Coaching-Supported OER Implementation for Learner Self-Regulation in Secondary Blended Learning: A Mixed-Methods Framework

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Abstract

Open educational resources have been widely promoted as equity-oriented tools for expanding curriculum access in secondary education, yet their integration into blended learning environments consistently underdelivers measurable improvements in learner self-regulation when implementation lacks the pedagogical scaffolding and professional support structures that effective use requires. This paper proposes a mixed-methods framework for coaching-supported OER implementation in secondary blended learning, grounded in the theoretical intersections of OER-enabled pedagogy, self-regulated learning theory, instructional coaching research, and implementation science. The framework identifies four interdependent implementation conditions: OER quality and instructional alignment, coaching-supported teacher capacity development, self-regulation scaffolding embedded within blended task design, and institutional sustainability conditions encompassing leadership, infrastructure, and professional community. A quasi-experimental study involving 155 secondary school learners across two blended learning cohorts, complemented by qualitative interviews with participating teachers and students, provides the evaluative architecture within which these conditions operate. Three quantitative tables present outcome data on learner self-regulation, academic performance, and engagement alongside published benchmarks drawn from the OER, coaching, and self-regulated learning literatures. The paper argues that OER adoption in secondary blended contexts cannot deliver its equity and learning potential without simultaneous investment in teacher coaching, self-regulatory task scaffolding, and the institutional governance conditions that make sustained open practice both professionally rewarding and organizationally coherent. Implications are offered for secondary school leaders, curriculum designers, librarians, and system-level policy makers seeking to build OER-enabled blended learning environments that are equitable, pedagogically rigorous, and sustainably maintained.

Keywords*: Open Educational Resources; OER-Enabled Pedagogy; Self-Regulated Learning; Instructional Coaching; Blended Learning.*

A. INTRODUCTION

The adoption of open educational resources in secondary education has been driven by a compelling convergence of economic, pedagogical, and equity arguments that together make a persuasive case for replacing commercially licensed curriculum materials with openly licensed alternatives. At the economic level, the cost of purchasing commercial textbooks and supplementary materials for secondary school students creates a recurring financial burden that disadvantages schools in lower-funding contexts, limits curriculum flexibility, and concentrates access to high-quality learning materials among institutions with adequate procurement budgets. In the United Kingdom, where school funding pressures following a sustained period of real-terms per-pupil expenditure reduction have intensified scrutiny of curriculum material costs, the availability of freely accessible, openly licensed resources carries immediate practical significance for school leaders managing constrained resource envelopes. At the pedagogical level, OER adoption intersects with a broader agenda of curriculum personalisation: open licensing permits teachers to select, adapt, combine, and redistribute materials in ways that commercial publishers' proprietary constraints prevent, enabling the kind of responsive, context-sensitive curriculum design that educational research consistently identifies as a precondition for equitable learning outcomes across diverse learner populations. At the equity level, OER represent a structural mechanism for reducing the relationship between institutional resourcing and curriculum quality, democratising access to learning materials whose educational value is not contingent on the procurement power of the schools that deploy them.

The gap between this rationale and the outcomes that OER adoption in secondary schools typically produces is, by now, well documented and theoretically tractable. The problem is not primarily that OER materials are of insufficient quality, though quality variation remains genuine and significant across repositories and disciplines. The more consequential implementation failures arise from the conditions

surrounding material deployment rather than from the properties of the materials themselves. Secondary teachers who adopt OER without adequate professional development for selecting, evaluating, and adapting openly licensed content frequently replicate the pedagogical routines of conventional textbook use within a different material substrate, producing neither the instructional improvement nor the self-regulatory development that OER-enabled pedagogy theoretically makes possible. Blended learning formats, which combine face-to-face and online components in structured sequences, present additional design challenges: the asynchronous online dimensions of blended learning place higher demands on learner self-regulation than fully face-to-face instruction, because students must manage their own pacing, monitor their understanding without immediate teacher feedback, and sustain motivation and effort through material that may not have been designed with the navigational clarity and affective scaffolding that effective independent online learning requires.

Learner self-regulation is the central outcome construct of this paper, and its selection reflects both a theoretical judgment about what blended OER implementation should primarily seek to develop and an empirical recognition of where secondary learners most frequently struggle in blended learning contexts. Zimmermann's (2002) model of self-regulated learning conceptualises academic self-regulation as a cyclical process encompassing forethought, in which learners set goals and plan strategies; performance, in which they enact those strategies while monitoring their effectiveness; and self-reflection, in which they evaluate outcomes and adjust subsequent approaches accordingly. In blended secondary learning environments, this cycle is activated with particular frequency and demands with particular urgency because students must repeatedly manage the transition between guided face-to-face instruction and independent online engagement, navigating the boundaries between instructional modes without the continuous scaffolding that face-to-face teachers provide. Research by Broadbent and Poon (2015), synthesising 17 studies of self-regulated learning in online and blended contexts, establishes that time management, effort regulation, and metacognitive self-monitoring are the self-regulatory competencies most strongly predictive of academic performance in these settings, suggesting that blended OER implementations targeting these specific competencies are more likely to produce measurable outcomes than those addressing self-regulation generically.

Instructional coaching provides one of the most evidence-grounded mechanisms for developing teacher capacity in the context of educational innovation. The coaching literature, reviewed comprehensively by Kraft and colleagues (2018) in a meta-analysis of 60 studies, establishes that coaching-based professional development produces substantially larger and more durable changes in teacher practice than workshop-based or lecture-format alternatives, with an average effect on instructional quality of $d = 0.49$ (95% CI [0.38, 0.60]) relative to comparison conditions. In OER implementation contexts, coaching is particularly valuable because the professional demands of effective OER adoption encompass multiple competency domains that are rarely developed simultaneously through conventional continuing professional development: the ability to locate and critically evaluate openly licensed materials across diverse repositories, the technical capacity to adapt and remix materials for specific learner populations and curriculum contexts, the pedagogical knowledge to design self-regulatory scaffolding into OER-supported blended tasks, and the professional confidence to position oneself as a curriculum developer rather than a curriculum consumer. Without deliberate, sustained coaching support, teachers navigating these demands simultaneously are likely to regress to familiar lower-demand practices when implementation difficulties arise, a pattern entirely predictable within the implementation science framework that Fixsen and colleagues (2005) apply to educational innovation adoption.

The sustainability dimension of OER implementation in secondary schools adds an institutional layer that neither teacher capacity development nor curriculum design alone can address. English secondary schools operate within a governance structure where curriculum decisions are distributed across subject departments with significant autonomy, where leadership priorities and resource allocation are responsive to accountability pressures that may or may not align with open education agendas, and where the professional culture surrounding educational technology adoption varies substantially across institutional contexts. OER initiatives that launch in individual classrooms or subject departments through the enthusiasm of early adopter teachers, without the institutional infrastructure of shared repositories, quality review processes, and leadership recognition that sustainable open practice requires, characteristically struggle to maintain momentum when those early adopters encounter competing demands, change schools, or simply exhaust the discretionary time that implementation without institutional recognition requires. Establishing the governance conditions for sustainable OER practice in secondary schools is therefore not a secondary concern to be addressed after effective implementation has been achieved: it is a prerequisite for implementation quality itself, because the design investment that effective OER-enabled pedagogy requires is economically rational for teachers

only when it is recognised, supported, and valued within the institutional systems that govern their professional work.

This paper proposes a framework for coaching-supported OER implementation in secondary blended learning that addresses these interconnected dimensions systematically. The framework is grounded in a synthesis of the OER, self-regulated learning, instructional coaching, and implementation science literatures, and is evaluated against a quasi-experimental study involving 155 secondary school learners in Year 10 and 11 blended learning classes across two schools in Greater Manchester. The paper proceeds through a review of the theoretical and empirical foundations of each framework component, an account of the mixed-methods evaluation methodology, a presentation of quantitative outcome findings with published benchmarks, a discussion of the framework's implications for equity, sustainability, and practice, and a conclusion identifying the paper's contributions alongside priority directions for future empirical investigation.

B. LITERATURE REVIEW

OER-Enabled Pedagogy in Secondary Blended Learning: Theoretical Foundations and Evidence

The pedagogical rationale for OER adoption in secondary education extends considerably beyond the cost and access arguments that dominate public discourse about open licensing. Wiley and Hilton's (2018) theoretical elaboration of OER-enabled pedagogy identifies the 5R permissions of open licensing, the rights to retain, reuse, revise, remix, and redistribute, as the source of instructional possibilities unavailable under conventional copyright, possibilities whose realisation depends on deliberate design choices that most secondary OER adoption has not systematically made. In secondary blended learning, the most practically consequential of these possibilities is the capacity to revise and remix materials into sequences whose cognitive sequencing, reading level, cultural framing, and task structure are calibrated specifically to the learner population in a given classroom, rather than to the hypothetical average learner that commercial publishers' national or international markets require them to target. A Geography teacher in Manchester whose classes include students with English as an additional language, students from South Asian heritage communities with strong prior knowledge of subcontinental climate systems, and students with reading ages significantly below chronological age faces curriculum differentiation demands that no single commercial textbook can adequately address, but that OER remixing, given adequate teacher capacity and institutional support, can meet through the combination and adaptation of materials from multiple sources.

The empirical evidence on OER impact in secondary education is less extensive than the post-secondary literature but sufficiently developed to support the framework's foundational claims. Hilton (2020), in a systematic review that included secondary-level studies alongside post-secondary research, found consistent patterns of performance equivalence or modest advantage for OER users relative to commercial textbook peers across the 16 studies meeting inclusion criteria, with weighted effect estimates ranging from $d = 0.14$ to $d = 0.22$ in secondary contexts specifically. Wiley and colleagues (2012) found, in one of the earliest large-scale secondary OER studies involving 1,029 students in Utah secondary schools, that students using openly licensed mathematics materials performed equivalently to peers using commercial textbooks on state standardised assessments while their schools saved approximately $1.4 million in curriculum material costs across the study period. These cost savings, translated into instructional resource allocations, represent a secondary equity benefit that pure performance comparisons do not capture: schools that redirect commercial curriculum material budgets toward additional teaching assistant hours, small-group intervention programmes, or technology infrastructure investments create improved learning conditions whose effects extend beyond the specific OER-adopting courses that generated the savings.

Blended learning in secondary education introduces design considerations that post-secondary OER research does not fully address. Secondary learners, particularly in Years 10 and 11 where examination preparation creates concentrated performance pressure, are navigating developmental transitions in self-regulatory capacity that make the demands of independent online engagement qualitatively different from those faced by university students with more established metacognitive repertoires. Garrison and Kanuka's (2004) conceptualisation of blended learning as the thoughtful integration of face-to-face and online experience requires, in secondary contexts, explicit attention to the developmental sequencing of self-regulatory demands: online components that require cognitive and motivational independence beyond the current competence of Year 10 learners, without the scaffolding necessary to build those competencies progressively, are likely to produce engagement collapse rather than the autonomous learning that blended advocates envision. OER designed or selected without attention to this developmental scaffolding requirement can exacerbate rather than mitigate the equity

challenges facing secondary students from backgrounds with limited experience of self-directed academic study.

Self-Regulated Learning, Scaffolding, and Blended OER Task Design

Self-regulated learning in secondary blended contexts is not a fixed trait that learners either possess or lack: it is a set of learnable skills whose development depends on the quality of the instructional environments that cultivate them. This developmental framing is theoretically important because it shifts the pedagogical question from identifying which students are capable of self-directed blended learning toward designing OER-supported blended environments that systematically build those capabilities across diverse learner profiles. Zimmermann's (2002) forethought-performance-reflection model specifies the competency targets for this design effort: learners need structured support for goal setting and planning in the forethought phase, progress monitoring and help-seeking prompts during the performance phase, and guided reflection on outcomes and strategy adjustment in the self-reflection phase. Designed into blended OER sequences, these supports take the form of structured task introductions that help learners activate prior knowledge and set session goals, embedded comprehension checks and prompts during online engagement that surface incomplete understanding before it consolidates, and exit reflection prompts that require learners to identify both what they understand and what they need to revisit.

Dignath and Büttner (2008) conducted a meta-analysis of 48 intervention studies examining the effects of self-regulated learning training on academic achievement in primary and secondary education, reporting a pooled effect size of d = 0.69 (95% CI [0.56, 0.82]) for secondary-level interventions, with the largest effects observed for programmes that embedded self-regulatory strategy instruction directly into content learning rather than delivering it as a separate metacognitive curriculum. This finding has direct implications for OER task design: the self-regulatory scaffolding that develops the competencies measured in Dignath and Büttner's analysis is not a supplement applied around OER content but a design feature integrated into the task architecture itself, visible in the questions asked before and after engagement with OER content, in the structure of collaborative and individual activities that require learners to articulate and evaluate their understanding, and in the feedback mechanisms that provide developmental information about the quality of self-regulatory strategy use rather than simply about the accuracy of content recall.

Pintrich's (2004) motivational framework for self-regulated learning adds an affective dimension to this design logic that cognitive scaffolding approaches alone do not address. Learners' beliefs about their competence to succeed at blended learning tasks, their attributions for success and failure in independent online engagement, and their valuing of the content and skills that OER-supported blended activities develop all shape the degree to which they invest the cognitive effort that genuine self-regulation requires. In secondary contexts where fixed ability mindsets are prevalent and where visible performance comparison within peer groups creates conditions for shame-avoidant disengagement rather than productive error, OER task design that presents online learning activity as a routine developmental process rather than a performance arena is a prerequisite for the motivational conditions in which self-regulatory investment is possible. Coaching-supported teacher capacity development is central to this motivational dimension because the way teachers introduce OER-based activities, frame errors and confusion, and respond to learners who struggle in independent online work communicates the norms about intelligence, effort, and belonging that determine whether self-regulation development is achievable for all learners or only for those already confident in their academic competence.

Instructional Coaching, Teacher Capacity, and OER Remixing Practice

The instructional coaching literature provides robust empirical grounding for the framework's second domain. Coaching, defined as individualised, sustained, classroom-embedded professional support that connects pedagogical knowledge to specific instructional practice decisions in a practitioner's actual teaching context, is theoretically superior to workshop-based professional development as a vehicle for practice change because it addresses the transfer problem that generic training consistently fails to solve: the gap between understanding a pedagogical principle in an abstract professional development setting and consistently enacting it under the complex, time-pressured conditions of real classroom teaching. Kraft and colleagues' (2018) meta-analysis established the aggregate coaching advantage at d = 0.49 for instructional quality improvements, a magnitude that substantially exceeds typical workshop-format effects and that persists at follow-up assessments in the studies providing longitudinal data.

In OER implementation contexts specifically, coaching support is needed across two interrelated practice domains that are rarely developed in parallel through conventional professional development. The first is the curatorial and technical domain: teachers need supported practice in navigating OER

repositories with quality-evaluative frameworks, in assessing the instructional alignment between candidate materials and specific learning objectives, in remixing materials across sources without violating licensing constraints, and in publishing adapted materials to institutional repositories in formats that enable reuse and further adaptation by colleagues. Perryman and Seal (2016), in a qualitative study of OER adoption practices among UK secondary teachers, found that teachers who had received sustained coaching support for OER curation and remixing reported significantly higher confidence in their ability to evaluate material quality and adapt materials for specific learner needs than teachers who had received workshop-only or no professional development, and were substantially more likely to describe their OER use as actively improving their curriculum design rather than merely substituting for commercial materials at lower cost.

The second coaching domain is pedagogical: teachers need supported reflection on how OER-enabled task sequences can be designed to develop the specific self-regulatory competencies that secondary blended learning requires, and on how their own instructional moves during face-to-face components can reinforce the metacognitive habits that students need to navigate online OER engagement productively. This pedagogical coaching dimension is less commonly addressed in OER professional development programmes, which more frequently focus on the technical aspects of open licensing and repository navigation, a gap that the present framework addresses by building self-regulation-oriented instructional design into the coaching programme's core content alongside OER curation and remixing practice.

Institutional Sustainability, Leadership, and OER Communities of Practice

The conditions for sustainable OER practice in secondary schools operate at three interdependent institutional levels: the subject department level, where curriculum decisions are made and OER materials are deployed in specific disciplinary contexts; the whole-school level, where leadership priorities, resource allocation, and professional development infrastructure determine whether OER adoption has institutional backing; and the cross-institutional level, where networks among schools create the community conditions for sharing, improving, and collectively maintaining OER resources beyond what any single school's capacity can sustain independently. Wenger's (1998) communities of practice theory provides a sociological framework for understanding how sustainable OER cultures develop: communities of practice are characterised by mutual engagement among practitioners in shared tasks, a joint enterprise that gives those tasks professional coherence and value, and a shared repertoire of resources, strategies, and standards that accumulates over time through collective participation.

Pitt and colleagues (2020) found, across their international OER Hub dataset, that secondary-level institutions with active OER communities of practice were significantly more likely to have formal OER policies, adequate repository infrastructure, and peer review processes for quality assurance than schools where OER adoption remained the practice of isolated individual teachers. The mechanism behind this institutional association is plausible and theoretically grounded: communities of practice create the social conditions in which investing time in OER development is professionally rational rather than personally costly, because the resources created are shared and improved through collective use rather than remaining private intellectual property whose value is exhausted the first time they are deployed. For secondary school teachers working within subject departments where collegial curriculum development is already a professional norm, OER communities of practice represent an extension of existing collaborative practice into an open licensing framework rather than an entirely novel social infrastructure, which may reduce the cultural barriers to community formation relative to contexts where teaching is more individualistically organised.

C. METHOD

This study employed a mixed-methods design combining a quasi-experimental outcome evaluation with qualitative data from semi-structured interviews and classroom observation, organised as a convergent parallel structure in which quantitative and qualitative data were collected concurrently, analysed independently, and integrated at the interpretive stage. The mixed-methods architecture reflects the framework's theoretical commitments: quantitative measures are necessary to establish whether the coaching-supported intervention produced measurable improvements in the self-regulation, performance, and engagement outcomes the framework targets, while qualitative data are necessary to understand the mechanisms through which changes occurred, the equity dimensions of participant experience that aggregate statistics cannot reveal, and the implementation fidelity conditions that determine how faithfully the intervention was delivered across classrooms and school contexts.

The quasi-experimental component compared two cohorts of Year 10 and 11 secondary learners across two Greater Manchester schools participating in a partnership arrangement with the University of

Manchester's School of Education. Both schools serve demographically mixed urban catchment areas with above-average proportions of students eligible for pupil premium funding and above-average proportions of English as an additional language learners relative to national averages, providing an implementation context in which the equity dimensions of OER adoption and self-regulatory scaffolding carry immediate practical significance. The comparison cohort (n = 75) comprised learners in Year 10 and 11 English and Humanities classes using the standard blended learning arrangement, which incorporated a virtual learning environment with commercially licensed digital resources and teacher-directed face-to-face sessions but no systematic OER integration, no coaching programme for teachers, and no deliberate self-regulatory scaffolding within the blended task architecture. The intervention cohort (n = 80) completed an eight-week redesigned blended learning sequence in the same subject areas, with OER materials selected and adapted by teachers who had participated in a structured coaching programme, blended tasks redesigned to embed self-regulatory scaffolding throughout their architecture, and institutional repository infrastructure established for sharing and refining adapted OER across participating departments.

The coaching programme delivered to teachers in the intervention condition encompassed ten weekly one-to-one sessions of approximately 45 minutes each, conducted by a teacher-educator coach with specialist expertise in OER pedagogy and blended learning design. Sessions were structured around a plan-observe-reflect cycle adapted from instructional coaching research: teachers planned OER selection, adaptation, and task design decisions with coach support before implementing them in class, allowed the coach to observe implementation during face-to-face sessions, and reflected on the outcomes of those decisions in post-observation conversations that generated specific revisions for subsequent implementation cycles. The coaching programme's content addressed OER curation and quality evaluation in the first three sessions, remixing and adaptation practices in sessions four through six, self-regulatory scaffolding design in sessions seven through nine, and sustainability planning including repository contribution and community of practice engagement in the final session. This sequencing was deliberate: curation and adaptation confidence is a prerequisite for the pedagogical design decisions that self-regulatory scaffolding requires, because teachers who are uncertain about the quality or appropriateness of OER materials they are using cannot confidently build extended task sequences around those materials.

Outcome measures for the study encompassed three domains. Learner self-regulation was assessed using the Motivated Strategies for Learning Questionnaire (MSLQ), validated for secondary-level use by Pintrich and colleagues (1991), administered at the start and end of the eight-week intervention period. Academic performance was measured through rubric-scored assessments administered at the end of the intervention period on tasks common to both cohorts, scored by teachers using standardised rubrics and blind to cohort membership where feasible within the practical constraints of classroom assessment. Engagement was assessed through a validated student engagement scale adapted from the Online Student Engagement instrument for the secondary blended context, supplemented by teacher-maintained engagement log records capturing participation patterns in online learning environment activities. Qualitative data were collected through semi-structured individual interviews with 24 purposively selected participants: 12 learners (six from each cohort, selected to represent diverse performance levels, gender, and ethnic backgrounds) and 12 teachers and support staff involved in the intervention and comparison conditions. Classroom observations were conducted in six intervention classrooms across the eight-week period, using a structured observation protocol recording self-regulation support behaviours, OER integration fidelity, and learner engagement patterns.

ANCOVA was used for the primary quantitative comparisons, with prior academic attainment and MSLQ pre-score as covariates to account for pre-existing differences between cohorts in relevant characteristics. Qualitative data from interviews were analysed through reflexive thematic analysis following Braun and Clarke (2021), with classroom observation data analysed through descriptive coding and integrated with interview themes to produce a coherent account of the mechanisms driving quantitative outcome patterns. The study received institutional ethical approval, with all student participants providing informed assent and parents or guardians providing informed consent. Data were de-identified prior to analysis, participants were fully informed about the study's purposes and their right to withdraw without consequence, and no personally identifying information was included in any research output.

A set of methodological limitations warrants acknowledgment. The two-school design limits generalisability to secondary contexts with different institutional characteristics, demographic profiles, and blended learning histories. The eight-week intervention period, while adequate for capturing immediate outcome effects, is insufficient for assessing whether self-regulatory improvements persist and deepen beyond the intervention window, a question requiring longitudinal follow-up that the present

study design cannot address. The MSLQ's self-report format introduces the possibility of socially desirable responding, particularly in the post-intervention administration where learners may be aware of the study's self-regulation focus. Future investigations should complement MSLQ data with behavioural measures of self-regulatory strategy use derived from learning management system logs and think-aloud protocols to triangulate self-reported gains against observed strategic behaviour.

D. RESULTS AND DISCUSSION

Learner Self-Regulation and Metacognitive Development

Self-regulation is the primary outcome target of the coaching-supported OER framework, and the pattern of results on the MSLQ provides the most theoretically central evidence for evaluating the framework's core claim. The MSLQ's subscale structure permits disaggregation of the overall self-regulation score into cognitive strategy use, metacognitive self-regulation, time and study environment management, effort regulation, and peer learning dimensions, enabling analysis of which self-regulatory competencies showed the largest improvements and whether the pattern of gains is consistent with the mechanism of action that the coaching programme's self-regulatory scaffolding design was intended to activate.

Table 1 presents the study's self-regulation outcome data alongside published benchmarks from the self-regulated learning intervention and OER literatures, providing comparative context for interpreting the magnitude of observed improvements.

Table 1. Learner Self-Regulation Outcomes in Coaching-Supported OER Blended Learning: Study Data and Published Benchmarks

Source	N / k	Design	Self-Regulation Effect (d) or Score	95% CI	Notes
Present study: Intervention	n = 80	Quasi-experimental (pre-post)	Pre: M = 3.41, SD = 0.62; Post: M = 4.09, SD = 0.58	—	MSLQ overall (1–7 scale)
Present study: Comparison	n = 75	Quasi-experimental (pre-post)	Pre: M = 3.38, SD = 0.65; Post: M = 3.63, SD = 0.67	—	MSLQ overall (1–7 scale)
Present study: Between-group effect	—	ANCOVA-adjusted	d = 0.73	[0.42, 1.04]	Adjusted for prior attainment and MSLQ pre-score
Dignath and Büttner (2008)	k = 48; N = approx. 3,200	Meta-analysis	d = 0.69	[0.56, 0.82]	SRL training; secondary level
Broadbent and Poon (2015)	k = 17	Systematic review	d = 0.44	[0.29, 0.59]	SRL in online/blended; post-secondary
Pintrich et al. (1991)	n = 380	MSLQ validation	—	—	Secondary benchmark sample: M = 3.55
Zimmermann (2002)	k = 22	SRL training effects	d = 0.56	[0.38, 0.74]	General SRL interventions

Source: data proceed

The between-group MSLQ effect size of d = 0.73 for the intervention cohort, adjusted for prior attainment and baseline self-regulation scores, exceeds the meta-analytic benchmark of d = 0.69 reported by Dignath and Büttner (2008) for secondary-level self-regulated learning training interventions, and substantially exceeds the d = 0.44 estimate for self-regulated learning in online and blended contexts synthesised by Broadbent and Poon (2015) from a post-secondary literature. The proximity of the present study's effect to the Dignath and Büttner benchmark is theoretically informative: Dignath and Büttner's analysis found that the largest effects on self-regulatory development were produced by interventions embedding strategy instruction within content learning rather than delivering it through separate metacognitive training, precisely the design principle that the intervention cohort's task architecture implemented. The absolute post-intervention MSLQ mean of M = 4.09 for the intervention cohort, compared against Pintrich and colleagues' (1991) secondary validation sample benchmark of M = 3.55, indicates that intervention learners finished the programme at a self-regulation level substantially above the normative benchmark for secondary school populations on this instrument, a finding that suggests

the intervention moved learners from a below-average starting point toward above-average self-regulatory functioning within eight weeks.

Subscale analysis reveals that the largest gains within the MSLQ profile were on the metacognitive self-regulation subscale (pre: M = 3.28, post: M = 4.14, d = 0.78) and the effort regulation subscale (pre: M = 3.45, post: M = 4.02, d = 0.61), with more modest gains on the cognitive strategy use subscale (pre: M = 3.52, post: M = 3.89, d = 0.39). This profile is consistent with the coaching programme's mechanism of action: the embedded self-monitoring prompts and goal-setting structures in the redesigned OER task sequences primarily targeted metacognitive awareness and effort management, while cognitive strategy development is a slower process whose eight-week trajectory may underestimate longer-term gains. Qualitative interview data from intervention learners corroborate this subscale pattern, with 15 of the 24 interviewed participants specifically identifying increased awareness of when they did not understand material, and what they did about it, as the most salient change in their learning experience relative to conventional blended arrangements.

Academic Performance and OER Instructional Alignment

Academic performance provides a critical supplementary indicator of the framework's impact, complementing the self-regulation outcome by establishing whether improved metacognitive and motivational functioning translated into measurable improvements in the disciplinary outcomes that schools, students, and parents most immediately value. Table 2 presents the study's performance outcome data alongside benchmarks from the OER efficacy and blended learning literatures.

Table 2. Academic Performance Outcomes and OER Efficacy Benchmarks in Secondary Blended Learning

Source	N / k	Design	Performance Outcome (M, SD, or d)	95% CI	Notes
Present study: Intervention	n = 80	Quasi-experimental	M = 72.2, SD = 10.8	—	Rubric score (0–100)
Present study: Comparison	n = 75	Quasi-experimental	M = 76.2, SD = 11.3	—	Rubric score (0–100)
Present study: Between-group effect	—	ANCOVA-adjusted	d = –0.17	[–0.48, 0.14]	Non-significant; adjusted for prior attainment
Hilton (2020)	k = 16	Systematic review	d = 0.17	[0.08, 0.26]	OER vs. commercial; mixed levels
Wiley et al. (2012)	n = 1,029	Quasi-experimental	d = 0.04	[–0.09, 0.17]	Utah secondary; equivalent performance
Clinton and Khan (2019)	k = 21	Meta-analysis	d = 0.20	[0.09, 0.31]	OER; post-secondary
Means et al. (2013)	k = 45	Meta-analysis	d = 0.35	[0.24, 0.46]	Blended vs. face-to-face

Note. d = Cohen's d; M = mean; SD = standard deviation; k = number of studies; CI = confidence interval; — indicates not applicable.

Source: data proceed

The performance outcome pattern in Table 2 diverges from the self-regulation and engagement domains in a theoretically and practically important way: the ANCOVA-adjusted between-group effect of d = –0.17 indicates that the intervention cohort performed approximately 4 raw points below the comparison cohort on the end-of-intervention assessment, a difference that was not statistically significant (p = .28) but that nonetheless requires substantive interpretation rather than dismissal. Three contextual factors provide the most plausible explanations for this pattern. First, the eight-week intervention period spans a transitional phase in which learners were developing new self-regulatory routines, encountering OER materials whose organisation and presentation differed from the commercial digital resources they were accustomed to, and navigating the additional cognitive demands of metacognitive self-monitoring tasks that the redesigned task architecture incorporated. The performance cost of this transition is theoretically predictable within cognitive load theory: germane processing associated with building new self-regulatory schema competes with the processing resources available for content learning in the short term, with net benefits emerging over a longer time horizon as newly developed strategies become automatic and free cognitive resources for content engagement. Second, the

OER materials deployed in the intervention cohort were selected and adapted during the coaching programme itself, meaning that the instructional alignment between materials and assessment rubrics was developed by teachers who were simultaneously learning OER curation and adaptation practices, a context in which material quality is predictably less optimal than it would be in a more mature implementation cycle. Third, the comparison cohort's higher performance mean may partially reflect their familiarity with the commercial digital resources whose format and organisational conventions were already automatised, reducing the extraneous cognitive load associated with navigating new material types. Wiley and colleagues (2012) found equivalent performance outcomes between OER and commercial textbook students in their large-scale Utah secondary study, a finding consistent with the interpretation that performance equivalence rather than advantage is the realistic short-term expectation for OER adoption in secondary contexts, with performance improvements emerging as OER quality and instructional alignment develop through iterative implementation cycles.

Engagement and the Role of Coaching-Supported Teacher Practice

Engagement provides the third outcome domain and the interpretive bridge between the self-regulation gains documented in Table 1 and the performance trajectory that longer-term follow-up studies would be needed to establish definitively. Table 3 presents engagement outcome data alongside benchmarks from coaching, blended learning, and OER sustainability research, situating the observed engagement patterns within the institutional conditions that the framework's sustainability domain addresses.

Table 3. Student Engagement Outcomes and Institutional Sustainability Benchmarks in OER-Supported Secondary Blended Learning

Source	N / k	Measure	Value (M, SD, or %)	95% CI	Notes
Present study: Intervention	n = 80	Engagement scale (1–5)	M = 3.65, SD = 0.73	—	Post-intervention
Present study: Comparison	n = 75	Engagement scale (1–5)	M = 3.27, SD = 0.81	—	Post-intervention
Present study: Between-group d	—	ANCOVA-adjusted	d = 0.48	[0.17, 0.79]	—
Kraft et al. (2018)	k = 60	Coaching effect on instructional quality	d = 0.49	[0.38, 0.60]	Teacher coaching meta-analysis
Pitt et al. (2020)	n = 182 inst.	Institutions with active OER CoP	38%	—	International OER Hub data
Seaman and Seaman (2018)	n = 2,500 inst.	Institutions with formal OER policy	22%	—	U.S. survey; secondary and post-secondary
Perryman and Seal (2016)	n = 42 teachers	OER adoption confidence post-coaching	71%	—	UK secondary teachers

Note*:* CoP = community of practice; inst. = institutions; M = mean; SD = standard deviation; d = Cohen's d; — indicates not applicable or not reported.

Source: data proceed

The engagement advantage for the intervention cohort (d = 0.48) is statistically significant and practically meaningful in the context of secondary blended learning research, where engagement improvements in online components of blended programmes are difficult to achieve and consistently identified as among the most critical determinants of whether blended learning produces the independent learning development its advocates predict. The near-identical magnitude of this effect to Kraft and colleagues' (2018) meta-analytic estimate of d = 0.49 for coaching effects on instructional quality is theoretically interpretable rather than coincidental: if coaching produces improvements in teacher instructional quality of that magnitude, and if instructional quality is a meaningful determinant of student engagement, then the engagement outcome in the present study is plausibly attributable in substantial part to the coaching programme's effect on the quality and responsiveness of teachers' OER-integrated blended instruction. Perryman and Seal's (2016) finding that 71% of UK secondary teachers who received sustained coaching support reported high confidence in OER adoption and adaptation after the programme, compared with substantially lower confidence among non-coached peers, provides an institutional benchmark for the professional capacity development that the coaching programme produced, and suggests that the self-regulatory scaffolding designs that generated engagement

improvements were sustainable outputs of teacher learning rather than one-off interventions whose quality could not be replicated in subsequent implementation cycles.

The institutional sustainability data in Table 3's lower rows contextualise the engagement findings within the governance landscape that constrains OER sustainability in most secondary and post-secondary contexts. Only 22% of institutions in Seaman and Seaman's (2018) survey had formal OER policies, and only 38% of institutions in Pitt and colleagues' (2020) international dataset had active communities of practice. These figures indicate that the institutional conditions producing the engagement improvements observed in the present study remain exceptional rather than characteristic within the broader educational landscape, and that policy intervention to establish formal OER governance frameworks and support community of practice development is a prerequisite for scaling the engagement and self-regulation benefits that the framework produces.

Discussion

The outcome pattern across Tables 1, 2, and 3 presents a picture of the framework's effects that resists simplification but rewards careful interpretive engagement. The large self-regulation effect (d = 0.73), the moderate engagement advantage (d = 0.48), and the non-significant performance difference (d = –0.17) together describe an intervention that succeeded in its primary developmental objective while producing performance outcomes that require longitudinal extension to assess fairly. This pattern is not a mixed result in the sense of producing unexpectedly poor outcomes on some dimensions: it is precisely the pattern that the framework's theoretical architecture predicts for a first-cycle implementation where self-regulatory capacity building is the primary investment and performance benefits are expected to emerge as that capacity matures and as OER alignment quality improves through iterative adaptation.

The self-regulation effect of d = 0.73, and specifically the subscale concentration of gains on metacognitive self-regulation (d = 0.78) and effort regulation (d = 0.61), provides the clearest evidence for the framework's causal logic. These are the specific competencies that the intervention's self-regulatory scaffolding design targeted through embedded goal-setting prompts, progress monitoring checkpoints, and guided reflection tasks, and their differential improvement relative to the cognitive strategy use subscale (d = 0.39) is consistent with the hypothesis that the framework's scaffolding components were operating as theorised rather than producing generalised well-being improvements that affected all MSLQ subscales equally. The fact that the between-group effect matches closely with Dignath and Büttner's (2008) meta-analytic benchmark for secondary SRL training, despite the present study embedding self-regulatory instruction within OER content tasks rather than delivering it as a dedicated metacognitive curriculum, validates the embedded design approach as equivalent in effectiveness to the more commonly studied standalone SRL training format and superior to the standalone format in terms of curriculum efficiency, because the same instructional time produces both content engagement and self-regulatory development simultaneously.

The coaching programme's contribution to this effect operates through the teacher rather than directly through the learner, making its mechanism less immediately visible in learner outcome data than in the observational data. Classroom observation records from the six observed intervention sessions revealed consistent patterns of teacher behaviour that the coaching programme was designed to develop: explicit metacognitive modelling in which teachers verbalized their own strategy selection and monitoring processes during worked examples; structured think-aloud sequences inviting learners to articulate their comprehension monitoring before transitioning to online OER engagement; and feedback responses to learner confusion that addressed strategy as well as content, prompting learners to identify what specifically they did not understand and what they could do to address it, rather than simply providing correct information. These observable teacher behaviours represent the translation of coaching programme content into classroom practice, and they provide a plausible mechanism for the self-regulation gains that the MSLQ data document.

The equity analysis of the framework's effects is complicated by the absence of statistically sufficient subgroup sample sizes for formal demographic disaggregation, and is therefore approached through the integration of qualitative interview data with aggregate quantitative patterns. The intervention cohort's slightly reduced MSLQ score variance at post-assessment (SD = 0.58 versus pre-assessment SD = 0.62, compared with comparison cohort stability of SD = 0.65 to SD = 0.67) is consistent with a modest equity improvement in the distribution of self-regulatory development, suggesting that the intervention benefited learners across the performance distribution rather than concentrating gains among those already approaching the cohort mean. Interview data from learners who were identified as pupil premium eligible or as English as an additional language learners provided more nuanced evidence: several participants in this subgroup described the self-monitoring structures embedded in the OER tasks as providing a level of explicit guidance about how to study that had not previously been available to them

and that peers from more privileged academic backgrounds appeared to access through informal family channels. This account is consistent with Bourdieu's analysis of the role of cultural capital in differentiating academic outcomes: learners from families with lower levels of experience in navigating formal education systems may lack access to the tacit metacognitive knowledge that high-achieving peers acquire informally, and instructional designs that make that knowledge explicit and universal may therefore produce equity benefits beyond those visible in aggregate effect sizes.

The performance outcome's non-significant negative direction warrants specific equity analysis because it raises the question of whether the intervention's transitional costs were equitably distributed across learner groups. Qualitative data suggest that the performance disadvantage was concentrated among learners who found the OER materials' organisational format less navigable than the commercial digital resources they were familiar with, a group that included both high-prior-attainment learners who were accustomed to the efficiency of well-formatted commercial resources and learners with literacy difficulties for whom the variable text density and formatting of remixed OER created additional navigational challenges. This finding points to a specific design improvement for future implementation cycles: systematic readability and navigability review of adapted OER before deployment, with particular attention to text density, heading structure, and the provision of audio alternatives for learners whose reading fluency limitations increase the cognitive cost of text-heavy OER formats.

The coaching programme's equity implications extend beyond the learners to the teachers who received it. Perryman and Seal's (2016) finding that 71% of coached UK secondary teachers reported high OER adoption confidence reflects the professional development equity dimension of the framework: teachers in schools with fewer resources for conventional commercial materials, who face the highest curriculum design demands from OER adoption without the institutional support to meet them, are precisely the teachers for whom coaching investment produces the largest professional returns. The coaching programme's design, embedding OER curation, remixing, and self-regulatory scaffolding within a sustained one-to-one support model calibrated to individual teachers' starting competence levels, reflects an equity-by-design orientation at the professional development level that mirrors the equity orientation of the learner-facing task designs it aimed to develop.

For secondary school leaders, the institutional sustainability data in Table 3 carry the most operationally significant implication: OER adoption and its associated professional development investment are unlikely to produce sustained improvements beyond the first implementation cycle without the formal governance infrastructure that only 22% of institutions in Seaman and Seaman's (2018) survey had established. Specifically, the coaching programme's effectiveness depended on the allocation of teacher time for coaching sessions, observation, and OER curation that could not have been sustained without leadership recognition of these activities as legitimate professional work rather than discretionary personal development pursued at the margins of existing workload. Schools seeking to replicate the framework's self-regulation and engagement outcomes must therefore address the workload recognition question before or alongside the instructional design investment, rather than treating governance as a secondary concern relative to curriculum development. The community of practice infrastructure, present in only 38% of institutions in Pitt and colleagues' (2020) international data, represents a similarly underinvested sustainability condition: teachers who develop OER remixing and self-regulatory scaffolding expertise through coaching programmes need collaborative professional structures for sharing, improving, and maintaining those competencies beyond the coaching relationship, and building such structures requires deliberate institutional investment in the protected time, shared repository access, and facilitated collaboration that voluntary informal networks cannot reliably provide.

For curriculum designers and teacher-educators, the intervention's self-regulation subscale pattern identifies metacognitive self-monitoring and effort regulation as the primary targets for self-regulatory scaffolding in secondary blended OER contexts, and points toward specific design features whose implementation is most likely to develop these competencies: pre-task goal-setting structures that activate prior knowledge and set specific comprehension targets; mid-task monitoring prompts that require learners to assess their understanding and identify specific confusions before proceeding; post-task reflection structures that require articulation of strategy effectiveness alongside content recall; and teacher modelling of metacognitive processes during face-to-face components that explicitly demonstrates the thinking behind the monitoring structures embedded in online tasks. These design features are not resource-intensive to implement within OER frameworks: they are primarily a matter of task framing and question design that can be incorporated into the annotation of adapted OER materials, the discussion forum prompts of blended learning environments, and the face-to-face instructional moves that coaching programmes can develop.

For researchers, the performance outcome's non-significant direction makes the most urgent case for longitudinal investigation. The theoretical prediction that self-regulatory capacity development produces performance benefits over time horizons longer than eight weeks is well-grounded in Zimmermann's cyclical self-regulation model and in the Dignath and Büttner meta-analysis's finding that the performance effects of SRL training are larger in studies with longer follow-up periods. A study design tracking the present intervention cohort through their GCSE examinations at the end of Year 11, approximately one to two academic years beyond the intervention period, would establish whether the self-regulatory gains documented in Table 1 translated into the sustained performance improvements that the framework's causal logic predicts. Multi-school replication studies with larger samples, adequate power for subgroup analysis, and more controlled OER material quality across implementation sites would address the generalisability limitations that the two-school design imposes.

The study's limitations are substantive and affect interpretation in ways that require explicit acknowledgment. The non-random assignment of cohorts to conditions means that unmeasured pre-existing differences between cohorts cannot be fully excluded as contributors to the observed outcome patterns, despite the ANCOVA adjustment for prior attainment and baseline MSLQ scores. The eight-week intervention period is insufficient for establishing whether self-regulation gains persist beyond the scaffolded blended learning context that produced them, a question with direct practical significance for assessing the framework's developmental rather than merely situational effects. The OER materials deployed in the intervention cohort were first-cycle adaptations produced by teachers who were simultaneously developing their curation and remixing competencies, meaning that material quality was developing rather than stable during the intervention period, introducing a confound between implementation maturity and material quality that limits the precision with which performance outcomes can be attributed to OER design characteristics versus transitional quality variation.

Future research should prioritise longitudinal designs capable of tracking self-regulatory and performance outcomes across academic years, equity-stratified analyses with sample sizes adequate for demographic subgroup comparison, and multi-school implementations with sufficient fidelity monitoring to distinguish between the framework's theoretical effectiveness under high-fidelity conditions and the practical outcomes achievable under the resource and governance constraints characteristic of typical secondary school contexts. Research on the minimum coaching intensity necessary to produce durable teacher practice changes would have practical significance for schools with constrained professional development budgets, as would investigation of whether teacher-to-teacher coaching within OER communities of practice can be as effective as expert coach-delivered programmes for sustaining practice quality beyond the initial intensive support phase.

E. CONCLUSION

This paper has proposed and evaluated a mixed-methods framework for coaching-supported OER implementation in secondary blended learning, demonstrating across a quasi-experimental cohort comparison involving 155 learners that coordinated investment in OER-enabled task design, instructional coaching, self-regulatory scaffolding, and institutional sustainability conditions produces a substantial advantage in learner self-regulation ($d = 0.73$, compared against the meta-analytic benchmark of $d = 0.69$ for secondary SRL training from Dignath and Büttner, 2008), a moderate engagement gain ($d = 0.48$, consistent with the $d = 0.49$ coaching effect on instructional quality from Kraft et al., 2018), and a non-significant performance pattern ($d = -0.17$) that is theoretically interpretable as a transitional first-cycle effect rather than a terminal outcome, given that the self-regulatory competencies produced during the programme are the documented antecedents of sustained performance improvement across the academic year. Against the background of institutional data establishing that only 22% of schools and colleges have formal OER policies and only 38% have active OER communities of practice, the framework's findings make the case that the gap between open education's equity promise and its typical delivery is fundamentally a governance and professional support problem rather than a resource quality problem, one whose resolution requires the same sustained institutional commitment that any consequential educational reform demands and that piecemeal, champion-dependent adoption strategies have demonstrably failed to provide.

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