*International Journal of Learning, Teaching and Educational Research*
*Vol. 24, No. 7, pp. 183-211, July 2025*
*https://doi.org/10.26803/ijlter.24.7.10*
*Received May 17, 2025; Revised Jun 18, 2025; Accepted Jul 1, 2025*

# Integrating Deliverology and Implementation Science to Strengthen Grade 12 Mathematics Curriculum Delivery in Community Learning Centres: Literature Review

**Carlit Casey Tibane*, Olivia Neo Mafa-Theledi, Tshediso Phanuel Masebe and Peter Mathye**
Department, Mathematics, Science & Business Education
School of Education,
Tshwane University of Technology, South Africa

**Abstract.** Community Learning Centers (CLCs**)** in South Africa often grapple with systemic barriers such as inadequate resources, heterogeneous student profiles, and uneven teacher competencies, which impede effective curriculum implementation. This study therefore presents a literature review and conceptual analysis aimed at evaluating how the integration of Deliverology and Implementation Science frameworks can strengthen the delivery of the Grade 12 Mathematics curriculum in Community Learning Centres (CLCs). This review identifies key strengths and limitations of each framework through the critical synthesis of 72 peer-reviewed sources. Deliverology offers a structured approach centred on goal clarity, performance measurement, and accountability, making it effective for aligning educational stakeholders and driving measurable outcomes. However, it tends to lack the flexibility needed for diverse and under-resourced environments. Conversely, Implementation Science emphasizes evidence-based adaptation, stakeholder collaboration, and long-term sustainability, allowing for responsive and inclusive practice. Its application can be complex and resource-intensive, often requiring specialized expertise and infrastructure. The analysis highlights that a synergistic integration of both frameworks can overcome their individual limitations. Deliverology's structured monitoring and accountability mechanisms can be enhanced by Implementation Science's capacity for contextual adaptation and continuous learning. This integrated approach is practically relevant for educational leaders and policymakers aiming to improve curriculum delivery in CLCs. Policymakers for instance, can use Deliverology to set and track performance targets, while employing Implementation Science to tailor interventions to local contexts and strengthen teacher support systems. The study positions the hybrid model as a practical and scalable solution

*Corresponding author: Carlit Casey Tibane; *caseyct.tibane@gmail.com*

for strengthening curriculum implementation in complex educational settings. Its dual emphasis on accountability and contextual adaptation offers concrete pathways for policymakers and practitioners to design reforms that are both data-driven and attuned to the lived realities of marginalised learning communities.

**Keywords:** deliverology; implementation science; educational policy; stakeholder engagement; mathematics; community learning centres; curriculum implementation

## 1. Introduction

The successful implementation of educational curricula remains a cornerstone of quality education, particularly in settings marked by resource scarcity, structural complexity, and student heterogeneity. In South Africa, Community Learning Centres (CLCs) were established to provide second-chance learning and post-school education opportunities. These institutions play a vital role in expanding educational access to youth and adults who have been underserved by the mainstream schooling system. Despite this mandate, CLCs frequently experience systemic barriers that impede the effective delivery of critical academic content, notably the Grade 12 Mathematics curriculum.

These barriers include inadequate infrastructure, outdated teaching materials, insufficient professional development, and inconsistent teaching capacity. These factors are compounded by the diverse socio-economic, linguistic, and cognitive profiles of students, many of whom require differentiated and sustained pedagogical support (Mginywa, 2021; Belete et al., 2022).

The ability to deliver the Grade 12 Mathematics curriculum effectively is not merely a technical concern but a strategic imperative for the country's broader educational, economic, and developmental goals. Mathematics serves as a gateway subject to higher education, technical professions, and numeracy-based employment opportunities. Yet, in many CLCs, curriculum coverage is fragmented, student performance remains low, and teacher efficacy is undermined by insufficient support mechanisms.

These challenges persist despite ongoing national reforms aimed at transforming the post-school education and training system, including the White Paper for Post-School Education and Training (DHET, 2013) and the National Development Plan (NDP) 2030, which emphasize improved quality, inclusive access, and systemic accountability.

In response to these challenges, this study proposes the integration of two complementary frameworks: Deliverology and Implementation Science as a basis for improving curriculum implementation in CLCs. Deliverology, conceptualized by Barber et al. (2011), is a results-driven performance framework initially applied to public service delivery. It offers a disciplined top-down approach, emphasizing clear goal setting, continuous progress monitoring, and structured accountability. In contrary, Implementation Science

is rooted in health and social sciences and focuses on the systematic, evidence-informed integration of innovations into real-world settings (Haines et al., 2021). It emphasizes adaptability, stakeholder involvement, and iterative learning, which are critical principles in educational settings characterized by variability and complexity. The synergy between these two frameworks holds considerable promise. While Deliverology ensures coherence, structure, and measurable impact, Implementation Science promotes responsiveness to local conditions, sustainability, and equity. Together, they offer a multi-dimensional lens through which curriculum implementation can be examined, refined, and scaled; particularly in marginalised contexts where traditional reform efforts have had limited success. This study applies these frameworks to the implementation of the Grade 12 Mathematics curriculum in CLCs, aiming to contribute both theoretically to educational implementation discourse and practically to reform strategies in the South African context.

### 1.1 Problem Statement

Community Learning Centres (CLCs) in South Africa faced persistent challenges in implementing the Grade 12 Mathematics curriculum effectively. These included limited physical and digital resources, inconsistent teacher expertise, and diverse student profiles requiring differentiated instruction. Collectively, these factors contributed to poor student outcomes and reinforced existing educational inequalities. Although national policies such as the White Paper for Post-School Education and Training (2013) advocated for the strengthening of CLCs, their implementation often lacked coherence, contextual sensitivity, and effective monitoring systems.

As a result, the gap between policy intention and classroom practice remained unresolved. This study investigated whether the integration of Deliverology and Implementation Science frameworks could address this implementation gap by combining structured oversight with adaptable, evidence-based strategies. The aim was to propose a practical and scalable framework for enhancing curriculum delivery in CLCs and similar under-resourced educational settings.

### 1.2 Research Objective

This conceptual study aimed to explore how integrating Deliverology and Implementation Science frameworks could strengthen the implementation of the Grade 12 Mathematics curriculum in CLCs, by addressing key challenges such as limited resources, varying teacher competencies, and diverse student needs. The objective was to develop a theoretically grounded and practically applicable model that offers strategic insights for improving curriculum delivery, supporting educational equity, and guiding policymakers and practitioners in under-resourced settings.

## 2. Literature Review

### 2.1 Conceptual Foundations of Deliverology

Deliverology, developed by Barber, et, al., (2011), is a performance management framework intended to enhance efficiency and outcomes in public sector organizations, particularly in education. It advocates for the use of dedicated

delivery units, goal-setting, and rigorous monitoring systems to ensure implementation fidelity and measurable results. The framework has been applied in a variety of educational systems globally and is praised for bringing structure, focus, and accountability into education delivery processes. However, critics such as Schacter (2016) and Behn (2017) argue that Deliverology can reduce education to a set of quantifiable metrics, potentially neglecting qualitative aspects such as student well-being and pedagogical innovation.

Behn (2017), for instance, challenges the scientific rigor of Deliverology, arguing that it tends to oversimplify the relationship between managerial actions and learning outcomes. Nordstrum, LeMahieu, and Dodd (2017) present a more balanced view by showing its effective application in Kentucky's Department of Education, where Deliverology was integrated with continuous improvement processes. Their case illustrates that the framework's effectiveness is heightened when used flexibly in response to specific local contexts. This suggests that the utility of Deliverology depends not only on its design but also on its adaptability and integration with other practices.

**2.2 Critical Evaluation of Existing Applications**

Deliverology's emphasis on standardization and accountability has drawn attention for both its benefits and drawbacks. In contexts like the United Kingdom (UK), Ball et al. (2012) argue that the rigid focus on standardized tests and key performance indicators narrows curricular goals and can result in pressure on teachers to teach to the test. This concern is echoed by Cheeseman (2022), who warns that innovation and exploratory pedagogies are often side-lined in pursuit of numerical targets. Such critiques are especially relevant to Grade 12 Mathematics in CLCs, where student diversity and foundational knowledge gaps demand instructional flexibility.

Tampio (2015) raises concerns about Deliverology's commercialization, highlighting the influence of corporate actors like Pearson, in shaping educational reforms. He argues that these profit-oriented engagements risk diverting the purpose of public education from equity and access to profitability and accountability. Furthermore, the methodological robustness of Deliverology has been questioned. Schacter (2016) and Behn (2017) highlight that despite its popularity, there is insufficient empirical validation of its outcomes across varied educational systems. Mouton (2021) and Gewirtz et al. (2021) add that Deliverology may conflict with educational values that prioritize student development over numeric indicators. These limitations suggest that its success is highly context-dependent and that its implementation must be localized to address socio-educational realities effectively.

**2.3 Structural Components of the Deliverology Framework**

According to Barber et al. (2011), Deliverology includes six interlinked components: Vision and Goals, Planning and Target Setting, Implementation, Monitoring and Evaluation, Adaptation and Scaling, and Results and Impact. These components create a cyclical process where continuous feedback informs iterative adjustments. The framework's structure (**see Figure 1**) reflects a

managerial logic of performance loops meant to sustain improvement in policy execution.

### 2.4 Vision and Goals

The first step in Deliverology is setting a clear vision and defining specific goals. Barber et al. (2011) emphasize the importance of aligning stakeholder efforts with well-defined educational aims. Gazeley (2013) supports this claim by noting that without a unified vision, reform initiatives often become fragmented and ineffective. In CLCs where contextual variability is high, establishing shared goals becomes essential to navigate the complexity of student diversity and limited resources (see Figure 1) components of Deliverology framework.

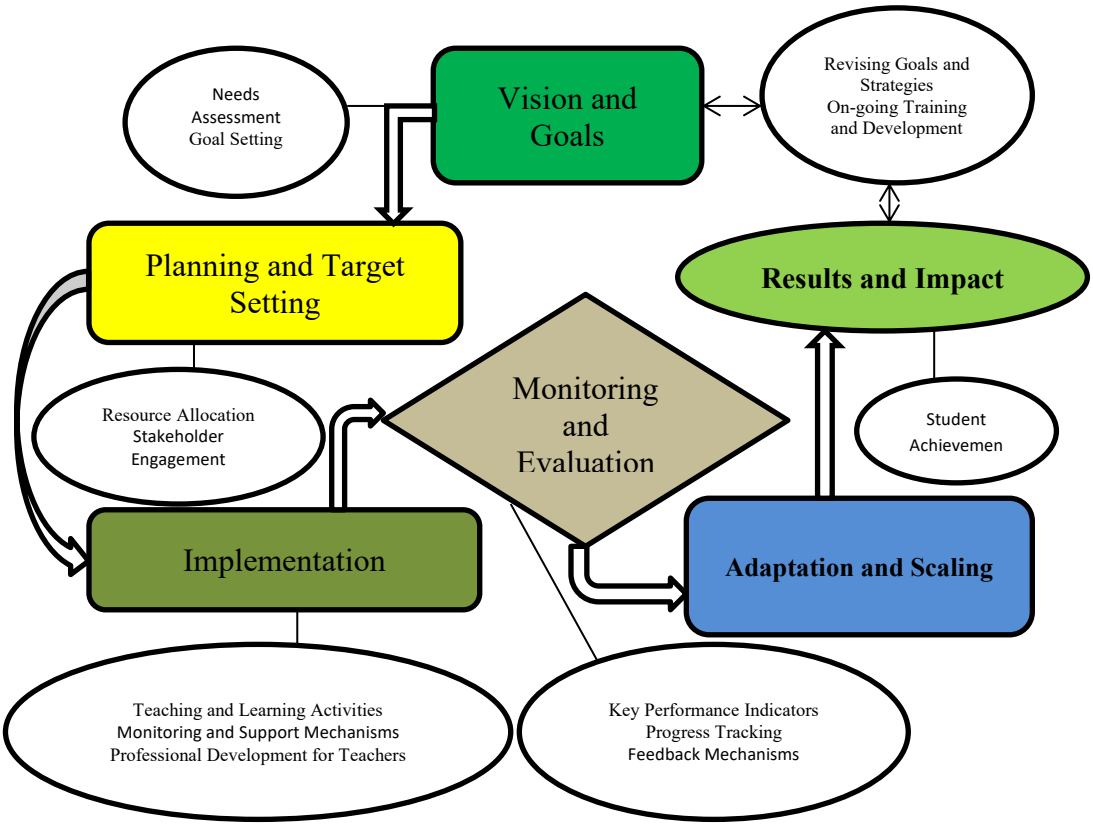


**Figure 1: key components of deliverology framework**

### 2.5 Planning and Target Setting

Once the vision is established, Deliverology calls for detailed planning and measurable targets. Barber et al. (2011) recommend integrating accountability mechanisms and stakeholder roles early in the planning phase. Wongwanich et al. (2015) stress the value of stakeholder involvement to ensure realistic and context-sensitive strategies. McKay (2018) and Cheeseman (2022) further note that planning must be adaptive to shifting educational environments, particularly in CLCs, where logistical and demographic uncertainties are frequent.

**2.6 Implementation**

The implementation phase involves translating plans into actions. Geng et al. (2023) emphasize that successful implementation must allow flexibility to respond to real-time challenges. Ball et al. (2012) highlight how pressure to meet performance targets can hinder effective implementation. Mouton (2021) showed that Deliverology when applied in South Africa's Western Cape Government, benefitted from iterative assessments and revisions. Cheeseman (2022) adds that teacher learning communities can enhance implementation by reinforcing new instructional methods. These findings reinforce the need for both structure and adaptability during this phase.

**2.7 Monitoring and Evaluation**

Monitoring and Evaluation (M&E) are crucial to ensuring that reforms remain on course. Barber et al. (2011) recommend KPIs and data systems for real-time tracking. Schacter (2016) points out that M&E processes also serve accountability purposes. Mouton (2021) documents their importance in South African reforms. However, Gewirtz et al. (2021) warn that an overemphasis on quantifiable outputs may lead to unintended distortions in educational priorities. A balanced M&E system that includes both quantitative and qualitative indicators is particularly relevant in CLCs where holistic student development is a priority.

**2.8 Adaptation and Scaling**

Adaptation involves refining practices based on feedback, while scaling involves expanding successful interventions. Barber et al. (2011) argue that scaling must be grounded in local realities. Ball et al. (2012) and Tampio (2015) highlight how rigid standardization may encounter resistance when applied in diverse environments. Mouton (2021) and Gewirtz et al. (2021) emphasize the need for culturally responsive scaling processes. Auld and Morris (2023) insist on the value of engaging local actors to maintain legitimacy and relevance. In the CLC context, both adaptation and scaling are crucial for sustainability and equity.

**2.9 Results and Impact**

The goal of Deliverology is to deliver measurable improvements in education systems. Wongwanich et al. (2015) advocate for outcome-focused evaluation while Mouton (2021) stresses the importance of system-wide reforms. Gewirtz et al. (2021) and Auld and Morris (2023) caution against equating impact solely with numerical data. For CLCs, especially in Grade 12 Mathematics, a dual focus on academic achievement and student empowerment is necessary to ensure meaningful results and impact.

**2.10 Research Gaps**

Although Deliverology has been widely studied, a significant gap exists in its application to CLCs, particularly for Grade 12 Mathematics curriculum. Most studies (e.g., Cheeseman, 2022; Schacter, 2016) focus on mainstream education systems and overlook the unique challenges of CLCs, such as inconsistent teacher competencies and student diversity. There is also a lack of research on its adaptability to resource-constrained environments (Behn, 2017; Schacter, 2016) and its integration with context-sensitive frameworks like Implementation Science. Studies by Gazeley (2013) and Nordstrum et al. (2017) suggest that

Deliverology's principles need contextual tailoring to be effective. In esences, balancing its quantitative focus with qualitative educational goals remains underexplored, especially in spaces like CLCs that serve marginalized students (Tampio, 2015). Addressing these gaps provides the rationale for this study's focus on integrating Deliverology with Implementation Science to strengthen curriculum implementation in CLCs, with an emphasis on Grade 12 Mathematics.

## 3. Implementation Science

### 3.1 The Evolution of Implementation Science (2011-2024)

Implementation Science has evolved into a key field that bridges the gap between research and practice across healthcare, education, and public health. This literature review examines major developments from 2011 to 2024, highlighting the transformation of frameworks and methodologies with an increasing focus on contextual adaptation, equity, and interdisciplinary collaboration. As the field matured, Implementation Science became more grounded in real-world systems, focusing not only on the fidelity of research-based practices but also on sustainability, cultural relevance, and scalability.

### 3.2 Early Developments and Foundational Contributions (2011–2014)

Sorensen and Kosten (2011) introduced structured models like the Consolidated Framework for Implementation Research (CFIR) to guide evidence-based practice, especially in complex healthcare settings. These studies highlighted the balance between leadership-driven strategies and grassroots staff engagement, emphasizing that successful implementation requires multi-level participation.

Concurrently, Thornicroft, Lempp, and Tansella (2011) advanced the role of implementation science in translational medicine, emphasizing patient and public participation. Their advocacy for democratic engagement in clinical decision-making signaled a pivotal departure from purely expert-driven models. Mitchell (2013) extended the conversation to social services, underlining the difficulty of integrating formal evidence with practice wisdom, particularly when addressing complex needs among vulnerable youth populations. This period emphasized the contextual grounding of implementation frameworks and recognized the importance of incorporating practitioner insight.

### 3.3 Methodological and Contextual Expansion (2015–2017)

From 2015 to 2017, Implementation Science broadened in scope. Padian et al. (2015) applied the field to global health through large-scale initiatives like PEPFAR, drawing attention to barriers in low-resource environments, such as infrastructure limitations and cultural misalignments. Their work underscored the importance of locally embedded implementation models. The need for flexible and context-sensitive approaches became increasingly apparent as the field moved beyond its initial healthcare roots.

Moir (2016) introduced these insights into educational contexts, calling for adaptable implementation models that consider staff engagement, material resources, and local culture. This application to education reflected a growing

recognition that complex environments such as schools require holistic planning, cross-sector alignment, and clear pathways for sustainability. Moir's work also contributed to a shift in discourse, placing teachers and students at the center of implementation analysis.

**3.4 Interdisciplinary Integration and Theoretical Refinement (2018–2020)**
Between 2018 and 2020, there was a clear movement toward integrating Implementation Science with disciplines such as epidemiology and public health. Rapport et al. (2018) discussed ongoing challenges in healthcare translation, advocating for theory-driven strategies and warning against simplistic or linear implementation pathways. Their focus on foundational theory emphasized the need for rigorous planning to bridge the gap between intervention design and real-world application. Neta, Brownson, and Chambers (2018) emphasized Implementation Science's potential in public health, calling for stronger integration into epidemiological practice. This represented an expansion of the field's application beyond intervention settings to systems-level thinking.

Nilsen and Bernhardsson (2019) reviewed determinant frameworks, exposing inconsistencies in the definition of "context." They identified a key theoretical gap in how frameworks conceptualize context, highlighting the risks of ignoring socio-political, economic, and cultural dynamics in implementation processes. Their critique called for a rethinking of how implementation environments are mapped and engaged.

**3.5 Equity, Adaptation, and New Paradigms (2020–2024)**
From 2020, the field shifted towards equity and context-specific implementation. Baumann et al. (2023) and Shelton and Brownson (2024) stressed that without equity-focused strategies, implementation could reinforce disparities. They advocated for embedding equity across all phases of implementation to address systemic health inequities, emphasizing that marginalized populations must be considered in both design and delivery. Leeman et al. (2021) introduced the significance of mental models and how stakeholders perceive implementation efforts as a critical factor. Their work emphasized the cognitive framing and expectations that shape implementation outcomes, reinforcing the need to engage stakeholders early and meaningfully.

Sarkies et al. (2022) expanded the scope through realist research paradigms that explain outcomes as the product of interactions between context and mechanisms. Their model of conditional causality strengthened the understanding of how and why interventions succeed or fail across settings. Schultes et al. (2021) and Chen et al. (2023) emphasized competency-based education in health professions, underscoring the importance of team collaboration, faculty development, and rigorous implementation strategies.

These studies moved the focus towards education-specific implementation models while noting the importance of competence profiling and structured support. However, the authors noted a need for greater transparency and

methodological rigour, given that persistent inconsistencies in research design and underlying biases continued to challenge replicability

### 3.6 Persistent Gaps and Challenges in Curriculum Implementation

Despite notable advances, gaps remain, particularly in education systems like South Africa's CLCs. While the broader literature promotes context and equity, these considerations are not sufficiently applied in CLCs. Grade 12 Mathematics curriculum implementation often lacks tailored strategies to accommodate resource shortages, student diversity, and socio-economic disparities.

Implementation often defaults to uniform models without accounting for the varied contexts in which students operate. As a result, these implementation efforts may unintentionally perpetuate inequalities. Generic rollout models that ignore systemic barriers and/or local nuances are unlikely to yield sustainable improvements. There is a pressing need to apply Implementation Science principles with a sharper focus on cultural relevance and inclusive practice.

This involves mapping localized determinants, aligning with existing infrastructure, and ensuring ongoing stakeholder feedback. Context-sensitive adaptation and stakeholder collaboration are essential for reforms that meet the needs of CLC students and support academic success across diverse populations. Without this, interventions may be technically robust yet fail to align with the social context in which they are implemented?

### 3.7 Operationalizing Implementation Science in CLCs

Figure 2 illustrates how the principles of Implementation Science can guide curriculum reform in mathematics for Grade 12 students in CLCs.

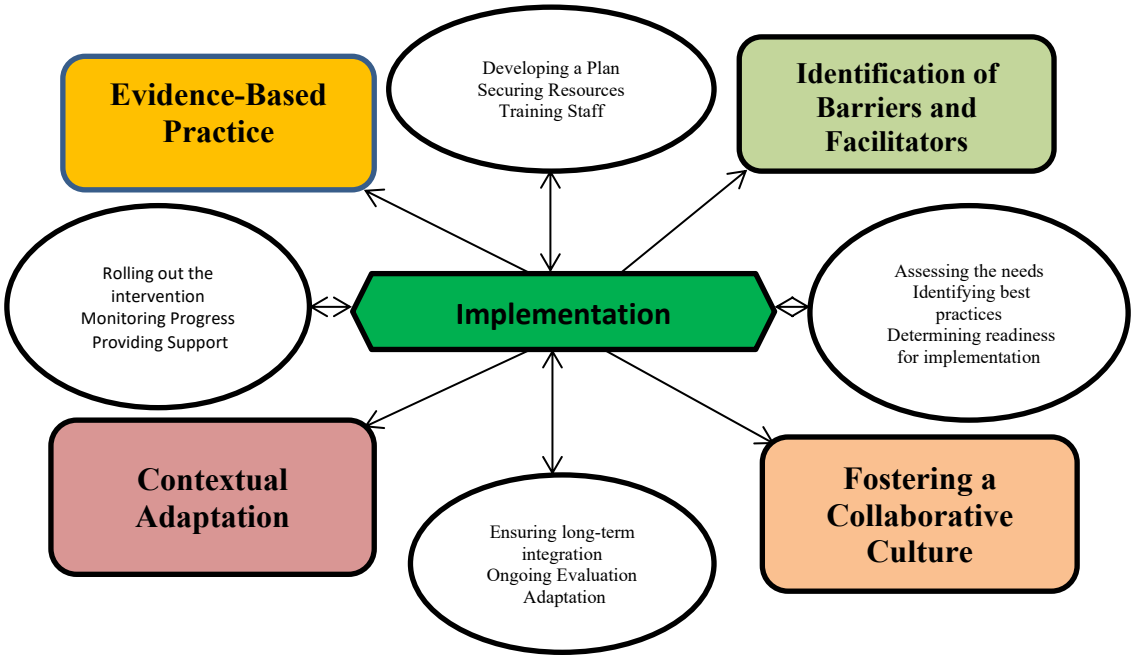


**Figure 2: Conceptual Diagram of Implementation Science**

A structured, context-aware approach ensures integration of evidence-based strategies and continuous feedback. Applying this model requires a diagnostic of contextual variables, alignment of intervention components, and iterative refinement based on stakeholder input.

**3.8 Evidence-Based Practice in Mathematics Curriculum**

Implementation begins with selecting effective teaching methods, such as problem-based learning, digital tools, and differentiated instruction (Moore et al., 2024). These practices require support systems: instructional resources, professional development, and teacher readiness (Sims & Fletcher-Wood, 2021). Effective use of these strategies depends not only on technical training but also on fostering pedagogical shifts that accommodate diverse student needs. A structured plan incorporating these methods improves the foundation for student achievement and prepares teachers to respond to emerging challenges in mathematics instruction.

**3.9 Identification of Barriers and Facilitators**

Successful implementation requires recognizing both constraints and enablers. Challenges may include technological limitations, teacher resistance, and uneven student preparedness (Rabin et al., 2018). These issues are often systemic and compounded by a lack of policy coherence and support infrastructure. Facilitators like leadership, ongoing training, and an innovation-driven culture can strengthen implementation (Powell et al., 2017). Mapping these factors systematically ensures that implementation plans are proactive rather than reactive. An early diagnostic of these factors is vital, as it enables education leaders to allocate resources and support strategically.

**3.10 Fostering Collaborative Culture**

Inclusive participation among teachers, administrators, students, and parents improves implementation outcomes. As noted by Wright, Ritter & Wisse Gonzales (2022) and Azorín & Fullan (2022), collaboration involves shared planning and open communication. Building a collaborative culture also enhances trust, which is foundational to buy-in and sustainability. Engagement enhances commitment, trust, and practical input. Teachers' insights can shape curriculum design (Waltz et al., 2019), while parents and students bring lived perspectives that guide relevance. Such participation transforms implementation from a top-down directive to a community-driven process.

**3.11 Contextual Adaptation of the Curriculum**

No curriculum implementation succeeds without adaptation to local contexts (Glasgow & Estabrooks, 2018). Schools differ not only by geography but also by language, infrastructure, and instructional culture. Diverse schools—linguistically, geographically, or socio-economically, require customized strategies (Wiltsey Stirman et al., 2015). This involves flexible deployment, ongoing monitoring, and iterative support (Riley et al., 2021), with continuous stakeholder feedback driving responsive modifications. In practical terms, contextual adaptation might mean translating materials, adjusting pacing guides, or tailoring assessment methods.

### 3.12 Ensuring Long-Term Integration

Sustained success requires institutionalizing the curriculum into school systems. This means moving beyond pilot initiatives and embedding changes into the daily fabric of instructional planning. Regular evaluation, feedback loops, and capacity building ensure relevance over time (Nilsen & Bernhardsson, 2019). As Proctor et al. (2015) and Hays & Reinders (2020) argue, structures such as professional learning communities and periodic curriculum reviews are vital. These systems support reflective practice and iterative adjustment. Embedding these practices into school routines ensures that students consistently benefit from quality mathematics education (Birken et al., 2017). Long-term integration also requires strong leadership, data literacy among teachers, and policy coherence at all levels of the education system.

### 3.13 Incorporating Deliverology and Implementation Science

Figure 3, below illustrates the overlap between Deliverology and Implementation Science, highlighting several key areas where the two fields intersect. Both frameworks emphasize the importance of clear goal setting and vision alignment to guide implementation efforts (Barber, Kihn, & Moffit, 2011; Proctor et al., 2015). They rely on data-driven monitoring and evaluation to track progress and make necessary adjustments, ensuring that initiatives stay on course (Behn, 2017; Damschroder et al., 2009). Adaptability is another shared focus, with both frameworks advocating for the modification of strategies to fit different contexts and the scalability of successful interventions (Mouton, 2021; Riley et al., 2021).

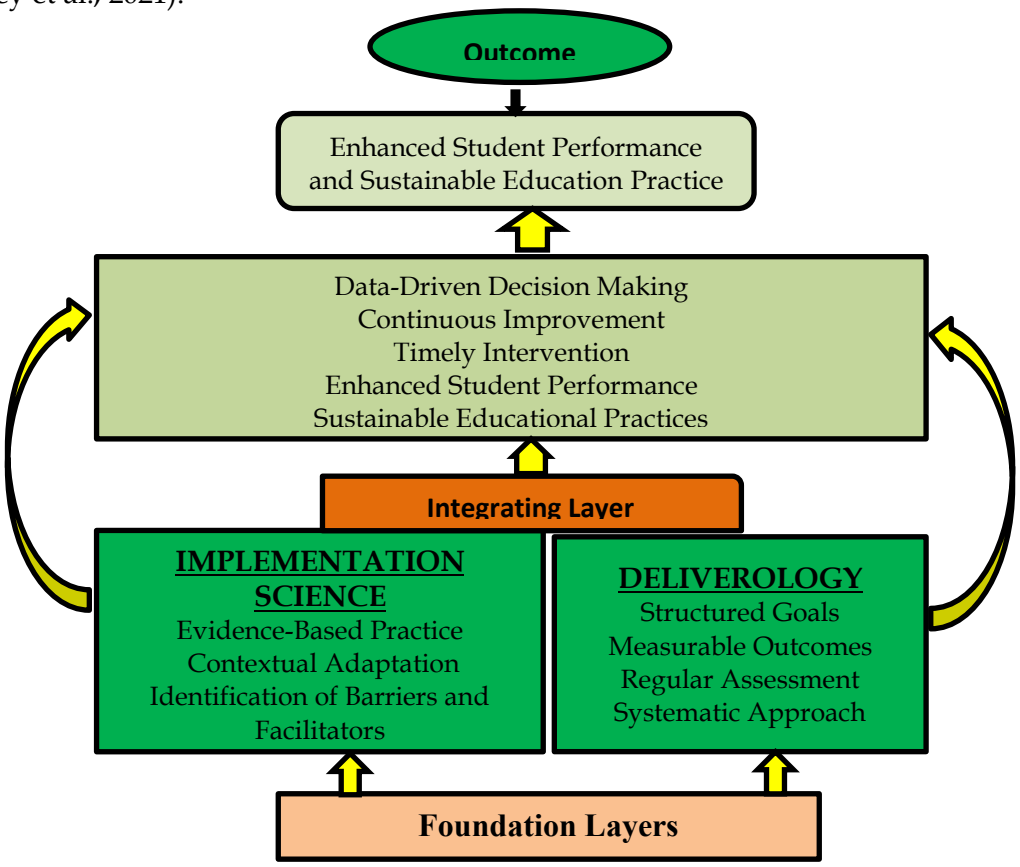


**Figure 3: Deliverology and implementation science model**

Stakeholder engagement and collaboration are also central, as both frameworks stress the need for involving all relevant parties to ensure buy-in and sustained success (Wright, Ritter, & Wisse Gonzales, 2022; Waltz et al., 2019). Finally, both Deliverology and Implementation Science commit to continuous improvement through iterative processes, balancing quantitative outcomes with qualitative insights, to ensure a comprehensive approach to implementation (Schacter, 2016; Nilsen & Bernhardsson, 2019). Integrating these frameworks can strengthen the effectiveness of educational interventions, particularly in challenging environments such as CLCs.

The integration of Deliverology and Implementation Science into a cohesive framework for educational reform, as depicted in the diagram, represents a strategic adaptation that capitalizes on the strengths of both approaches. Deliverology provides a structured foundation with its emphasis on setting clear, measurable goals, ensuring regular assessment, and maintaining a systematic approach to achieving these objectives (Barber, Kihn, & Moffit, 2011).

This structure is essential for establishing a focused direction in educational settings, particularly where clarity of purpose and accountability are critical. On the other hand, Implementation Science brings to the table an evidence-based approach that is adaptable to various contexts. It emphasizes the importance of understanding and addressing the specific barriers and facilitators within each educational environment, while fostering a collaborative culture among stakeholders (Powell et al., 2017; Damschroder et al., 2022).

The integration of these foundational elements ensures that the strategies employed are not only clear and goal-oriented but also grounded in research and responsive to the unique challenges of each educational setting. At the heart of the integration lies the middle layer, which focuses on processes that drive the implementation of educational reforms. Data-driven decision-making is a key component, ensuring that every step in the process is informed by real-time data, allowing for timely adjustments and refinements (Barber et al., 2011). This continuous improvement process, which is central to both frameworks, enables educational systems to remain dynamic and responsive to the evolving needs of students and teachers.

Moreover, the focus on timely intervention is crucial in preventing small issues from escalating into major obstacles, thereby maintaining the momentum of reform efforts (Schacter, 2016; Gewirtz et al., 2021). By aligning these processes, the integrated framework ensures that both short-term gains in student performance and long-term sustainability of educational practices are achieved. The ultimate goal of this integrated framework, as highlighted in the outcome layer of the diagram, is to enhance student performance and ensure sustainable educational practices.

This dual focus is achieved by leveraging the complementary strengths of Deliverology and Implementation Science. Deliverology's emphasis on achieving specific, measurable outcomes is balanced by Implementation

Science's focus on context and adaptability, ensuring that reforms are not only effective but also sustainable in the long term (Rabin et al., 2018; Powell et al., 2017). This comprehensive approach addresses both the "what" and the "how" of educational reform, making it particularly well-suited for challenging environments like CLCs, where resource limitations and diverse student needs require both structured strategies and flexible implementation (Geng, Mody, & Powell, 2023; Auld & Morris, 2023). In the context of this study, the adaptation of Deliverology and Implementation Science into a unified framework for educational reform, as depicted in the diagram, provides a powerful tool for enhancing educational outcomes.

By integrating structured goal setting with evidence-based, context-sensitive practices, this approach ensures that educational reforms are both effective and sustainable. The framework's focus on data-driven decision-making, continuous improvement, and timely intervention further strengthens its capacity to drive meaningful change in educational settings, ultimately leading to improved student performance and more resilient educational systems (Barber et al., 2011; Powell et al., 2017; Damschroder et al., 2022).

## 4. Methodology

This study adopted a qualitative research design, combining a systematic literature review with a conceptual analysis to explore how the integration of Deliverology and Implementation Science frameworks could strengthen the implementation of the Grade 12 Mathematics curriculum in CLCs. Qualitative research is well-suited for exploring complex, context-bound phenomena and allows for the interpretation of social systems through theoretical constructs (Tisdell, et., al., 2025). Given that the study sought to develop a conceptual framework rather than test hypotheses or generalize statistical data, a non-empirical, theory-driven design was appropriate (Chukwuedo, et, al., 2021; Tedre & Pajunen, 2022).

### 4.1 Research Design and Rationale

The primary goal of this study was to develop a theoretically grounded and practically relevant model to improve curriculum delivery in CLCs. The design involved interrogating existing theoretical models of Deliverology and Implementation Science; and synthesizing them to address systemic educational challenges. Deliverology, as conceptualized by Barber, et, al., (2011), provides a structured method for ensuring service delivery through goal setting, monitoring, and accountability. Implementation Science, meanwhile, supports the uptake of evidence-based practices in real-world settings, emphasizing adaptability, fidelity, and sustainability (Wang, et, al., 2023; Berk, et, al., 2024). The combination of these models was examined through a conceptual lens informed by grounded theory and implementation evaluation logic.

### 4.2 Literature Search and Source Selection

A systematic literature review was conducted using key databases: Google Scholar, JSTOR, ERIC, Scopus, and SpringerLink. The review focused on publications from 2011 to 2024, aligning with the post-publication impact of

Barber et al. (2011) on public sector management and the rise of Implementation Science in educational reform discourse (Viennet & Pont, 2017; Berk, et, al., 2024). Search terms included combinations such as "Deliverology in education", "Implementation Science curriculum reform", "curriculum implementation in low-resource contexts", and "teacher capacity and educational delivery".

The inclusion criteria required that studies be (1) peer-reviewed, (2) written in English, (3) directly related to the application of Deliverology and/or Implementation Science in education, and (4) focused on implementation challenges in under-resourced or reforming education systems. Exclusion criteria included studies lacking methodological detail, those unrelated to education, or publications that were purely theoretical without applied relevance. After abstract screening and full-text review, 72 sources were selected for in-depth analysis.

**4.3 Analytical Procedures**

The literature was analyzed using a thematic analysis framework as outlined by Braun and Clarke (2006). This involved three key stages. First, open coding was used to extract core concepts related to both frameworks, such as target-setting, fidelity, stakeholder collaboration, sustainability, and adaptive leadership. Second, axial coding facilitated a comparison between the frameworks' approaches to curriculum implementation, enabling the identification of areas where Deliverology's structured accountability could complement the flexible, evidence-informed practices of Implementation Science (Viennet & Pont, 2017; Berk, et, al., 2024). Third, the results were synthesized into a proposed integration model, articulating how the two frameworks could address key barriers in CLCs: inadequate infrastructure, inconsistent teaching quality, and student diversity. Manual coding was used for reliability, with constant comparison and memoing applied to ensure coherence and thematic saturation (Keane, 2022; Ando, et, al., 2014).

**4.4 Ensuring Validity and Reliability**

To enhance validity, the study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2010; Panic, et, al., 2013; O'Dea, et, al., 2021), ensuring a transparent search and selection process. Triangulation across multiple sources and disciplines (education, implementation science, public administration) ensured that themes were not overly reliant on a single perspective (Donkoh & Mensah, 2023). A reference log, coding matrix, and audit trail were maintained throughout the analysis. Reliability was ensured by using consistent thematic codes and reviewing findings in multiple rounds. Although software like NVivo was not employed, the structured use of manual content analysis tools and qualitative memoing enabled rigorous cross-checking and reflection, aligning with best practices in non-empirical educational research (Moher et al., 2010; Panic, et, al., 2013; O'Dea, et, al., 2021).

**4.5 Ethical Considerations**

This study did not involve human participants or personal data. However, academic ethics were strictly observed through proper citation, avoidance of

plagiarism, and accurate representation of authors' arguments. All sources were drawn from publicly available and credible academic repositories.

**4.6 Limitations and Mitigation Strategies**

A primary limitation of the study was its reliance on secondary data. t This limited empirical generalizability was mitigated by the use of a broad and peer-reviewed evidence base, spanning international and local literature. Another limitation was that the conceptual model was not field-tested; future studies could pilot the integrated framework in actual CLC settings to assess its applicability and impact. Nonetheless, the methodology employed allows for transferable insights and offers a foundational platform for further empirical investigation.

**4.7 Findings**

The findings from the literature review and conceptual analysis highlight the strengths and limitations of each framework when applied independently and the potential benefits of their integration. This section delineates the key findings related to the application of both frameworks, focusing on aspects such as goal setting, planning, implementation processes, monitoring and evaluation, contextual adaptation, stakeholder engagement, and sustainability of educational reforms within CLCs. The table (**see Table 1**) compares the effectiveness of the Deliverology and Implementation Science frameworks in the context of implementing the Grade 12 Mathematics curriculum in CLCs.

Deliverology is highlighted for its strengths in goal setting, structured planning, and rigorous monitoring, which drives accountability and focus on measurable outcomes (Barber et al., 2011; Wongwanich et al., 2015; Schacter, 2016). However, it faces challenges in contextual adaptation and may inadvertently narrow the educational focus (Auld & Morris, 2023; Gewirtz et al., 2021; Ball et al., 2012). Implementation Science, on the other hand, emphasizes contextual adaptation, barrier mitigation, and inclusive practices, offering flexibility and a focus on equity (Damschroder et al., 2022; Powell et al., 2017; Shelton & Brownson, 2024).

Its challenges include complexity and the potential lack of clear performance metrics (Nilsen & Bernhardsson, 2019; Proctor et al., 2015). The integration of both frameworks is proposed as a balanced approach, combining Deliverology's structured processes with Implementation Science's adaptability, enhancing stakeholder engagement, resource allocation, and the balance between quantitative and qualitative outcomes for sustainable curriculum implementation in CLCs (Geng, Mody, & Powell, 2023; Riley et al., 2021; Glasgow & Estabrooks, 2018).

**Table 1: The effectiveness of the Deliverology and Implementation Science frameworks**

| **Effectiveness of Deliverology Framework in CLCs** | |
|---|---|
| **Strengths in Goal Setting and Clarity of Vision** | *Deliverology excels in establishing clear, measurable goals and a focused vision, which are critical for driving educational reforms in CLCs. The framework's emphasis on specificity and accountability aids in aligning all stakeholders towards common objectives, ensuring that efforts are concentrated on improving student outcomes in Grade 12 Mathematics (Barber et al., 2011). This clarity helps in overcoming ambiguities often associated with curriculum implementation in diverse and resource-constrained environments like CLCs.* |
| **Structured Planning and Target Setting** | *The structured approach of Deliverology facilitates detailed planning and precise target setting, which are essential for effective curriculum implementation. By breaking down overarching goals into actionable steps and setting specific performance indicators, the framework provides a roadmap that guides teachers and administrators through the implementation process (Wongwanich et al., 2015). This systematic planning ensures that resources are allocated efficiently and that strategies are tailored to meet predefined objectives.* |
| **Rigorous Monitoring and Evaluation Mechanisms** | *Deliverology's robust monitoring and evaluation mechanisms enable continuous tracking of progress and timely identification of challenges. The use of data-driven assessments and performance metrics allows for informed decision-making and necessary adjustments to strategies, ensuring that implementation stays on course towards achieving desired outcomes (Schacter, 2016; Mouton, 2021). This emphasis on accountability fosters a culture of continuous improvement and responsiveness within CLCs.* |
| **Challenges in Contextual Adaptation** | *Despite its strengths, Deliverology faces challenges in adapting to the unique contexts of CLCs. The framework's standardized and outcome-focused approach may not adequately account for the diverse cultural, socio-economic, and educational backgrounds present in CLC settings (Auld & Morris, 2023; Gewirtz et al., 2021). This rigidity can lead to a mismatch between prescribed strategies and the actual needs of students and teachers, potentially hindering the effectiveness of curriculum implementation.* |
| **Potential for Narrowing Educational Focus** | *The intense focus on measurable outcomes in Deliverology may inadvertently narrow the educational experience, emphasizing test scores and quantitative metrics over holistic learning and critical thinking skills (Ball et al., 2012; Cheeseman, 2022). This outcome-centric approach could marginalize important qualitative aspects of education, such as fostering creativity and addressing individual student needs, which are particularly crucial in the diverse environments of CLCs.* |

| | |
|---|---|
| **Resource and Capacity Constraints** | *Implementing Deliverology effectively requires substantial resources and dedicated teams, which may pose significant challenges in the resource-limited contexts of CLCs (Behn, 2017; Schacter, 2016). Limited funding, inadequate infrastructure, and varying levels of teacher competencies can impede the full realization of Deliverology's structured processes and rigorous monitoring requirements.* |
| **Effectiveness of Implementation Science Framework in CLCs** | |
| **Emphasis on Contextual Adaptation** | *Implementation Science strongly emphasizes adapting interventions to fit specific contexts, making it highly suitable for diverse and complex environments like CLCs (Damschroder et al., 2022; Powell et al., 2017). By systematically identifying and addressing contextual factors such as cultural norms, resource availability, and stakeholder readiness, this framework enhances the relevance and effectiveness of the Grade 12 Mathematics curriculum implementation.* |
| **Identification and Mitigation of Barriers** | *A core strength of Implementation Science lies in its systematic approach to identifying and mitigating barriers to effective implementation (Rabin et al., 2018). Through frameworks like the Consolidated Framework for Implementation Research (CFIR), practitioners can proactively address challenges such as limited resources, resistance to change, and diverse student needs, thereby increasing the likelihood of successful curriculum adoption and sustained use in CLCs.* |
| **Fostering Collaborative and Inclusive Practices** | *Implementation Science promotes collaboration among stakeholders, including teachers, administrators, students, and community members (Wright et al., 2022; Azorín & Fullan, 2022). This inclusive approach ensures that multiple perspectives are considered, fostering a sense of ownership and commitment to the curriculum implementation process. Such collaboration is vital in CLCs, where community engagement and support play a significant role in educational success.* |
| **Flexibility and Continuous Learning** | *The framework's iterative nature allows for flexibility and continuous learning, enabling adaptations based on ongoing feedback and emerging evidence (Glasgow & Estabrooks, 2018; Wiltsey Stirman et al., 2015). This adaptability is particularly beneficial in CLCs, where changing circumstances and diverse student profiles necessitate responsive and evolving implementation strategies.* |
| **Integration of Equity Considerations** | *Implementation Science increasingly incorporates equity-focused approaches, ensuring that educational interventions address disparities and promote inclusive learning environments (Shelton & Brownson, 2024; Baumann et al., 2023). In the context of CLCs, this focus on equity helps in tailoring the Grade 12 Mathematics curriculum to meet the needs of marginalized and underserved student populations effectively.* |
| **Challenges in** | *One of the challenges associated with Implementation Science* |

| | |
|---|---|
| **Establishing Clear Performance Metrics** | *is the potential lack of clear and consistent performance metrics, which can make it difficult to assess progress and outcomes systematically (Nilsen & Bernhardsson, 2019). This may result in less structured monitoring and evaluation processes compared to Deliverology, potentially affecting accountability and the ability to demonstrate tangible improvements in student performance within CLCs.* |
| **Resource Intensiveness and Complexity** | *While Implementation Science offers comprehensive and nuanced strategies, its processes can be resource-intensive and complex to implement (Proctor et al., 2015). Ensuring thorough context analysis, stakeholder engagement, and iterative adaptations requires time, expertise, and resources, which may be challenging to secure in the constrained settings of CLCs.* |
| **Integrated Application of Deliverology and Implementation Science in CLCs** | |
| **Complementary Strengths for Enhanced Outcomes** | *Integrating Deliverology and Implementation Science frameworks leverages the strengths of both approaches to address the multifaceted challenges of implementing the Grade 12 Mathematics curriculum in CLCs. Deliverology's structured goal-setting and rigorous monitoring complement Implementation Science's emphasis on contextual adaptation and stakeholder engagement, creating a balanced and comprehensive implementation strategy (Geng, Mody, & Powell, 2023; Auld & Morris, 2023).* |
| **Structured Planning with Contextual Sensitivity** | *The integration facilitates structured and detailed planning that remains sensitive to the specific contexts of CLCs. Clear goals and performance metrics from Deliverology are adapted using the contextual analysis tools of Implementation Science, ensuring that plans are both precise and relevant to local needs and conditions (Barber et al., 2011; Damschroder et al., 2022).* |
| **Enhanced Monitoring and Adaptive Evaluation** | *Combining the monitoring strengths of Deliverology with the iterative evaluation processes of Implementation Science results in a robust system that tracks progress effectively while allowing for necessary adjustments based on real-time feedback and emerging challenges (Schacter, 2016; Glasgow & Estabrooks, 2018). This adaptive monitoring ensures that implementation remains on track and responsive to changing circumstances within CLCs.* |
| **Improved Stakeholder Engagement and Ownership** | *The collaborative focus of Implementation Science enriches Deliverology's implementation processes by ensuring active and meaningful involvement of all stakeholders. This collaboration fosters greater buy-in, enhances communication, and ensures that diverse perspectives inform decision-making, leading to more effective and sustainable curriculum implementation (Wright et al., 2022; Wongwanich et al., 2015).* |
| **Addressing Resource and** | *The integrated approach allows for strategic resource allocation by combining Deliverology's efficiency-oriented planning with* |

| | |
|---|---|
| **Capacity Constraints** | *Implementation Science's emphasis on leveraging existing capacities and identifying external support mechanisms (Behn, 2017; Powell et al., 2017). This synergy aids in overcoming resource limitations common in CLCs, ensuring that implementation processes are both feasible and effective.* |
| **Balancing Quantitative and Qualitative Outcomes** | *Integration balances Deliverology's focus on quantitative outcomes with Implementation Science's attention to qualitative aspects of education, such as student engagement and well-being (Ball et al., 2012; Nilsen & Bernhardsson, 2019). This balance ensures a more holistic approach to curriculum implementation that values both measurable achievements and the overall educational experience of students in CLCs.* |
| **Ensuring Sustainability and Scalability** | *The combined frameworks enhance the potential for sustaining and scaling successful curriculum interventions. Deliverology's structured processes provide a foundation for replicability, while Implementation Science's focus on context and adaptability ensures that scaling efforts are sensitive to diverse environments and can be maintained over time (Mouton, 2021; Riley et al., 2021).* |

## 5. Discussion of the findings

The present study reaffirms that Deliverology and Implementation Science, although conceived for different policy arenas; each furnish indispensable levers for reforming Grade 12 Mathematics curriculum in CLCs. Deliverology's hallmark is its systematic orientation: it compels actors to translate visionary policy aspirations into a cascade of specific, time-bound, and measurable objectives. In CLCs, where fragmented governance and historically under-resourced classrooms often impede coherent planning, this laser-like focus on milestones can galvanise teachers, district officials, and community stakeholders around a common results agenda (Barber et al., 2011; Schacter, 2016).

Moreover, the cyclical "stock-take" routines popularised by Deliverology have repeatedly proven effective in other education systems by spotlighting implementation bottlenecks early and reallocating resources, accordingly, thus preventing mid-course drift (Ball et al., 2012). Yet this same rigidity can blunt local ingenuity. When uniform performance dashboards are imposed without room for contextual nuance, teachers in rural or township CLCs may experience the framework less as a scaffold for improvement and more as a compliance mechanism, an outcome that risks diminishing intrinsic motivation and pedagogical experimentation (Auld & Morris, 2023; Gewirtz et al., 2021). Compounding the challenge, an exclusive emphasis on test scores can marginalise the cultivation of higher-order competencies such as creative reasoning and critical reflection, capacities that are indispensable for meaningful participation in a rapidly evolving knowledge economy (Cheeseman, 2022).

By contrast, IS begins with the premise that context is not noise but data. It explicitly interrogates the organisational climate, resource profile, cultural norms, and readiness for change in each site, then tailors intervention

components accordingly (Damschroder et al., 2022; Powell et al., 2017). In the diverse landscape of South African CLCs, where one centre may serve adult students seeking matric equivalency while another supports out-of-school youth; this capacity to customise is a decisive advantage. Implementation Science also embeds iterative Plan-Do–Study–Act (PDSA) cycles that treat early failures not as verdicts but as feedback, enabling continuous calibration of teacher support, learning materials, and student engagement strategies (Glasgow & Estabrooks, 2018). Crucially, its collaborative stance invites teachers, community leaders, and even students into decision-making forums, fostering deep ownership and reducing the likelihood that reforms remain a "project of outsiders" (Wright et al., 2022; Azorín & Fullan, 2022).

Nevertheless, the framework demands substantial human and financial capital: skilled facilitators to guide fidelity-versus-adaptation judgments, data systems that capture qualitative and quantitative indicators, and time for reflective dialogue-all luxuries that many CLCs, dependent on volunteer administrators or precarious provincial grants, cannot easily afford (Proctor et al., 2015).

Furthermore, the flexible, site-specific metrics encouraged by IS can make cross-centre comparisons difficult, potentially eroding the accountability that external funders and education departments expect (Nilsen & Bernhardsson, 2019). Integrating Deliverology and IS therefore offers a mutually reinforcing solution. Deliverology supplies the unambiguous destination and performance cadence, while IS ensures that the route remains responsive to terrain changes, be those sudden teacher shortages, fluctuating enrolments, or erratic infrastructure support (Barber et al., 2011; Damschroder et al., 2022). In practice, this means anchoring each CLC in a core set of non-negotiable metrics, for example, minimum lesson-coverage rates or formative-assessment intervals while allowing teachers flexibility to adopt differentiated instructional models or culturally relevant examples that resonate with their student cohort.

The two frameworks' monitoring traditions can likewise be blended: Deliverology's dashboard becomes a living document enriched by IS's qualitative "learning logs" that capture student voice, teacher reflections, and community feedback, permitting data-informed mid-stream course corrections (Schacter, 2016; Glasgow & Estabrooks, 2018). A further benefit of this hybridisation is amplified stakeholder investment: the results-oriented urgency of Deliverology appeals to policymakers seeking tangible returns, whereas the inclusive ethos of IS builds trust and legitimacy at the classroom level (Wright et al., 2022; Wongwanich et al., 2015).

Notwithstanding its promise, the hybrid model must grapple with persistent contextual constraints. Many CLCs operate in spaces not purpose-built for schooling, such as church halls, community centres, and even unused municipal offices, conditions that complicate the data-collection mandates central to both frameworks. Resource scarcity extends beyond finances to include technological deficits; for instance, real-time dashboards require stable internet connectivity and data management skills rarely available in marginalised districts (Powell et

al., 2017). Social factors also loom large: students frequently juggle employment, caregiving, or transport challenges that undermine consistent attendance, thereby limiting the reliability of performance indicators. Here, IS's iterative assessment processes can surface hidden barriers such as evening lighting constraints and cultural expectations around household duties, enabling micro-interventions that keep students engaged while still satisfying Deliverology's macro-level accountability (Glasgow & Estabrooks, 2018).

The present analysis is constrained by its reliance on secondary literature. While synthesis across multiple studies yields transferable insights, it may inadvertently mask idiosyncratic realities in individual CLCs, such as local leadership dynamics or informal support networks. This study does not furnish empirical evidence of the hybrid model's effectiveness, since no field trial was mounted. These omissions point directly to future research priorities: participatory action research and longitudinal case studies that pilot the integrated framework across varied CLC typologies, urban, peri-urban, and rural can illuminate how contextual factors modulate implementation fidelity and student outcomes. Such work should also explore cost-effectiveness, identifying lean data-collection tools and professional-development models that align with fiscal realities while safeguarding measurement integrity (Ball et al., 2012; Nilsen & Bernhardsson, 2019).

The synthesis of Deliverology and Implementation Science demonstrates that rigour and responsiveness need not be mutually exclusive. When intelligently combined, they create a pragmatic yet principled pathway for equitable Mathematics curriculum reform—one that couples the discipline of delivery with the wisdom of adaptation. For policymakers and practitioners committed to transforming South African CLCs into engines of social mobility, this hybrid approach offers both a compass and a toolkit, advancing the dual imperatives of performance and justice in education.

## 6. Recommendations

To transform the analytical insights of Deliverology and Implementation Science into concrete gains for Grade 12 Mathematics curriculum in South African CLCs, seven SMART, context-responsive recommendations are proposed. Within the first three months, district authorities should assemble a joint "delivery-and-adaptation" task team that draws together curriculum planners, CLC principals, lead Mathematics teachers, and community representatives. The task team modelled on Deliverology's delivery-unit logic yet infused with Implementation Science's participatory ethos, must produce formally endorsed terms of reference and a rolling schedule of quarterly meetings.

Early deliverables should include a shared problem statement and a high-level implementation map that identifies quick wins and structural bottlenecks. Because many CLCs face travel-budget constraints, hybrid meetings using low-data platforms can mitigate cost, while modest stipends funded from district/region discretionary lines can sustain broad participation (Barber et al., 2011; Damschroder et al., 2022; Schacter, 2016).

By the end of month six, the task team should have co-designed and piloted a contextualised results framework consisting of three to five core quantitative indicators-such as lesson-coverage rates, student attendance, and quarterly diagnostic scores-balanced by two or three qualitative indicators, including student engagement journals and teacher reflective logs. A successful pilot study conducted in at least four demographically distinct CLCs will provide baseline evidence against which subsequent progress can be judged.

Smartphone-based survey tools can lighten data-entry workloads, and a rotating "data champion" system will distribute responsibility equitably (Schacter, 2016; Glasgow & Estabrooks, 2018; Auld & Morris, 2023). Capacity building for teachers must proceed in three staged "learning arcs." The orientation arc (months 1-2) should focus on conceptual exposure to Deliverology stock-takes and Implementation Science PDSA cycles, targeting 90 percent teacher attendance.

The skill-transfer arc (months 3-6) should pair novice and veteran teachers for peer-mentoring sessions on data interpretation and instructional differentiation, with the submission of reflective adaptation logs by at least 75 percent of teachers as a key milestone. The consolidation arc (months 7-12) requires monthly virtual coaching and bimonthly reflection huddles aimed at a 10 percent improvement in mid-year pass rates (Proctor et al., 2015; Wongwanich et al., 2015). Limited internet connectivity can be offset by distributing data bundles and using asynchronous voice-note coaching.

Starting in month four, every CLC should launch at least one equity-oriented adaptation that addresses barriers faced by marginalised students. Examples include bilingual glossaries for multilingual communities and flexible evening classes to accommodate working adolescents and young adults. A 15 percent rise in attendance among target groups across the academic year will serve as the primary indicator of success. Dialogue with parents and community leaders can mitigate potential resistance to altered schedules, as documented in adult-education centres that shifted timetables following stakeholder forums (Shelton & Brownson, 2024; Baumann et al., 2023; Gewirtz et al., 2021).

Commencing in month five, CLCs should institutionalise bi-monthly mini-stock-takes, limiting each session to the five most critical implementation blockers to prevent information overload. This blend of Deliverology's rapid-review dashboards and qualitative Implementation Science feedback loops should achieve an 80 percent resolution and/or active-progress rate on flagged issues by the subsequent meeting. Moderated WhatsApp groups can facilitate real-time problem-solving between formal reviews while preserving a documented trace of decisions (Schacter, 2016; Glasgow & Estabrooks, 2018).

By the twelfth month, the task team should compile a concise practice brief distilling success, barriers encountered, cost implications, and adaptation tips. Disseminating the brief through provincial education bulletins and professional networks should result in downloads and/or citations by at least twenty

additional CLCs, a metric that signals both reach and peer recognition. Where teachers lack technical writing capacity, volunteer postgraduate students can support the drafting process in exchange for research credits (Riley et al., 2021; Geng, Mody & Powell, 2023). Throughout the eighteen-month implementation window, district officials and task-team members should prepare semi-annual policy memoranda that translate dashboard evidence and stakeholder testimonies into concrete funding and/or regulatory requests. Achieving at least one budgetary reallocation will mark a successful advocacy cycle. Aligning requests with national skills-development agendas and highlighting early student-achievement gains, as demonstrated in earlier reform experiences, can counter bureaucratic inertia (Behn, 2017; Proctor et al., 2015; Ball et al., 2012).

Together these seven recommendations establish a time-bound, measurable, and contextually grounded roadmap that marries the clarity and rigour of Deliverology with the adaptive sensitivity of Implementation Science. If followed, they would promise to strenghten both the effectiveness and equity of Grade 12 Mathematics curriculum reforms across South African CLCs, without departing from the evidence base and theoretical foundations already cited in this study.

## 7. Conclusion

This study demonstrates that merging Deliverology's disciplined, goal-driven architecture with Implementation Science's adaptive, context-sensitive ethos yields a robust pathway for rolling out the Grade 12 Mathematics curriculum in CLCs. Deliverology excels at crystallising what must be achieved - clear milestones, transparent dashboards, and hard accountability (Barber et al., 2011; Schacter, 2016). Implementation Science clarifies how those targets can be reached in resource-constrained, culturally diverse settings by emphasising continuous learning, stakeholder co-creation, and iterative course-correction (Damschroder et al., 2022; Glasgow & Estabrooks, 2018).

By integrating these strengths, the study contributes a balanced framework that simultaneously safeguards rigour and nurtures responsiveness-an essential duality for CLCs striving to lift student performance while respecting local realities. Practical implications for stakeholders are clear. Education departments can deploy Deliverology-style "delivery units" to keep reforms on schedule yet embed Implementation Science's PDSA cycles to refine strategies in real time.

CLC leaders can use the blended results framework—quantitative dashboards paired with qualitative reflection logs—to capture both test-score gains and richer learning experiences (Ball et al., 2012; Nilsen & Bernhardsson, 2019). Teachers gain structured targets without sacrificing professional autonomy; communities secure a stronger voice in shaping interventions; and students benefit from instruction that is at once accountable and equitable. Findings draw primarily on secondary sources; thus, contextual nuances in individual CLCs may be under-represented.

Moreover, the integrated model remains conceptually validated rather than empirically tested, and its resource demands may stretch thinly staffed centres (Proctor et al., 2015). Acknowledging these constraints enhances the credibility of the conclusions and signals where further evidence is needed. Future research must now move from blueprint to build. Field-based trials across urban, peri-urban, and rural CLCs can gauge real-world feasibility, cost-effectiveness, and long-term student outcomes. Comparative studies should explore how varying mixes of quantitative and qualitative metrics influence teacher motivation and policy uptake. Finally, longitudinal designs are needed to assess whether the initial performance gains and equity advances predicted here can be sustained and scaled over multiple cohorts.

In essence, this study reframes curriculum implementation not as a choice between structure or flexibility, but as a strategic fusion of both. By championing an integrated Deliverology–Implementation Science model, it offers policymakers and practitioners, a dynamic and evidence-aligned roadmap to ensure that every CLC student, not just a fortunate few, has a fair and fighting chance to succeed in Grade 12 Mathematics curriculum

## 8. References


Adsul, P., Shelton, R. C., Oh, A., Moise, N., Iwelunmor, J., & Griffith, D. M. (2024). Challenges and opportunities for paving the road to global health equity through implementation science. *Annual Review of Public Health, 45*. https://doi.org/10.1146/annurev-publhealth-060922-034822

Ando, H., Cousins, R., & Young, C. (2014). Achieving saturation in thematic analysis: Development and refinement of a codebook. *Comprehensive Psychology, 3,* 03-CP. https://doi.org/10.2466/03.cp.3.4

Auld, E., & Morris, P. (2023). Global Salvation Inc.: Sir Michael Barber's education for the apocalypse and the church of Deliverology®. *Comparative Education, 59(*3), 341-361. https://doi.org/10.1080/03050068.2023.2241006

Ayee, J. R. (2023). *Public sector reform and innovation in Sub-Saharan Africa: The case of Ghana.* In Handbook of public management in Africa (pp. 279-299). Edward Elgar Publishing. https://doi.org/10.4337/9781803929392.00031

Azorín, C., & Fullan, M. (2022). Leading new, deeper forms of collaborative cultures: Questions and pathways. *Journal of Educational Change, 23*(1), 131-143. https://doi.org/10.1007/s10833-021-09448-w

Ball, S., Maguire, M., Braun, A., Perryman, J., & Hoskins, K. (2012). Assessment technologies in schools:'Deliverology'and the 'play of dominations'. *Research Papers in Education, 27*(5), 513-533. https://doi.org/10.1080/02671522.2010.550012

Barber, M., Kihn, P., & Moffit, A. (2011). Deliverology: From idea to implementation. *McKinsey on Government, 6*, 32-39. https://doi.org/10.4135/9781452219660

Bauer, M. S., & Kirchner, J. (2020). Implementation science: What is it and why should I care?. *Psychiatry research, 283*, 112376. https://doi.org/10.1016/j.psychres.2019.04.025

Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2015). An introduction to implementation science for the non-specialist. *BMC psychology, 3*, 1-12. https://doi.org/10.1186/s40359-015-0089-9

Baumann, A. A., Shelton, R. C., Kumanyika, S., & Haire-Joshu, D. (2023). Advancing healthcare equity through dissemination and implementation science. *Health services research, 58*, 327-344. https://doi.org/10.1111/1475-6773.14175

Baxter, J. (2016). Strategic leadership: board members in areas of high deprivation'deliverololgy or systems approach?'.

Behn, R. D. (2017). How scientific is "the science of delivery"?. *Canadian Public Administration, 60*(1), 89-110. https://doi.org/10.1111/capa.12207

Belete, S., Duke, C., Hinzen, H., Owusu-Boampong, A., & Khau, H. P. (2022). Community Learning Centres (CLCs) for Adult Learning and Education (ALE): development in and by communities. *International Review of Education, 68*(2), 259-290. https://doi.org/10.1007/s11159-022-09954-w

Berk, J., Frank, H. E., & Drainoni, M. L. (2024). Locked in and left out: the" prison penalty" for implementation of evidence-based interventions. *Implementation Science Communications, 5*(1), 36. https://doi.org/10.1186/s43058-024-00573-0

Birch, L., & Jacob, S. (2019). "Deliverology" and evaluation: A tale of two worlds. *Canadian Journal of Program Evaluation, 34*(2), 303-328. https://doi.org/10.3138/cjpe.53365

Braithwaite, J., Marks, D., & Taylor, N. (2014). Harnessing implementation science to improve care quality and patient safety: a systematic review of targeted literature. *International Journal for Quality in Health Care, 26*(3), 321-329. https://doi.org/10.1093/intqhc/mzu047

Brock, K. L. (2020). Government and non-profit collaboration in times of deliverology, policy innovation laboratories and hubs, and new public governance. VOLUNTAS: *International Journal of Voluntary and Nonprofit Organizations, 31*(2), 257-270. https://doi.org/10.1007/s11266-019-00145-0

Buriachenko, A. Y., Zhyber, T. V., & Paientko, T. (2020). Managerial accounting in the implementation of deliverology using the example of Ukraine. *Central European Economic Journal, 7(*54), 72-83. https://doi.org/10.2478/ceej-2020-0003

Cabassa, L. J. (2016). Implementation science: Why it matters for the future of social work. *Journal of Social Work Education, 52*(sup1), S38-S50. https://doi.org/10.1080/10437797.2016.1174648

Cheeseman, M. F. (2022). *Changing School Improvement Team Behaviors: The Influence and Impact of Engaging School Improvement Teams in Professional Learning Cycles as a Measure to Achieve Schoolwide Academic Growth*. East Carolina University.

Chinman, M., Woodward, E. N., Curran, G. M., & Hausmann, L. R. (2017). Harnessing implementation science to increase the impact of health equity research. *Medical care, 55*, S16-S23. https://doi.org/10.1097/mlr.0000000000000769

Chukwuedo, S. O., Chukwuedo, C. B., Ogwuche, J. P., & Nnajiofor, F. N. (2021). From choice of concepts to designing statistically testable models: On the centrality of developing conceptual frameworks in research. *NAU Journal of Technology and Vocational Education, 6*(1), 1-12.

Curran, G. M. (2020). Implementation science made too simple: a teaching tool. *Implementation Science Communications, 1*, 1-3. https://doi.org/10.1186/s43058-020-00001-z

Demiris, G., Parker Oliver, D., Capurro, D., & Wittenberg-Lyles, E. (2014). Implementation science: implications for intervention research in hospice and palliative care. *The gerontologist, 54*(2), 163-171. https://doi.org/10.1093/geront/gnt022

Dobell, R., & Zussman, D. (2018). Sunshine, scrutiny, and spending review in Canada, Trudeau to Trudeau: From program evaluation and policy to commitment and results. *Canadian Journal of Program Evaluation, 32(*3), 371-393. https://doi.org/10.3138/cjpe.43184

Dobroszek, J., Heinzelmann, R., & Kabalski, P. *Managerial accounting in the implementation of deliverology using the example of Ukraine.* https://doi.org/10.2478/ceej-2020-0003

Donkoh, S., & Mensah, J. (2023). Application of triangulation in qualitative research. *Journal of Applied Biotechnology and Bioengineering, 10*(1), 6-9. https://doi.org/10.15406/jabb.2023.10.00319

Forman, S. G., Shapiro, E. S., Codding, R. S., Gonzales, J. E., Reddy, L. A., Rosenfield, S. A., ... & Stoiber, K. C. (2013). Implementation science and school psychology. School Psychology Quarterly, 28(2), 77. https://doi.org/10.1037/spq0000019

Gazeley, L. (2013). *The life and death of secondary education for all*. https://doi.org/10.1080/00071005.2013.816045

Geng, E. H., Mody, A., & Powell, B. J. (2023). On-the-go adaptation of implementation approaches and strategies in health: emerging perspectives and research opportunities. *Annual Review of Public Health, 44*(1), 21-36. https://doi.org/10.1146/annurev-publhealth-051920-124515

Gewirtz, S., Maguire, M., Neumann, E., & Towers, E. (2021). What's wrong with 'deliverology'? Performance measurement, accountability and quality improvement in English secondary education. *Journal of Education Policy, 36*(4), 504-529. https://doi.org/10.1080/02680939.2019.1706103

Glasgow, R. E., Eckstein, E. T., & ElZarrad, M. K. (2013). Implementation science perspectives and opportunities for HIV/AIDS research: integrating science, practice, and policy. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 63*, S26-S31. https://doi.org/10.1097/qai.0b013e3182920286

Glasgow, R. E., Phillips, S. M., & Sanchez, M. A. (2014). Implementation science approaches for integrating eHealth research into practice and policy. *International journal of medical informatics, 83*(7), e1-e11. https://doi.org/10.1016/j.ijmedinf.2013.07.002

Glasgow, R. E., Vinson, C., Chambers, D., Khoury, M. J., Kaplan, R. M., & Hunter, C. (2012). National Institutes of Health approaches to dissemination and implementation science: current and future directions. *American journal of public health, 102*(7), 1274-1281. https://doi.org/10.2105/ajph.2012.300755

Haines, E. R., Dopp, A., Lyon, A. R., Witteman, H. O., Bender, M., Vaisson, G., ... & Birken, S. (2021). Harmonizing evidence-based practice, implementation context, and implementation strategies with user-centered design: a case example in young adult cancer care. *Implementation science communications, 2*(1), 45. https://doi.org/10.1186/s43058-021-00147-4

Handley, M. A., Gorukanti, A., & Cattamanchi, A. (2016). Strategies for implementing implementation science: a methodological overview. *Emergency Medicine Journal, 33*(9), 660-664. https://doi.org/10.1136/emermed-2015-205461

Hays, J., & Reinders, H. (2020). Sustainable learning and education: A curriculum for the future. *International Review of Education, 66*(1), 29-52. https://doi.org/10.1007/s11159-020-09820-7

Helfrich, C. D., Damschroder, L. J., Hagedorn, H. J., Daggett, G. S., Sahay, A., Ritchie, M., ... & Stetler, C. B. (2010). A critical synthesis of literature on the promoting action on research implementation in health services (PARIHS) framework. *Implementation Science, 5*, 1-20. https://doi.org/10.1186/1748-5908-5-82

Holtrop, J. S., Scherer, L. D., Matlock, D. D., Glasgow, R. E., & Green, L. A. (2021). The importance of mental models in implementation science. *Frontiers in Public Health, 9*, 680316. https://doi.org/10.3389/fpubh.2021.680316

Keane, E. (2022). Critical analytic memoing. *Analyzing and interpreting qualitative research*: After the interview, 259-274.

Kilbourne, A., Chinman, M., Rogal, S., & Almirall, D. (2024). Adaptive designs in implementation science and practice: their promise and the need for greater understanding and improved communication. *Annual Review of Public Health, 45*. https://doi.org/10.1146/annurev-publhealth-060222-014438

Leeman, J., Birken, S. A., Powell, B. J., Rohweder, C., & Shea, C. M. (2017). Beyond "implementation strategies": classifying the full range of strategies used in implementation science and practice. *Implementation Science, 12*, 1-9. https://doi.org/10.1186/s13012-017-0657-x

Lobb, R., & Colditz, G. A. (2013). Implementation science and its application to population health. *Annual review of public health, 34*(1), 235-251. https://doi.org/10.1146/annurev-publhealth-031912-114444

McKay, J. R. (2018). Deliverology and Canadian military commitments in Europe circa 2017. *Canadian Foreign Policy Journal, 24*(1), 39-55. https://doi.org/10.1080/11926422.2017.1331175

Meyers, D. C., Katz, J., Chien, V., Wandersman, A., Scaccia, J. P., & Wright, A. (2012). Practical implementation science: developing and piloting the quality implementation tool. *American journal of community psychology, 50,* 481-496. https://doi.org/10.1007/s10464-012-9521-y

Mginywa, N. (2021). The transition of Public Adult Learning Centres (PALCs) to Community Education and Training Colleges (CETCs): *Perspectives and experiences of a selection of management and lecturer staff in the greater Cape Town area.*

Mitchell, P. F. (2011). Evidence-based practice in real-world services for young people with complex needs: New opportunities suggested by recent implementation science. *Children and Youth Services Review, 33*(2), 207-216. https://doi.org/10.1016/j.childyouth.2010.10.003

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *International journal of surgery, 8(*5), 336-341. https://doi.org/10.1016/j.ijsu.2010.02.007

Moir, T. (2018, July). *Why is implementation science important for intervention design and evaluation within educational settings?. In Frontiers in Education* (Vol. 3, p. 61). Frontiers Media SA. https://doi.org/10.3389/feduc.2018.00061

Mouton, C. (2021). Performance measurement of policy priorities: *Tracking government performance* (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Neta, G., Brownson, R. C., & Chambers, D. A. (2018). Opportunities for epidemiologists in implementation science: a primer. *American journal of epidemiology, 187*(5), 899-910. https://doi.org/10.1093/aje/kwx323

Nilsen, P., & Bernhardsson, S. (2019). Context matters in implementation science: a scoping review of determinant frameworks that describe contextual determinants for implementation outcomes. *BMC health services research, 19*, 1-21. https://doi.org/10.1186/s12913-019-4015-3

Nordstrum, L. E., LeMahieu, P. G., & Dodd, K. (2017). *Deliverology. quality assurance in education, 25*(1), 43-57. https://doi.org/10.1108/qae-11-2016-0078

Northridge, M. E., & Metcalf, S. S. (2016). Enhancing implementation science by applying best principles of systems science. *Health Research Policy and Systems, 14*, 1-8. https://doi.org/10.1186/s12961-016-0146-8

O'Dea, R. E., Lagisz, M., Jennions, M. D., Koricheva, J., Noble, D. W., Parker, T. H., ... & Nakagawa, S. (2021). Preferred reporting items for systematic reviews and meta-analyses in ecology and evolutionary biology: a PRISMA extension. *Biological Reviews, 96*(5), 1695-1722. https://doi.org/10.1111/brv.12721

Olkaba, T. T., & Tamene, E. H. (2019). Deliverology in Ethiopian Higher Education as a Quality Management Tool: Critical Review and the Insider's Reflection. *International Journal of Education and Literacy Studies, 7*(4), 83-90. https://doi.org/10.7575/aiac.ijels.v.7n.4p.83

Olswang, L. B., & Prelock, P. A. (2015). Bridging the gap between research and practice: Implementation science. *Journal of Speech, Language, and Hearing Research, 58*(6), S1818-S1826. https://doi.org/10.1044/2015_jslhr-l-14-0305

Padian, N. S., Holmes, C. B., McCoy, S. I., Lyerla, R., Bouey, P. D., & Goosby, E. P. (2011). Implementation science for the US President's Emergency Plan for AIDS Relief (PEPFAR*). JAIDS Journal of Acquired Immune Deficiency Syndromes, 56*(3), 199-203. https://doi.org/10.1097/qai.0b013e31820bb448

Panic, N., Leoncini, E., de Belvis, G., Ricciardi, W., & Boccia, S. (2013). Evaluation of the endorsement of the preferred reporting items for systematic reviews and meta-analysis (PRISMA) statement on the quality of published systematic review and meta-analyses. *PloS one, 8*(12), e83138. https://doi.org/10.1371/journal.pone.0083138

Purtle, J., Moucheraud, C., Yang, L. H., & Shelley, D. (2023). Four very basic ways to think about policy in implementation science. *Implementation science communications, 4*(1), 111. https://doi.org/10.1186/s43058-023-00497-1

Rabin, B. A., Purcell, P., Naveed, S., Moser, R. P., Henton, M. D., Proctor, E. K., ... & Glasgow, R. E. (2012). Advancing the application, quality and harmonization of implementation science measures. *Implementation Science, 7*, 1-11. https://doi.org/10.1186/1748-5908-7-119

Ramanadhan, S., Revette, A. C., Lee, R. M., & Aveling, E. L. (2021). Pragmatic approaches to analyzing qualitative data for implementation science: an introduction. *Implementation Science Communications, 2*, 1-10. https://doi.org/10.1186/s43058-021-00174-1

Rapport, F., Clay-Williams, R., Churruca, K., Shih, P., Hogden, A., & Braithwaite, J. (2018). The struggle of translating science into action: foundational concepts of implementation science. *Journal of evaluation in clinical practice, 24*(1), 117-126. https://doi.org/10.1111/jep.12741

Rapport, F., Smith, J., Hutchinson, K., Clay-Williams, R., Churruca, K., Bierbaum, M., & Braithwaite, J. (2022). Too much theory and not enough practice? The challenge of implementation science application in healthcare practice. *Journal of Evaluation in Clinical Practice, 28*(6), 991-1002. https://doi.org/10.1111/jep.13600

Ridde, V., Pérez, D., & Robert, E. (2020). Using implementation science theories and frameworks in global health. *BMJ global health, 5*(4), e002269. https://doi.org/10.1136/bmjgh-2019-002269

Roberts, M. C., Kennedy, A. E., Chambers, D. A., & Khoury, M. J. (2017). The current state of implementation science in genomic medicine: opportunities for improvement. *Genetics in Medicine, 19*(8), 858-863. https://doi.org/10.1038/gim.2016.210

Sarkies, M. N., Francis-Auton, E., Long, J. C., Pomare, C., Hardwick, R., & Braithwaite, J. (2022). Making implementation science more real. *BMC Medical Research Methodology, 22*(1), 178. https://doi.org/10.1186/s12874-022-01661-2

Schackman, B. R. (2010). Implementation science for the prevention and treatment of HIV/AIDS*. JAIDS Journal of Acquired Immune Deficiency Syndromes, 55*, S27-S31. https://doi.org/10.1097/qai.0b013e3181f9c1da

Schacter, M. (2016). Does "deliverology" matter. Mark Schacter Consulting.

Shelton, R. C., & Brownson, R. C. (2023). Advancing the science and application of implementation science to promote health equity: commentary on the symposium. *Annual Review of Public Health, 45*. https://doi.org/10.1146/annurev-publhealth-062723-055935

Shelton, R. C., & Brownson, R. C. (2024). Enhancing impact: a call to action for equitable implementation science. *Prevention Science, 25*(Suppl 1), 174-189. https://doi.org/10.1007/s11121-023-01589-z

Sorensen, J. L., & Kosten, T. (2011). Developing the tools of implementation science in substance use disorders treatment: applications of the consolidated framework for implementation research. *Psychology of Addictive Behaviors, 25*(2), 262. https://doi.org/10.1037/a0022765

Stratton, T. S. (2019). Deliverology in Community Economic Development: Enhancing Results Frameworks and Performance Measurement. *Papers in Canadian Economic Development, 18*, 1-16. https://doi.org/10.15353/pced.v18i0.90

Tampio, N. (2015). For Pearson, common core is private profit. Aljazeera America.

Tedre, M., & Pajunen, J. (2022). Grand theories or design guidelines? perspectives on the role of theory in computing education research. *ACM Transactions on Computing Education, 23*(1), 1-20. https://doi.org/10.1145/3487049

Thornicroft, G., Lempp, H., & Tansella, M. (2011). The place of implementation science in the translational medicine continuum. *Psychological medicine, 41*(10), 2015-2021. https://doi.org/10.1017/s0033291711000109

Tisdell, E. J., Merriam, S. B., & Stuckey-Peyrot, H. L. (2025). Qualitative research: A guide to design and implementation. John Wiley & Sons. https://doi.org/10.1177/0741713616671930

Underhill, K., Operario, D., Mimiaga, M. J., Skeer, M. R., & Mayer, K. H. (2010). Implementation science of pre-exposure prophylaxis: preparing for public use. *Current HIV/AIDS Reports, 7*, 210-219. https://doi.org/10.1007/s11904-010-0062-4

Viennet, R., & Pont, B. (2017). *Education policy implementation: A literature review and proposed framework*. https://doi.org/10.1787/fc467a64-en

Wang, Y., Wong, E. L. Y., Nilsen, P., Chung, V. C. H., Tian, Y., & Yeoh, E. K. (2023). A scoping review of implementation science theories, models, and frameworks—an appraisal of purpose, characteristics, usability, applicability, and testability. *Implementation Science, 18*(1), 43. https://doi.org/10.1186/s13012-023-01296-x

Wensing, M. (2015). Implementation science in healthcare: Introduction and perspective. Zeitschrift für Evidenz, *Fortbildung und Qualität im Gesundheitswesen, 109*(2), 97-102. https://doi.org/10.1016/j.zefq.2015.02.014

Wensing, M., & Grol, R. (2019). Knowledge translation in health: how implementation science could contribute more. *BMC medicine, 17*, 1-6. https://doi.org/10.1186/s12916-019-1322-9

Williams, N. J., & Beidas, R. S. (2019). Annual research review: The state of implementation science in child psychology and psychiatry: A review and suggestions to advance the field. *Journal of Child Psychology and Psychiatry, 60*(4), 430-450. https://doi.org/10.1111/jcpp.12960

Wilson, P., & Kislov, R. (2022). *Implementation science*. Cambridge University Press. https://doi.org/10.1017/9781009237055

Wongwanich, S., Piromsombat, C., Khaikleng, P., & Sriklaub, K. (2015). Policy delivery strategies for education reform: A formative research and development. *Procedia-Social and Behavioral Sciences, 171*, 1365-1372. https://doi.org/10.1016/j.sbspro.2015.01.255

Wright, C., Ritter, L. J., & Wisse Gonzales, C. (2022). Cultivating A Collaborative Culture For Ensuring Sustainable Development Goals In Higher Education: An Integrative Case Study. *Sustainability, 14*(3), 1273. https://doi.org/10.3390/su14031273