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Understanding Silence in Science Education: Emotional, Personal and Motivational Barriers Facing Comprehensive Sexuality Education – A Systematic Review

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Abstract. Classroom silence remains a persistent pattern in science-based sexuality education, despite the recognised importance of including sexual and reproductive health in formal curricula. Though scholars have identified various barriers to comprehensive sexuality education, little attention has been given to how these barriers interact over time to shape teachers' instructional responses. This qualitative systematic review was guided by PRISMA 2020 and analysed 30 peer-reviewed studies published between 2015 and 2025 that were identified by searching Scopus, ERIC and SciELO. Findings were synthesised thematically. Quality appraisal guided interpretation but did not exclude studies. The review identifies three recurring patterns relating to barriers, namely emotional discomfort, limited perceived capacity, and institutional constraints, which frequently co-occur across contexts. These barriers shape classroom engagement by narrowing discussion, redirecting sensitive questions and confining content to biological explanations. Emotional discomfort often emerges early, though its influence is mediated by teachers' self-efficacy and by institutional conditions that signal professional legitimacy and risk. Over time, these interacting pressures lead to repeated instructional adjustments that stabilise into instructional silence as a professional response. This study proposes a pathway framework for explaining how emotional, personal and structural factors interact dynamically in shaping classroom practice. The findings highlight the limits of isolated interventions and point to the need for coordinated support, including teacher professional development, clearer curriculum guidance and stronger institutional support. This framework provides a foundation for designing more

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effective teacher support systems, which could enable more confident and sustained engagement with sensitive topics in science classrooms.

Keywords: comprehensive sexuality education; science education; instructional silence; teacher barriers; thematic synthesis

1. Introduction

Sexuality is still considered a taboo topic in formal education. In some countries, discussions of sexuality in science education, while inherently integrated with students' biological development and health literacy, are limited by dominant sociocultural values (Ito et al., 2022; Lafontan et al., 2024). For example, in China, more than half (52.47%) of teachers have never provided school-based sexuality education, yet 51.77% of them regarded it as a very pressing issue (W. Liu et al., 2024). The presence of strong importance beliefs and limited classroom enactment suggests the gap identified cannot be attributed to lack of awareness of importance alone.

In this study, comprehensive sexuality education (CSE) is understood as a curriculum-based approach that addresses the cognitive, emotional and social dimensions of sexuality in age-appropriate ways (UNESCO, 2018, 2023). This definition is actually implied in science education, especially in biology education, where discussions of human development, reproduction and sexual health can be situated in scientific explanations. Effective CSE helps students acquire accurate health knowledge and develop attitudes that support healthy relationships (Anderle et al., 2025; Haberland et al., 2015). CSE also aligns with the Sustainable Development Goals (SDGs) by promoting quality education (SDG 4) and health and wellbeing (SDG 3) (UNESCO, 2018).

Although the importance of CSE is widely recognised, its implementation in the classroom has not been optimal. Teaching tends to focus on biology content, without considering social, ethical and emotional dimensions. Many teachers are uncertain about the extent to which they can take a pedagogical role, how society will respond to discussions of sexuality-related topics, and the possible professional consequences that may arise, even if sexuality education is formally supported by policy (Keogh et al., 2021; Shibuya, Sari et al., 2023). These challenges create a gap between curriculum intentions and classroom practice.

The silence around sexuality in science classrooms has consequences that go beyond simply ignoring certain content. In this study, this situation is referred to as instructional silence, which describes the tendency of teachers to avoid, minimise or redirect classroom discussions of sexuality-related topics despite the curricular relevance of these topics. Regulations on science content discussions leave students with little understanding of biological processes relevant to them. In the absence of guided dialogue, students are likely to develop their own ideas based on informal sources or assumptions, which may not be in full accordance with scientific principles (Nehm, 2025). These situations can weaken students' understanding of and their ability to think deeply about how science connects to real-world issues.

Recent research highlights the role of teachers' emotional experiences, personal capacity and institutional conditions in shaping their engagement with sexuality-related topics (Burić & Frenzel, 2023; De Haas & Hutter, 2019; Macleod & Du Plessis, 2024). In sensitive sociocultural contexts, discussions of sexuality may evoke embarrassment, anxiety or concern about community reactions, while teachers' confidence and perceived professional risks influence whether these topics are addressed in classroom practice (Shibuya, Sari et al., 2023). These emotions often relate to teachers' confidence about managing sensitive discussions and to institutional support or perceived professional risk (Hornyák, 2025; Ramos et al., 2025).

Studies have documented various emotional, personal and institutional barriers; however, these factors are often examined separately. While empirical research has identified individual barriers to CSE implementation, less theoretical attention has been paid to how these barriers interact in teachers' professional decision-making. Consequently, little theoretical attention has been given to how these barriers interact in everyday teaching practice, thus leaving the persistence of instructional silence in science classrooms insufficiently explained. Understanding these interactions is important, not only for clarifying the dynamics of teachers' instructional decision-making, but also for informing professional support and instructional interventions that enable teachers to engage more confidently with sexuality-related topics.

To address this gap, this review aims to (1) Identify patterns of emotional, personal and motivational barriers facing the integration of CSE in science education; (2) Examine how these barriers influence teachers' instructional engagement with sexuality-related topics; and (3) Analyse how these barriers interact to sustain instructional silence in science classrooms. The study employed a systematic qualitative synthesis of empirical research and, based on this synthesis, developed a pathway framework that explains how these interacting barriers shape teachers' instructional responses in science education contexts.

The remainder of this paper presents the theoretical background, which is followed by an explanation of the methodology that was followed, the results, and a discussion of the findings and their implications. Guided by this framework, this review addresses the following research questions.

- 1) What patterns characterise emotional, personal and motivational barriers facing the integration of CSE in science education contexts?
- 2) How do emotional, personal and motivational barriers influence teachers' instructional engagement with sexuality-related topics in science classrooms?
- 3) What implications do these patterns of barriers have for supporting teachers in integrating CSE in science education?

2. Literature Review

International frameworks developed by UNESCO position CSE as a key component of quality education and public health promotion (UNESCO, 2018, 2023). However, translating these principles into everyday classroom practice

remains a challenge, particularly in science education, where sexuality-related topics are often only briefly discussed or avoided entirely. The following section synthesises research on emotional, personal and institutional factors as they relate to teachers, in order to develop a conceptual framework that explains barriers facing CSE integration.

2.1 Emotional Barriers Facing the Teaching of Sensitive Scientific Content

Teaching culturally sensitive or morally controversial topics often places emotional demands on teachers. Studies in science education report that embarrassment, anxiety and concern about controversy shape how teachers anticipate classroom interactions and assess potential professional risk (Lutaj et al., 2024; Twyford, 2025). These emotional responses become even more pronounced when science content intersects with moral norms, religious beliefs or community expectations.

Emotional discomfort has been established to be a barrier to pedagogical transparency in relation to sex education. When they expect a reaction from parents, public scrutiny or possible moral criticism, teachers experience considerable emotional pressure. This expectation may lead to more defensive teaching, and some teachers may choose to limit or withdraw from these discussions (Burić & Frenzel, 2023; De Ruiter et al., 2021; Shibuya, Estrada, et al., 2023). Such responses are part of broader sociocultural value systems about what kinds of knowing are 'permitted' in science classrooms (Vilugrón et al., 2023). Although it is a common experience and a problem that has been addressed by several studies, the emotional discomfort of teachers does not account for how this discomfort interacts with teacher competence and contextual conditions that affect teacher decisions.

2.2 Self-Efficacy and Personal Capacity in CSE Instruction

Pedagogical psychology reveals that teachers' efficacy shapes their participation in teaching environments that are characterised by uncertainty or emotional stress. Regarding CSE, teachers' sense of self-efficacy affects how they manage discussions, respond to student questions and integrate ethical or sociological considerations alongside biological content (J. Liu et al., 2025; Narayanan et al., 2021; Teig et al., 2019). Teachers with low efficacy, in particular, tend to feel overwhelmed by these demands, especially if they lack strong pedagogical preparation (Choohe & Yangailo, 2024; Shibuya, Estrada et al., 2023).

Inadequate preparation for CSE not only reduces teachers' confidence but also leads to emotional stress and potential avoidance (Kyriacou, 2015). Even though self-efficacy has a strong effect on the teaching behaviour of teachers, many studies still discuss teachers' emotions and personal competencies separately. As a result, the reciprocal relationship between emotional distress and teacher confidence is obscured and, thus, the mediating role of self-efficacy in CSE instruction has not been thoroughly examined.

2.3 Institutional and Policy Contexts Shaping CSE Implementation

Several studies have shown that the institutional and policy environment influences teachers' motivation and the way they teach CSE. Studies on

curriculum implementation suggest that classroom practice is influenced by not only teachers' personal beliefs or competencies, but also by the clarity of policy expectations, leadership support and prevailing organisational norms (Alemi et al., 2025). When curricular guidance is ambiguous or sexuality-related content is politically sensitive, teachers often adopt cautious instructional approaches to minimise professional risk (Hung, 2020).

Policy-oriented analyses of CSE implementation illustrate further how weak institutional support and fragmented guidance shift responsibility onto individual teachers. In these settings, teachers are expected to manage emotionally and morally sensitive topics with limited structural backing, which increases their sense of vulnerability in practice (Chavula et al., 2022; UNESCO, 2023). These conditions reduce their motivation to engage with CSE, even for teachers who recognise its educational value.

Despite these insights, institutional constraints are often treated in the literature as external or contextual factors, rather than as conditions that actively interact with teachers' emotional experiences and perceptions of personal capacity. As a result, studies offer limited explanation of how policy ambiguity and organisational uncertainty reinforce emotional discomfort and undermine self-efficacy in everyday classroom decision-making.

2.4 Towards an Interactional Understanding of Barriers Facing CSE Integration

In this review, instructional silence refers to situations in which teachers avoid, minimise or redirect classroom discussions of sexuality-related topics despite the curricular relevance of these topics. Such responses often emerge when teachers navigate issues that carry emotional, cultural, or professional risks. When determining how sensitive topics are addressed in classroom settings, instructional silence reflects more than a lack of knowledge, and can be understood as part of teachers' broader pedagogical decision-making processes.

Research on CSE in science education suggests that a single factor rarely shapes teachers' instructional responses to sexuality-related topics. Instead, these responses emerge from the interaction between emotional experiences, perceived personal capacity and institutional conditions. Emotional discomfort often emerges when sexuality-related topics intersect with moral expectations or community norms. Teachers report experiencing embarrassment, anxiety and concern that such discussions may provoke controversy (Burić & Frenzel, 2023; Pratiwi et al., 2025). Teachers' willingness to engage with these topics is closely linked to their confidence in handling sensitive classroom interactions. Uncertainty about how to respond to students' questions or manage discussion can cause teachers to proceed cautiously, especially when conversations extend beyond explanations of biology (Li et al., 2022; Sealy, 2019).

School conditions also shape these decisions. Clear curriculum guidance, supportive leadership and a sense of professional security make teachers more comfortable about addressing contested issues, whereas limited support often encourages more cautious engagement (Alemi et al., 2025). These influences are

shaped further by broader education and sociocultural contexts. Teachers working at different education levels or in different cultural environments may encounter distinct expectations, sensitivities and institutional constraints when they teach sexuality-related topics in science classrooms.

Building on this interactional perspective, the present review synthesises studies on the topic to develop a pathway framework to explain how emotional experiences, perceived personal capacity, particularly self-efficacy, and institutional conditions combine to shape teachers' instructional responses in science education.

3. Methodology

3.1 Research Design

This review was designed as a systematic qualitative synthesis of literature to examine emotional, personal and motivational barriers to teachers' engagement with CSE in science education. A qualitative synthesis approach was used to combine findings from studies with diverse methods while preserving context and interpretive depth, particularly for understanding affective and sociocultural aspects of education (Braun & Clarke, 2008; Thomas & Harden, 2008).

The review process was guided by the PRISMA 2020 framework and, to ensure transparency and methodological rigour, included the stages of identification, screening, eligibility assessment and inclusion (Page et al., 2021). An a priori review protocol informed the formulation of the research question, eligibility criteria, data sources, screening procedures, quality appraisal and analytic strategy, according to established guidance for systematic reviews in education and the social sciences (Višić, 2022).

This research does not cover all publications on sexuality education; instead, it focused on research that had been peer-reviewed and presents empirical evidence and clear conceptual contributions. The findings are presented as an integrative synthesis to identify recurring emotional, personal and motivational barriers facing CSE integration in science classrooms, consistent with established approaches to qualitative evidence synthesis (Thomas & Harden, 2008; Sandelowski et al., 2012). Drawing on the 30 included studies, the analysis also develops a pathway framework that explains how these interacting barriers contribute to patterns of instructional silence in science education.

3.2 Inclusion and Exclusion Criteria

Article selection was based on inclusion and exclusion criteria to ensure relevance and quality. The characteristics of the included studies are summarised in Table 1, and is followed by a brief narrative explaining the rationale for these criteria.

Table 1: Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Study focus	CSE or sexuality education in science/biology education	Studies outside science or biology education
Target group	Teachers or pre-service teachers	Non-teaching populations
Analytical focus	Emotional, personal, or motivational influences on CSE engagement	Studies without affective or motivational analysis
Study type	Empirical studies or relevant conceptual analyses	Studies lacking empirical or conceptual relevance
Publication type	Peer-reviewed journal articles	Non-peer-reviewed publications
Language and access	English, full text available	In languages other than English or full text inaccessible
Methodological quality	Adequate methodological transparency	

3.3 Information Sources and Search Strategy

The literature search followed PRISMA 2020 guidelines and established standards for transparent evidence synthesis (Page et al., 2021; Višić, 2022). The search strategy for research on CSE was applied using a variety of terms to identify relevant studies. This approach allowed the inclusion of research addressing emotional, personal or motivational barriers, even when these were not explicitly labelled (Cooper et al., 2018).

Search terms were applied to titles, abstracts and keywords to capture studies that address affective or motivational aspects of teaching practice (Rathbone et al., 2017). Searches were conducted in Scopus, ERIC and SciELO, which provide extensive coverage of peer-reviewed research in science education and teacher education. The search period covers publication from January 2015 to December 2025, and consolidated research on teacher emotion and self-efficacy and recent developments in CSE implementation studies.

Relevant studies indexed in other databases or grey literature may not have been captured. To enhance transparency and reproducibility, database-specific Boolean search strings were developed and are reported in Table 2.

Table 2: Search Strategy Across Databases

Database	Search Strategy
Scopus	TITLE-ABS-KEY ("comprehensive sexuality education" OR "sexuality education" OR "sexual and reproductive health education") AND TITLE-ABS-KEY ("science education" OR "biology education" OR "science classroom") AND TITLE-ABS-KEY ("teacher barriers" OR "emotional factors" OR "self-efficacy" OR "motivation" OR "teacher beliefs")
ERIC	("comprehensive sexuality education" OR "sexuality education") AND ("science education" OR "biology education") AND ("teacher beliefs" OR "emotional barriers" OR "motivation")
SciELO	("sexuality education" OR "reproductive health education") AND ("science education")

No additional records were identified through other methods such as citation searching, manual searching or grey literature sources. Accordingly, the corresponding fields in the PRISMA flow diagram are reported as zero.

3.4 Study Selection Process

Retrieved records were imported into a reference manager and duplicates were removed. Study selection was conducted in two sequential stages. Titles and abstracts were, first, screened against the inclusion criteria. Full-text articles were examined to confirm conceptual relevance, methodological adequacy and analytical transparency. To enhance reliability and minimise the potential for selection bias, the screening process was reviewed independently by a second researcher, and any discrepancies were resolved through discussion until consensus was reached.

Reasons for exclusion at the full-text stage were recorded and categorised. Numerical outcomes are reported in the Results section and summarised in the PRISMA flow diagram (Figure 1), rather than described in detail here (Page et al., 2021). The analysis focused on identifying and examining three analytical categories reported across the literature: emotional barriers, personal capacity-related barriers and motivational or institutional constraints, and on how these factors interact in shaping teachers' instructional engagement with sexuality-related topics.

3.5 Quality Appraisal

A methodological quality appraisal was conducted to support the transparent interpretation of the evidence. The Critical Appraisal Skills Programme (CASP) qualitative checklist was used as the main tool to evaluate the study. Key domains are research aims, methodological appropriateness, data sources, analytical rigour and coherence between data and interpretation (CASP, 2018).

Each study was appraised to assess the extent to which its methodological and analytical features supported a trustworthy interpretation of the findings. For mixed-methods and conceptual studies, the appraisal focused on qualitative components and the coherence of analytical arguments. The results informed the weighting of findings in the synthesis; studies demonstrating greater transparency and rigour contributed more to theme development (Frias-Goytia et al., 2024; Thomas & Harden, 2008). Quality appraisal outcomes are reported in the Results section, where studies are categorised by methodological quality.

3.6 Data Extraction and Synthesis

Data were extracted using a structured extraction matrix that captures publication year, country or region, education context, participant characteristics, study design and reported barriers to CSE implementation. Particular attention was given to how emotional, personal and motivational barriers were conceptualised, operationalised and related to instructional decision-making by each study.

A thematic synthesis was applied to synthesise findings across studies (Thomas & Harden, 2008). Deductive coding was guided by the predefined domains of emotional, personal and motivational barriers, while inductive coding allowed

additional subthemes and interaction patterns to emerge from the data. By using iterative comparison and refinement, emerging themes were integrated into a framework that describes how emotional, personal and motivational barriers are mediated to influence teacher engagement in CSE. This analysis process conforms to recommended standards for qualitative evidence synthesis conducted with iterative interpretation and conceptual integration across studies (Noyes et al., 2018).

Coding was conducted iteratively. Text segments describing barriers to CSE implementation were, first, coded under the predefined domains of emotional, personal and motivational barriers. During subsequent rounds of analysis, these codes were compared across studies to identify recurring patterns and additional subthemes. For example, descriptions of embarrassment, discomfort or fear of controversy were initially coded under emotional barriers and later grouped into broader themes related to teachers' affective responses to sensitive classroom discussions. Through this iterative comparison, related codes were organised into broader thematic categories that informed the integrative synthesis.

4. Results and Findings

4.1 Study Selection Results

The reviewed studies identify three categories of barriers that shape CSE integration in science education: emotional, personal and motivational. These findings combine descriptive patterns with analytical interpretation, thereby supporting a coherent reading of the evidence. A total of 842 records were identified across the databases. After duplicate removal, screening and eligibility assessment, 30 studies met the inclusion criteria for qualitative synthesis. The full selection process is presented in the PRISMA flow diagram (Figure 1).

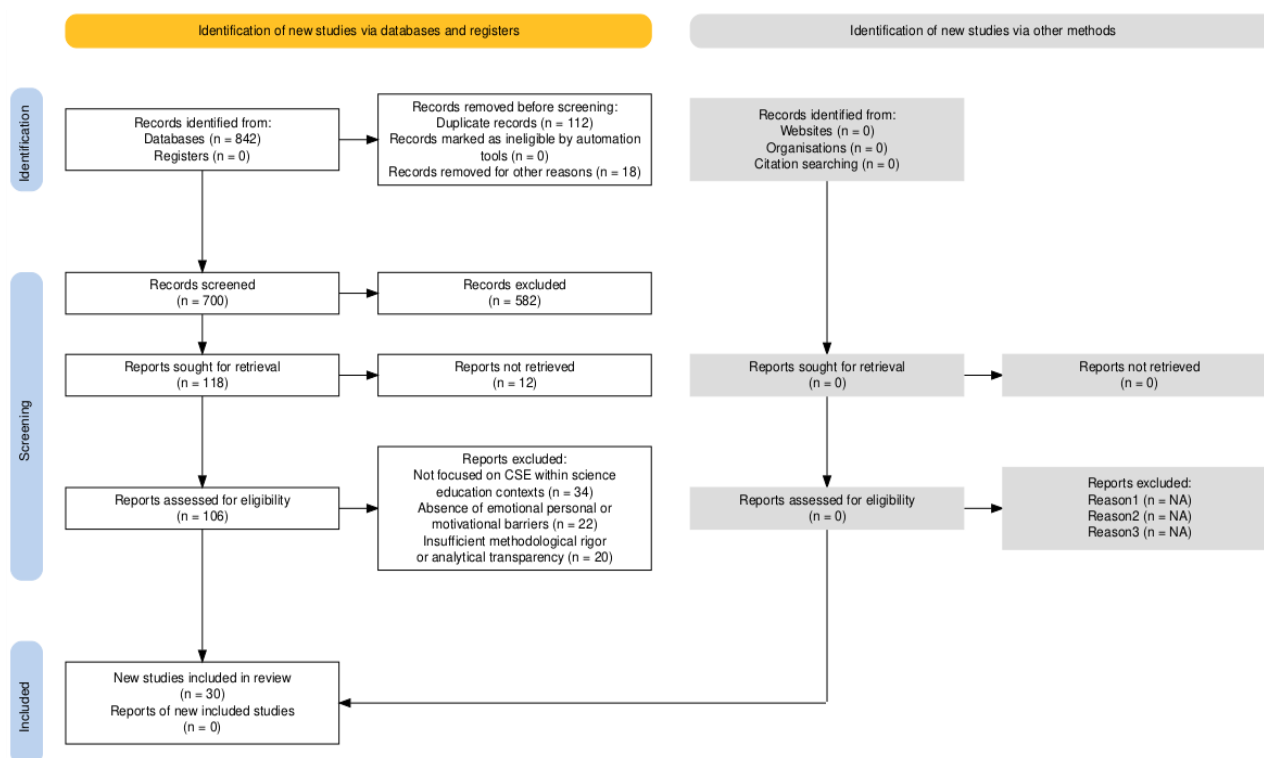


Figure 1: PRISMA 2020 Flow Diagram for Study Selection

4.2 Characteristics and Contextual Distribution of the Included Studies

This subsection provides an overview of the key features of the included studies by geographical distribution, education contexts, participant groups and methodological approaches. An overview of the characteristics of the 30 studies that were included, including geographical distribution, education settings, participant profiles and methodological designs, is presented in Table 3.

Table 3: Characteristics of Included Studies

Authors, year of publication	Country / setting	Participants / sample	Study design / method	Identified barriers
Adebayo et al., 2022	Nigeria	Educators and stakeholders	Qualitative study	Motivational (community resistance influencing teacher engagement)
Adekola, 2024	Global	Teachers	Qualitative study	Personal (training gaps); Emotional (discomfort); Motivational (perceived lack of institutional backing)
Alekhyia et al., 2025	India	Secondary school teachers	Qualitative study	Emotional (moral discomfort); Personal (limited instructional competence); Motivational (fear of professional backlash)

Authors, year of publication	Country / setting	Participants / sample	Study design / method	Identified barriers
Black et al., 2024	Canada	Teachers	Qualitative study	Motivational (perceived lack of support); Emotional (risk-related anxiety)
Bourke et al., 2025	Ireland	Student teachers	Survey study	Personal (low perceived knowledge); Emotional (low comfort); Motivational (low teaching readiness)
Chavula et al., 2022	Global	Policy documents and studies	Systematic review	Motivational (reduced teacher engagement linked to unclear policy support)
Costello et al., 2022	Global	Pre-service teachers	Systematic review	Personal (poor preparedness); Emotional (low instructional comfort); Motivational (limited readiness)
Descheneaux and Otis, 2021	Canada	Teachers	Quantitative survey	Personal (low self-efficacy); Motivational (weak teaching intention)
Diaz, 2024	Global	Youth-focused studies	Literature review	Motivational (implementation-related engagement constraints)
Gelehkolaee et al., 2021	Iran	Teachers and stakeholders	Qualitative study	Emotional (cultural resistance); Motivational (perceived social pressure)
Goldfarb and Lieberman, 2021	Global	Review of studies	Narrative review	Motivational (institutional resistance shaping teacher willingness)
Greene et al., 2025	United States	Teachers	Qualitative study	Emotional (anxiety); Personal (low self-efficacy); Motivational (perceived implementation constraints)
Haberland et al., 2015	Global	Multiple stakeholders	Review study	Emotional (value-based resistance); Motivational (system-level resistance as perceived by educators)
Hendriks et al., 2024	Australia	Parents and educators	Quantitative study	Motivational (anticipated parental opposition);

Authors, year of publication	Country / setting	Participants / sample	Study design / method	Identified barriers
				Emotional (fear of controversy)
Holt et al., 2025	United States (Texas)	Teachers & administrators	Mixed-methods	Motivational (perceived policy resistance and professional risk)
Kagola, 2024	South Africa (Eastern Cape; Foundation Phase schools)	South Africa (Eastern Cape; Foundation Phase schools)	South Africa (Eastern Cape; Foundation Phase schools)	Emotional (gendered discomfort); Personal (role-related uncertainty); Motivational (perceived professional vulnerability)
Kim et al., 2023	Global	Multiple studies	Meta-analysis	Motivational (implementation-related engagement challenges)
Koch and Beyers, 2023	South Africa	Teachers	Qualitative study	Emotional (tension); Personal (instructional uncertainty); Motivational (perceived legitimacy concerns)
Koch et al., 2021	South Africa	Teachers	Systematic review	Motivational (policy practice tension affecting teacher engagement)
Lafontan et al., 2024	Nepal	Teachers and school stakeholders	Qualitative study	Emotional (taboo-related anxiety); Personal (limited pedagogical competence); Motivational (perceived lack of support)
Macleod and Du Plessis, 2024	Crisis-affected settings	Teachers	Qualitative study	Personal (insufficient training); Motivational (perceived absence of systemic support)
Mukoro et al., 2025	Global	Teachers, parents, policymakers	Systematic review	Emotional (moral discomfort); Motivational (stakeholder resistance influencing instruction)
Pillay and Mfid, 2024	South Africa	Life orientation teachers	Qualitative study	Motivational (limited intersectoral collaboration affecting engagement)
Pound et al., 2017	United Kingdom	Teachers, students, parents, stakeholders	Qualitative evidence synthesis	Emotional (discomfort, anxiety); Personal (low

Authors, year of publication	Country/setting	Participants/sample	Study design/method	Identified barriers
				confidence, limited preparation); Motivational (perceived lack of institutional support)
Rossouw, 2024	South Africa	Life orientation teachers	Qualitative study	Emotional (value conflict); Personal (pedagogical uncertainty); Motivational (perceived professional risk)
Shibuya, Estrada et al., 2023	Indonesia	School teachers	Qualitative study	Emotional (fear, discomfort); Personal (limited preparedness); Motivational (anticipated community reaction)
Shibuya, Sari et al., 2023	Global	Teachers (various contexts)	Qualitative systematic review and meta-synthesis	Emotional (moral conflict, discomfort); Personal (low confidence); Motivational (perceived social pressure)
Siqwavu and Ngobeni, 2025	South Africa	Secondary school teachers	Qualitative study	Personal (low confidence); Emotional (discomfort); Motivational (perceived community expectations)
Van Reeuwijk et al., 2023	Global	Policy and implementation cases	Review study	Motivational (absence of enabling environment for teacher action)
Venketsamy and Kinear, 2018	South Africa	Primary school teachers	Qualitative study	Personal (limited instructional skills); Emotional (anxiety)

Based on the CASP quality appraisal, the majority of the included studies demonstrated moderate to high methodological quality. Of the 30 reviewed studies, 18 were assessed as high quality, 9 as moderate quality, and 3 as lower quality. The appraisal results were used to inform the interpretation of findings rather than to exclude studies from the synthesis.

4.3 Contextual and Educational Distribution

The reviewed studies span a wide range of sociocultural contexts, with a notable concentration in the Global South, particularly South and Southeast Asia and sub-Saharan Africa. Data show that cultural, religious and community norms shape the inclusion of sexuality education in the classroom. These norms shape what can

be discussed and who may address it, and often limit open discussion of sexuality-related topics (Goldfarb & Lieberman, 2021; Haberland et al., 2015).

Most studies examined sexuality education in formal school-based science or biology classrooms, while a smaller number focused on pre-service teacher education. In each of these cases, sex education is primarily conceptualised as biological – social, emotional, and moral aspects are ignored or sidelined. The implication of this pattern is that instructional silence is shaped by the cultural and institutional conditions surrounding science teaching, rather than primarily by the individual choices of teachers (Kagola, 2024; Mukoro et al., 2025).

4.4 Methodological Characteristics of the Included Studies

The analyses of the studies reviewed indicates that qualitative approaches were predominantly implemented through interviews, focus groups, classroom observations and case studies. This is particularly evident in socioculturally sensitive education contexts, where exploring teachers' emotions, beliefs, professional identities and motivations requires careful attention to lived experiences and contextual nuances.

A small number of investigations used quantitative or mixed-methods designs; surveys were, generally, employed to investigate self-efficacy, perceived preparedness and instructional intentions concerning CSE (Bourke et al., 2025; Descheneaux & Otis, 2021). This methodological approach suggests that research on affective and motivational barriers facing sexuality education is interpretive and highly context dependent. However, quantitative approaches still play a complementary role, particularly in describing broader trends among teachers. Therefore, these dimensions are generally measured through qualitative and mixed-methods approaches that emphasise teachers' experiences and professional judgement.

4.5 Research Question 1: Patterns of Emotional, Personal, and Motivational Barriers Facing CSE Integration

Analysis of the reviewed studies identified three categories of barriers shaping CSE integration in science education: emotional, personal, and motivational factors. These barriers rarely appeared alone. Many studies reported several barriers occurring simultaneously in the same educational settings. Table 4 summarises how frequently each type of barrier appeared across the literature.

Emotional barriers appeared in 18 of the 30 studies (60%; see Table 4). Teachers described experiencing a range of affective responses when they addressed sexuality-related topics in science classrooms. Feelings of embarrassment, anxiety, moral unease and fear of controversy were reported repeatedly (Alekhya et al., 2025; Bourke et al., 2025; Lafontan et al., 2024; Rossouw, 2024; Shibuya, Estrada, et al., 2023; Shibuya, Sari et al., 2023). Concerns often emerged when teachers anticipated reactions from parents, school leaders or local communities. Some worried about public scrutiny. Others mentioned the possibility of moral judgement or professional misunderstanding if they discussed sexuality in science lessons (Black et al., 2024; Hendriks et al., 2024; Mukoro et al., 2025; Pound et al., 2017). These concerns shaped classroom practice in noticeable ways.

Discussions were sometimes shortened, sensitive questions were avoided, and lessons were confined to biological explanations of reproduction (Goldfarb & Lieberman, 2021; Venketsamy & Kinear, 2018). Similar patterns appeared in studies conducted in Africa, Asia, Europe and North America. Emotional discomfort, therefore, does not seem to be limited to a particular cultural or policy context (Bourke et al., 2025; Costello et al., 2022; Kagola, 2024).

Personal barriers were reported by 14 studies (46.7%). Most of these barriers were linked to teachers' perceptions of their own instructional capability. Limited self-efficacy, uncertainty about pedagogical strategies and doubts about how to guide classroom discussions were frequently mentioned (Adekola, 2024; Costello et al., 2022; Descheneaux & Otis, 2021; Macleod & Du Plessis, 2024). Pre-service and experienced teachers described similar concerns. Many were confident explaining biological processes yet hesitated when discussions moved towards ethical questions, relationships or sociocultural aspects of sexuality. Responding to students' questions also proved challenging for some teachers, particularly when conversations became unpredictable or emotionally sensitive (Bourke et al., 2025; Shibuya, Estrada, et al., 2023; Venketsamy & Kinear, 2018). Evidence from quantitative and mixed-methods research points in the same direction. Lower perceptions of instructional competence were associated with weaker intentions or readiness to teach CSE (Bourke et al., 2025; Descheneaux & Otis, 2021).

Motivational barriers appeared most frequently, as reported by 24 of the 30 studies (80%; Table 4). Teachers often described uncertainty surrounding curriculum expectations, receiving little administrative support and concerns about opposition by parents or community members (Adebayo et al., 2022; Chavula et al., 2022; Holt et al., 2025; Van Reeuwijk et al., 2023). In some schools, teachers perceived little institutional protection in relation to sexuality education. Under such conditions, engagement with CSE tended to become cautious. Lessons were shortened, discussions avoided or responsibility shifted to external actors such as visiting health educators or specialised facilitators (Goldfarb & Lieberman, 2021; Pillay & Mfid, 2024; Pound et al., 2017). Emotional unease, little instructional confidence and institutional uncertainty frequently appeared together within the same studies, which suggests that these barriers often operate in combination rather than as separate influences.

Table 4: Frequency of Barrier Categories Identified in the Reviewed Literature

Barrier Category	Number of Studies (n = 30)	Percentage (%)
Emotional barriers	18	60.0%
Personal barriers	14	46.7%
Motivational barriers	24	80.0%

Note. Percentages represent the proportion of reviewed studies reporting each barrier category. As studies may contribute to multiple categories, totals should not be summed and may exceed 30; however, all values remain within the total number of studies (n = 30).

4.6 Research Question 2: Influence of Barriers Facing Teachers' Instructional Engagement with Sexuality-Related Topics

Several studies describe a similar tendency of sex education being increasingly focused on biology. Teachers commonly focused on anatomical structures or

reproductive processes, while discussions about relationships, gender identity, ethical questions or the broader social dimensions of sexuality received far less attention. In several studies, this narrowing of content is presented as a practical way to manage potential controversy. By limiting explanations to biology, teachers can meet curriculum requirements while avoiding topics that may be viewed as morally or socially sensitive (Goldfarb & Lieberman, 2021; Venketsamy & Kinear, 2018).

Another pattern was seen in the management of classroom dialogue. Teachers are often uncertain when their students ask questions about sexuality, for instance, about the scientific accuracy of teacher responses and about how they, as teachers, should respond to such questions in a manner that is pedagogically and socially appropriate. Therefore, classroom discussion is prone to be more directed. Teachers were unapologetic about limiting the response to a few facts; in other cases, they were more teacher-centred. Broader questions that could branch off into more extensive discussions were redirected or were not taken up (Bourke et al., 2025; Shibuya, Estrada et al., 2023). In this way, the topic was still acknowledged but the possibility of a discussion that teachers were unprepared to handle was minimised.

In other situations, teachers choose to delay or ignore the topic. A review of several studies found that teachers shortened lessons, skipped certain themes or postponed discussions when they anticipated resistance from parents, the community or school leaders (Black et al., 2024; Hendriks et al., 2024; Mukoro et al., 2025). Responsibility for addressing sexuality education was occasionally transferred to external professionals such as health practitioners or visiting specialists. This arrangement appeared especially common when teachers perceived limited institutional backing for handling the topic within their own classrooms (Pillay & Mfid, 2024; Pound et al., 2017).

According to the literature review, teachers consistently expressed concerns about professional risk. Decisions about whether and how to address sexuality-related topics were rarely driven by a single consideration. Emotional discomfort, uncertainty about teaching readiness, and limited reliance on institutional support often coexisted and intertwined. Considering these overlapping pressures, teachers made decisions about whether to include sexuality-related topics and also adjusted how the content was introduced and discussed in the classroom. These patterns suggest that teachers' engagement with sexuality-related topics is not simply determined by willingness, but is shaped by how they navigate overlapping emotional, instructional and institutional pressures in practice.

4.7 Research Question 3: Interaction of Barriers Sustaining Instructional Silence in Science Education Contexts

Synthesis of the literature review suggests that emotional, personal or motivational barriers were commonly mentioned collectively rather than individually. Several studies documented the presence of multiple barriers in a single context, such as emotional unease, lack of confidence or readiness to teach and feeling unsupported by the institution (Koch & Beyers, 2023; Pound et al.,

2017; Shibuya, Sari et al., 2023). These trends indicate that constraints on CSE implementation often arise as a nexus of related factors that influence how teachers interact with sexuality-related topics.

Similar patterns of co-occurrence were reported for diverse sociocultural and policy environments. Studies conducted in different regions described overlapping affective, personal and institutional conditions influencing teachers' engagement with CSE in science classrooms (Kagola, 2024; Mukoro et al., 2025; Siqwavu & Ngobeni, 2025). In these contexts, emotional discomfort, perceived lack of pedagogical confidence and concerns about institutional or community reactions were often described together within the same instructional settings.

Table 5 summarises the way different categories of barriers were identified together in the literature. These descriptive patterns indicate that instructional silence around sexuality-related topics is often associated with the simultaneous presence of emotional, personal and motivational constraints. These co-occurrence patterns describe how barriers appear together in the literature but do not explain their causal relationships. Interpretation of these relationships is developed further in the Discussion section.

Table 5: Interaction Patterns Between Emotional, Personal and Motivational Barriers Facing CSE Integration

Primary Barrier	Associated Barrier	Reported Interaction in the Literature
Emotional discomfort (e.g., anxiety, embarrassment)	Low self-efficacy	Emotional tension reduces confidence to manage sexuality-related discussions and encourages avoidance
Emotional discomfort	Motivational withdrawal	Heightened emotional strain increases sensitivity to perceived professional risk and reduces willingness to engage with CSE
Low self-efficacy	Motivational constraints	Limited instructional confidence weakens motivation to teach CSE, especially if institutional support is limited
Motivational constraints (e.g., policy ambiguity, community resistance)	Emotional avoidance	Weak institutional endorsement amplifies teachers' anxiety when they address sexuality-related topics
Motivational constraints	Personal uncertainty	Ambiguous curriculum guidance reinforces uncertainty about pedagogical boundaries
Emotional and personal barriers combined	Sustained instructional silence	Emotional discomfort and low confidence stabilise silence as a professional response

5. Discussion

5.1 Patterns of Emotional, Personal and Motivational Barriers Facing CSE Integration

Research on the integration of CSE in science classrooms consistently points to three sources of difficulty, namely motivational conditions, emotional responses and teachers' perceptions of instructional capability. Motivational barriers appear most frequently in the reviewed studies, followed by emotional discomfort and then personal capacity challenges. This suggests that teachers' engagement with sexuality-related topics is shaped not only by individual beliefs or knowledge but also by institutional expectations and sociocultural pressures surrounding science teaching.

Motivational barriers are more likely to be evident when curriculum guidelines are vague or institutional support is weak. Situations like these often result in teachers bracing themselves for opposition from parents or community members at large, and lead to questions about how closely they can engage with the subject matter. Even when teachers recognise the importance of sexuality education, their responses tend to be cautious in situations where professional expectations are not clearly defined. Research on curriculum implementation also indicates that teachers' instructional decisions are closely linked to their sense of organisational support and professional security (Hannah et al., 2022).

Emotional distress is commonly reported when sexuality-related topics are brought up in science classrooms. Feelings such as shame, anxiety or concern about controversy tend to emerge, especially when these topics intersect with prevailing cultural norms or moral expectations. This trend is consistent with the wider literature around teacher emotions, which indicates that social-political topics, in particular, can exacerbate feelings of professional visibility and vulnerability in the classroom (Burić & Frenzel, 2023).

Perceived teaching competence, furthermore, shapes how teachers engage in discussions about sexuality. When teachers feel unsure about responding to students' questions or facilitating dialogue around the ethical and social dimensions of sexuality, teachers often limit the depth of classroom interactions. This can be understood as a form of professional caution, in which reduced engagement serves as a way to maintain control over potentially sensitive discussions. Similar findings are reported by Narayanan et al. (2021), who report that perceived competence plays a central role when teachers encounter topics characterised by uncertainty and emotional sensitivity.

Some studies report the opposite situation, namely that teachers continue to address sexuality-related topics despite experiencing emotional or institutional constraints. Prior professional development, supportive school leadership or strong commitments to student wellbeing appear to enable more open classroom discussion (Bourke et al., 2025; Koch & Beyers, 2023). These cases demonstrate that barriers do not inevitably produce avoidance and that teacher agency can moderate contextual pressures. Several studies report that limited instructional time, dense curricula and competing academic priorities sometimes discourage

extended engagement with sexuality-related topics (Teig et al., 2019). Under these conditions, instructional silence may reflect pragmatic classroom management decisions rather than solely emotional or motivational resistance. Overall, the reviewed studies indicate that barriers to CSE integration rarely stem from a single factor. Instead, emotional responses, perceived capability and contextual conditions interact to shape teachers' instructional decisions, as reflected in the pathway model proposed in this review (Figure 2).

5.2 How Barriers Shape Teachers' Instructional Engagement with Sexuality-Related Topics

The literature reviewed suggests that barriers rarely lead teachers to excise sexuality-related topics from science instruction. Instead, the content remains present but is handled cautiously, and instructional adjustments are made to reduce perceived professional or social risk.

A recurring pattern involves narrowing the instructional scope, and sexuality-related topics are often confined to explanations of biology. This approach can be seen as a strategic response to perceived professional and social risk; focusing on biology content offers curricular legitimacy and reduces the likelihood of value-based disagreement (Flynn et al., 2011; Goldfarb & Lieberman, 2021). This tendency is also reflected in the way classroom interactions are managed. When sexuality-related questions arise, teachers may limit discussion, restrict the exchange of opinions or redirect conversation to less sensitive, more factual content. In doing so, classroom dialogue is carefully controlled to avoid controversy and manage the unpredictability of socially sensitive discussions.

How teachers respond is closely tied to how prepared they feel. When confidence about handling sensitive questions is limited, discussion tends to remain at a surface level, particularly in relation to the social and ethical dimensions of sexuality (Baillie & Gebre, 2023; Tsang et al., 2012). This finding is in line with social cognitive theory, which posits that perceived ability is an important determinant of behaviour, especially in uncertain situations (Schunk & DiBenedetto, 2021). At the same time, these responses are not formed in isolation; they are shaped by sociocultural contexts that set boundaries on what can be discussed and how far discussion can develop (Choobe & Yangailo, 2024; Zulu et al., 2019).

Impending instructional decisions, therefore, are not solely influenced by pedagogy, because teachers negotiate competing education, emotional, cultural, and institutional priorities. Similar patterns appear in other socio-scientific contexts that require classroom dialogue to be carefully managed to handle potentially controversial issues (Hung, 2020; Sadler et al., 2016). Such conditions influence not only whether sexuality-related topics are discussed at all, but also how they are addressed. As a result, discussion is often limited in ways that constrain more open and exploratory inquiry.

5.3 Interaction of Barriers and the Emergence of Instructional Silence

The reviewed studies show that barriers to CSE integration rarely operate in isolation. Emotional discomfort, perceived instructional capability and

motivational conditions frequently appeared together within the same teaching situations (Koch & Beyers, 2023; Pound et al., 2017; Shibuya, Sari et al., 2023). Rather than functioning as separate constraints, these factors form an interconnected system that shapes how teachers interpret and respond to sexuality-related topics in the classroom.

Similar patterns appear in the way these factors interact and influence teaching decisions. Emotional discomfort often emerges first, particularly when sexuality-related topics intersect with sociocultural expectations or moral norms. Feelings of embarrassment or anxiety can create hesitation at the point where classroom discussion begins. In this context, the perception of teachers' instructional competence becomes more ambiguous. When educators do not have guidance on how to address sensitive questions or facilitate open discussion, they may feel the emotional weight of the uncertainty even more strongly and their ability to engage their students on the depth of the matter may be limited (Burić & Frenzel, 2023).

This change in what is seen as possible occurs not only at the individual level but also influences the way teachers make sense of their professional context. When curriculum guidance is unclear or institutional support is limited, uncertainty is often interpreted as professional risk, and leads to teachers restricting their engagement despite recognising the value of sexuality education (Choobe & Yangailo, 2024; Zulu et al., 2019). Instead of withdrawing completely, teachers adjust their practice by shortening, redirecting or limiting discussion to less contested content. Over time, these repeated adjustments may stabilise into instructional silence.

Thus, instructional silence is more accurately seen as a result of competing pressures, instead of a matter of decision-making. It is the result of emotional discomfort, perceived limitations in instructional capability and contextual uncertainty. Comparable interactional patterns have been reported elsewhere in socio-scientific contexts where teachers manage classroom discussion when they address contentious or sensitive matters (Hung, 2020; Sadler et al., 2016).

The pathway model presented in Figure 2 is grounded in recurring patterns identified across the reviewed studies, particularly the consistent co-occurrence of emotional discomfort, perceived capability and contextual constraints reported in diverse settings. These interaction patterns correspond closely to the co-occurrence trends summarised in Table 5, which indicates that emotional, personal and motivational barriers were frequently reported together and linked to patterns of instructional adjustment and silence.

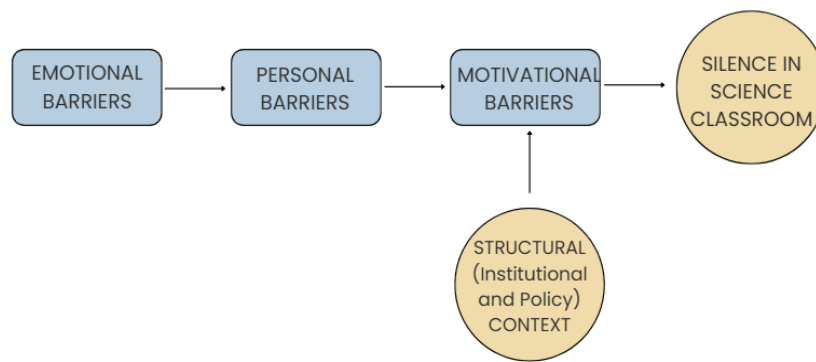


Figure 2: Conceptual Pathway Model of instructional Silence in Science Classrooms

Importantly, the strength of these interactions is shaped by context. In education settings where curriculum guidance is clear, teacher preparation is sufficient and institutional support is visible, these constraints tend to weaken. By contrast, in contexts where sexuality education remains socially contested or policy direction is unclear, emotional discomfort and motivational uncertainty more readily translate into cautious engagement or silence (Mukoro et al., 2025; Siqwavu & Ngobeni, 2025). This suggests that the model may operate differently in different contexts, and its effects are moderated by the level of institutional and sociocultural support available to teachers.

Analysing barriers as a system of interacting elements also sheds light on why so much instructional silence still exists in science classrooms. Teachers' decisions are shaped not by a single factor, but by a combination of emotional responses, perceived capability and institutional conditions. Thus, responding to these challenges needs a concerted effort beyond preparing individual teachers, and should include clearer curriculum guidance, time- and context-appropriate approaches to building confidence in managing sensitive discussions and stronger institutional support at schools. These findings suggest that the model may be less applicable in contexts with strong institutional support, clear curriculum guidance and high teacher preparedness, where barrier interactions are less pronounced.

5.4 Implications and Recommendations for Practice, Policy, and Future Research

Based on the results of this review, the following recommendations for the promotion of CSE in science education may be useful. The findings indicate that improving the realisation of CSE cannot be founded solely on teachers' knowledge of content, because hesitation is shaped by emotional, professional and institutional factors. The support, then, needs to go beyond just pedagogical knowledge and skills to include being prepared to discuss sensitive topics and to deal with the realities of the classroom. This means that teacher education should focus less on teaching content and more on working to develop confidence about dialogue and offering ways to deal with encounter diverse views and experiences of managing uncertainty. Stronger guidance is also required at the curriculum and policy levels to address the ambiguity raised by a number of studies.

Curriculum frameworks could also include real-life examples that illustrate how sexuality-related topics can be covered through science education (e.g., providing discussion questions, connections to health literacy and sensitive pedagogical approaches contextually adapted). Ambiguous instructions or guidelines often cause teachers to refrain from or prevent more open discussions. Hence, stronger policy direction, supported by coherent training and assessment systems, would boost schools' leadership and institutional conditions, thereby further mediating the translation of these efforts into practice. Supportive leadership, professional collaboration, and positive interactions with parents and community all may mitigate risk perception and enhance teacher confidence. Successful implementation is also contingent on sufficient resources, such as teacher training, curriculum support, institutional commitment and availability of suitable materials. Without them, full implementation is unlikely.

Prospective studies could investigate how teachers' emotional reactions evolve with different teaching methods, and how school- and education system-level institutional conditions influence instructional decision-making over the course of a teacher's career. Longitudinal and cross-context research may also provide additional insight into the process through which supportive contexts emerge and are maintained.

6. Conclusion

Efforts to introduce CSE within science education are still facing barriers. Through synthesis of the reviewed studies, a series of recurring themes related to the way teachers engage with sexuality-related topics emerged. The literature consistently documents motivational barriers related to instructional decisions, emotional unease and beliefs about instructional competence, which indicates that instructional decisions may be influenced by the teacher's personal and situational factors. Rather than completely avoiding the topic, teachers often modify their instructional engagement by restricting discussions to biological aspects of reproduction and limiting broader socio-scientific dialogue. When emotional responses, perceived instructional readiness and contextual pressures converge, instructional silence may emerge as a stabilised professional response.

This study proposes a pathway model as a conceptual contribution to explain how emotional, personal and contextual factors interact over time to shape classroom practice. Viewing barriers as an interconnected system helps explain why interventions that focus on a single dimension, such as content knowledge alone, often have limited impact. From a methodological perspective, this study contributes by applying a qualitative evidence synthesis to integrate findings across diverse contexts, thereby allowing patterns of interaction to be identified beyond individual studies.

A constraint of the current review is that the social, cultural and educational settings of the included studies were not homogeneous, therefore, barriers facing the integration of CSE in the reviewed studies may manifest in practice. Moreover, the analysis was confined to peer-reviewed articles published in English, which could result in publication and language bias.

Future work to enhance the integration of CSE should focus on both the preparation of future teachers and improving the readiness of current teachers to conduct CSE discussions, and institutions and policymakers providing clearer. To enhance integration of CSE, a multi-level approach within teacher education, including curriculum design and organisational policy, is needed, instead of single-level approaches.

Conflict of Interest

The authors declare that there was no conflict of interest regarding the publication of this article.

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