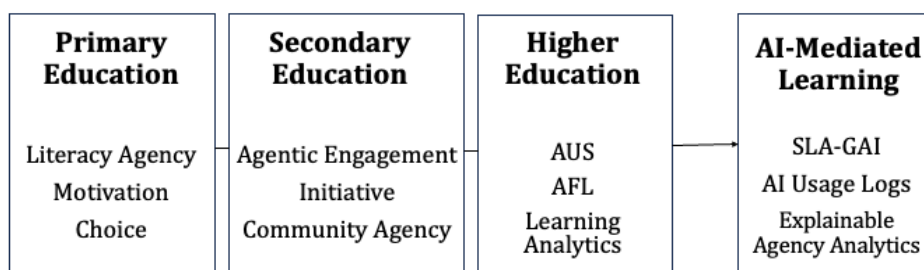


Fig. 2. Evolution of student agency measurement across educational contexts.

Discussion

A. What Current Measures Capture Reliably

The review shows that current student agency measurement is strongest when the construct is framed as a learning-related capacity tied to task engagement, self-regulation, and proactive participation. This is not a trivial achievement. Instruments such as StAP, agentic engagement scales, AUS, and Agency for Learning have given the field psychometrically usable tools and made agency examinable across educational levels [6]–[10], [22], [43]. Their dominance can therefore be interpreted not only as a theoretical preference, but also as a methodological solution: they translate agency into constructs that are stable enough to quantify and sensitive enough to respond to pedagogical conditions.

B. What Remains Under-measured

At the same time, the review indicates that prevailing measures capture only part of the phenomenon. Agency expressed through resistance, strategic withdrawal, identity protection, collective action, and structurally constrained participation remains less visible in the dominant measurement architecture [26],[27],[39],[40]. This does not mean that current instruments are invalid. Rather, they tend to privilege institutionally valued expressions of

agency such as compliance-compatible initiative, productive engagement, and effective self-management.

C. Interpreting Agency in AI-Mediated Learning

The AI-mediated literature sharpens this limitation. Here, an important alternative interpretation must be acknowledged: AI assistance does not always dilute agency. In some studies, generative AI appears to scaffold planning, revision, and reflective self-adjustment, thereby extending students' capacity to act [52],[53],[56]. In other studies, however, the same support raises concerns about cognitive offloading, opaque dependence, and reduced authorship [15], [29], [57]. The empirical issue is therefore conditional rather than categorical. These contrasting findings suggest that the effects of AI on student agency are not inherent to the technology itself but depend on how AI is positioned within the learning process. AI may support agency when it functions as a scaffold for planning, reflection, and revision, but it may constrain agency when it substitutes for judgment, reduces authorship, or encourages uncritical reliance. The contradictory evidence may also reflect differences in task design, learner control, and measurement assumptions, such that the same AI tool can appear agency-supportive in one context and agency-reducing in another. Measurement, therefore, needs to distinguish augmented agency from surrendered agency, rather than assuming that higher productivity or smoother task completion automatically signals greater autonomy.

Recent work in AI-supported learning also suggests that agency should be assessed at more than one level. Self-report scales remain useful for capturing perceived intention, control, and responsibility; behavioral indicators reveal how students actually use AI support; and qualitative evidence clarifies how students justify, resist, or reinterpret that support in context [28], [52]–[57], [59]. Multi-method designs that combine psychometric scales, behavioral traces, and qualitative accounts are especially well suited to this agenda.

D. Implications for Instrument Development, Counselling, and Policy

For future instrument development, four design principles follow from the review. First, measures should distinguish initiation from reliance by assessing whether students decide when AI support is appropriate, rather than merely whether they use it [29], [52], [53]. Second, measures should capture evaluative judgment by examining whether learners verify, revise, or reject AI outputs in relation to their own goals [52], [53], [56], [57]. Third, measures should retain indicators of responsibility, including authorship, accountability, and ownership of final decisions, given persistent concerns that AI may facilitate task completion while reducing authorship or encouraging cognitive offloading [15], [28], [29], [57]. Fourth, measures should remain sensitive to structural and relational conditions, since agency is shaped not only by individual capacity but also by opportunities for voice, recognition, participation, and support [8]–[10], [26], [27], [39], [40]. Taken together, these principles suggest that future instruments

should move beyond productivity-oriented indicators and assess whether students can engage AI support without surrendering autonomy, judgment, or responsibility. Illustrative items might include statements such as: “I decide when AI assistance is appropriate for my task”; “I check whether AI suggestions fit my goals before using them”; “I remain responsible for the final version of my work”; and “I can explain why I accepted, revised, or rejected AI output.”

Conclusion

This review shows that student agency has most often been measured through multidimensional but predominantly social-cognitive frameworks, which have been useful for capturing intentional action, participation, and self-regulated learning across educational levels. Its main contribution, however, is to show that these measurement traditions are not neutral: they reflect different theoretical assumptions about what agency is, where it resides, and what counts as evidence of it. As a result, dominant measures remain only partial, especially when learning is increasingly shaped by AI-supported interaction.

The review also highlights that agency in AI-mediated learning cannot be interpreted in a single direction. AI may extend agency when it supports planning, reflection, and revision, but it may also constrain agency when it substitutes for judgment, reduces authorship, or encourages uncritical reliance. The key challenge, therefore, is not simply to measure engagement with AI, but to determine whether learners can use such support without surrendering autonomy, evaluative judgment, and responsibility.

The practical implications are clear. Future research should develop multi-method instruments that distinguish supported learning from surrendered agency and that attend to authorship, accountability, and equitable opportunities for voice and influence. For schools and policy-makers, the challenge is equally urgent: agency must be treated not only as a pedagogical ideal, but as an instructional, assessment, and counselling concern in contemporary learning environments. In an era of AI-mediated education, the central question is no longer whether students use intelligent systems, but whether they remain the authors of their own learning.

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Conflict of Interest

The authors declare no conflict of interest.

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