education sciences

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Article

The Chicken-and-Egg Dilemma: A Review of Integrated Science and Mathematics Teacher Preparation Policy

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Abstract

Current calls to integrate science and mathematics in PK-16 education build on decades of prior initiatives, yet the United States still lacks consensus on what integration entails and consistent policies to support it. This study systematically reviews current U.S. policies to identify guidance on the: (1) preparation for teaching integrated science and mathematics, and which states offer dual or integrated science and mathematics teacher endorsements; (2) PK-12 teacher endorsements, standards, and school designations, contexts that require teachers prepared to teach integrated science and mathematics. Taken together, these questions highlight a "chicken-and-egg" dilemma between preparing teachers qualified to effectively teach science and mathematics using an integrated approach and implementing integrated science and mathematics in PK-12 schools. Findings reveal consistent recommendations for integrating the disciplines in PK-12 classrooms, but a siloed approach to preparing teachers.

Keywords: science teacher education; mathematics teacher education; teacher preparation; STEM; STEAM; policy

1. Introduction

Calls to integrate science and mathematics in PK-16 education have circulated for decades, yet U.S. policy has not kept pace with this momentum. While integration is widely promoted as a way to increase student engagement, strengthen problem-solving skills, and prepare learners for a complex workforce, there remains little consensus on what integration entails or how to enact it at scale (National Council of Teachers of Mathematics [NCTM], 2024; Next Generation Science Standards [NGSS] Lead States, 2013; National Research Council [NRC], 2012). Six iterations of the National Survey of Science, Mathematics, Computer Science, and Engineering Education (NSSME+) have been released, but the most recent was in 2018, leaving a nearly decade-long gap until the next iteration is released in 2027 (Horizon Research, n.d.). In contrast, the European Commission recently issued a coordinated STEAM policy guide (Mazzeo Ortolani, 2025), and the European Schoolnet published a practitioner policy framework to guide integration across the European Union (Tasiopoulou, 2022). These international efforts serve as one model for how coordinated policy can support both teacher preparation and classroom practice, highlighting the fragmented approach in the United States. In this review, we are defining educational policy as the standards, professional recommendations, government arrangements, laws, and principles that govern the operation of education systems, influencing all levels of education from early childhood to professional training (Zainudin et

al., 2021). This review responds to the absence of a single PK-16 U.S. policy on integrating science and mathematics education by systematically analyzing how integration appears in state and national licensure endorsements, PK-12 standards, school designations, and teacher preparation policy.

Prior reviews of integrated science and mathematics education policy are limited. Existing syntheses have examined STEM education more broadly, often emphasizing workforce development, equity, or disciplinary reform (Conference Board for the Mathematical Sciences [CBMS], 2012; NCTM, 2020; NRC, 2001). However, these reviews have not focused specifically on how science and mathematics are integrated in licensure structures, PK-12 standards, school designations, or U.S. teacher education policy. Moreover, while international policy frameworks (Consortium for Mathematics and Its Applications & Society for Industrial and Applied Mathematics [COMAP & SIAM], 2016; European Commission, 2025) position modeling and application as inherently integrated, U.S. standards tend to present modeling as a mathematical practice with possible integrated connections, but without explicit policy guidance for integrated science and mathematics preparation (Association of Mathematics Teacher Educators [AMTE], 2017). This gap leaves questions about whether U.S. teachers are being prepared to teach science and mathematics together, or whether policy continues to reinforce disciplinary silos.

Since terminology surrounding integration varies widely across policies, it is essential to first define the key terms to ensure clarity and consistency in interpretation. Stember (1991) described a five-stage typology including intradisciplinary, cross-disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary, where each level requires more collaboration and synthesis. Inspired by this, Choi and Pak (2006), similarly distinguished between multidisciplinary work as distinct but combined, interdisciplinary work as blended with visible disciplinary parts, and transdisciplinary work as producing wholly new outcomes. Jensenius (2012) and Bailey (2025) have illustrated the different disciplinarities (intra, cross, multi, inter, trans). In addition, Scholz and Steiner (2015) and Rigolot (2020) describe "Mode 2" transdisciplinarity, in which knowledge is co-produced with non-academic stakeholders to address real-world problems. In this review, we use “integration” as an umbrella term while attending to these important distinctions in how science and mathematics may be linked. Clarifying this terminology provides a foundation for analyzing the ways integration is framed within policy documents. In the methods section, we specify the terms we included in our reviews of policy documents.

This review is guided by two research questions: (1) What policy exists regarding preparing teachers to teach integrated science and mathematics? And (2) What PK-12 policy exists regarding the teaching science and mathematics using an integrated approach, (2a) Which states offer dual or integrated teacher endorsements? (2b) Which states designate integrated PK-12 schools? (2c) In what ways do national standards for PK-12 curricula promote or impede integration? Together, these questions illuminate the policy landscape shaping how integration is conceptualized, enacted, and supported in U.S. teacher preparation and PK-12 education. By identifying the current state of U.S. integrated science and mathematics policy, this review seeks to inform ongoing policy development, highlight areas where the U.S. may lag behind international efforts, and contribute to conversations about the future of integrating science and mathematics education.

2. Methods

Education policy in the U.S. is primarily determined by individual states. Except where federal laws (e.g. Elementary and Secondary Education Act [ESEA] or Special Education [IDEA]) or U.S. Department of Education regulations (e.g., assessment requirements), often tied to federal funding, apply, each state establishes its own policy at both the state and local levels. This design of the educational landscape complicates nationwide

inquiries such as ours. Consequently, we could not rely on a single data source or uniform method to address our research questions. Instead, our approach involved reviewing multiple sources, including published policies and official education websites. The following section describes the specific data collection and analysis methods we used to investigate each of our research questions.

Our analysis of Question 1 focused on the inclusion of guidance on integrated science and mathematics teacher preparation in policy. In the United States, several professional organizations and accrediting bodies set standards and provide guidelines for preparing teachers. These policies drive the design of teacher preparation programs and courses. Therefore, the content of these policies was critical to answering our first research question.

A systematic review of policy pertaining to the preparation of science and mathematics teachers was undertaken. We selected policies that are widely recognized as authoritative, either because they establish accreditation requirements, articulate professional teaching standards, or provide national guidance on teacher preparation. The review period was limited from 2011 to 2022 to align with the release of the InTASC standards, which marked a significant policy shift in expectations for teacher preparation. Table 1 summarizes the six documents included in this review.

Table 1. Teacher Preparation Policy Documents Reviewed

Year	Organization	Policy Document	Focus Area
2022	Council for the Accreditation of Educator Preparation (CAEP)	Initial Teacher Preparation Standards	Accreditation standards for teacher preparation
2011	Council of Chief State School Officers (CCSSO)	InTASC Model Core Teaching Standards	Professional standards for teacher knowledge, skills, and dispositions
2020	National Science Teaching Association (NSTA) & Association for Science Teacher Education (ASTE)	Standards for Science Teacher Preparation	Science teacher preparation
2020	National Council of Teachers of Mathematics (NCTM)	Standards for Preparing Teachers of Mathematics	Mathematics teacher preparation
2017	Association of Mathematics Teacher Educators (AMTE)	Standards for Preparing Teachers of Mathematics	Mathematics teacher preparation
2012	Conference Board of the Mathematical Sciences (CBMS)	Mathematical Education of Teachers II (MET II)	Recommendations for mathematics teacher education

To be included in the review, the keywords "science and mathematics," "integrate, "transdisciplinary," "interdisciplinary," "STEM," "STEAM," or "application" needed to be evident in the policy. If a keyword appeared in the document, we read the surrounding text to see if it pertained to guidance on preparing teachers to teach integrated science and mathematics. Two researchers independently reviewed each policy document and kept

detailed memos to record their findings. They then met to synthesize results, resolving any discrepancies through discussion until consensus was reached.

Our initial analysis for research Question 2 included a systematic review of national organizations, national conferences, and published documents intended to influence the national discussion of implementation of integrated science and mathematics education in PK-12 schools. After detailed discussions, we agreed to review the current guiding standards in STEM, STEAM, mathematics, and science, and focus on each subquestion. For subquestion 2a, concerning which states offer dual or integrated endorsements, we conducted Google searches to locate the official website of each state's department of education (DOE). We used the embedded search tool to identify the page(s) pertaining to teacher endorsements. When no direct list of endorsements was available, we reviewed licensure areas for supplemental or equivalent options. In states that did not use the term "endorsement," we noted comparable terms such as "additional subject-specific pathways." We also used ChatGPT to compile a list of states with STEM and STEAM endorsements to cross-reference the Google search in case there was a missing link not covered by the initial Google search.

Subquestion 2b focuses on the states that designate PK-12 schools as integrated STEM or STEAM. To analyze this question, a review of the official state DOE websites was conducted. The keywords "STEM schools," "STEAM schools," "STEM curriculum," "STEAM curriculum," "STEM standards," and "STEAM standards" were searched to locate specific information about STEM/STEAM programs within the state, assuming information is not located behind restricted portions of the website. We reviewed the information, specifically looking for requirements for being named a STEM and or STEAM school. We also searched for the state name for each state combined with keywords "STEM Designation," "STEAM Designation," "STEM Endorsement," and "STEAM Endorsement."

To address subquestion 2c, we searched national PK-12 science and mathematics standards. Although no universally adopted national curricula exist, 41 states and the District of Columbia initially adopted the Common Core State Standards for Mathematics (CCSS-M) (National Governors Association Center for Best Practices and Council of Chief State School Officers [NGA], 2010), and 24 states later developed their own state's version of the CCSS-M (Education Commission, 2020). We analyzed CCSS-M by the following keywords "STEM", "STEAM", "science", "technology", "art", "integrate", and "application". To date, 39 states and the District of Columbia have adopted the Next Generation Science Standards (NGSS) or similar standards (Achieve, 2018). These two documents, along with the National Research Council's *2012 Framework for K-12 Science Education*, which is the foundational document for the NGSS, were analyzed by keyword search (NRC, 2012). The keywords "science and mathematics," "integrate," "transdisciplinary," "interdisciplinary," "STEM," "STEAM," or "application" were searched and analyzed for context. Next, we analyzed state standards to understand if/how these mentions of integration were impacting STEM education in PK-12 schools.

3. Findings

3.1. Standards for Preparing Teachers

Question 1 focused on policy guidance on preparing teachers to teach integrated science and mathematics. We reviewed six policy documents written in English and published by state or national policymakers or professional organizations in the United States between 2011 and 2022. Across all six policy documents, we found consistent emphasis on preparing teachers with deep disciplinary knowledge in science or mathematics and, in some cases, applications within those disciplines. However, there was little to no policy

guidance on preparing teachers to integrate science and mathematics. Below, we present findings from each policy document.

3.1.1. CAEP Initial Teacher Preparation Standards

CAEP serves as the primary accreditor for teacher preparation programs. We reviewed the CAEP standards for initial teacher preparation (CAEP, 2022). No mentions were found of the keywords science and mathematics, transdisciplinary, STEM, or STEAM. We found three mentions of "integrate", all of which referred to the integration of technology rather than science and mathematics. For example, Standard R3.2: Monitoring and Supporting Candidate Progression emphasizes candidates' ability to integrate technology into practice. The ability to integrate technology was also listed as a key concept for Standards R3.2 and R3.3: Competency at Completion (CAEP, 2022).

The keyword "application" appeared 10 times in the initial standards. However, only two instances pertained to STEM, and both referred specifically to technology. The first mention was in the quality evidence for Standard R1.3: Instructional Practice, which referenced applications of technology to enhance P-12 learning. The second was in the guiding question for Standard R2.3: Clinical Experiences, which asked, "What applications of technology have prepared completers for their responsibilities on the job?" (CAEP, 2022, p. 22).

3.1.2. CCSSO InTASC Model Core Teaching Standards

The CCSSO created the InTASC Model Core Teaching Standards to provide leadership and guidance on major educational issues (CCSSO, 2011). Our review found no mentions of the keywords science and mathematics, transdisciplinary, STEM, or STEAM. However, the standards define content knowledge as including "connections to other disciplines and the development of new, interdisciplinary areas of focus such as civic literacy, environmental literacy, and global awareness" (p. 20).

The keywords integrate, interdisciplinary, and application appeared extensively in Standard 5: Application of Content. We identified seven components of this standard as relevant: 5b, 5c, 5e, 5j, 5q, 5r, and 5s. These performances, knowledge, and dispositions emphasize interdisciplinary applications, valuing knowledge across content areas, and encouraging learner exploration. Table 1 presents the descriptions of these elements.

Table 2. InTASC Standard 5 (CCSSO, 2011, p. 14)

#	Description
5b	The teacher engages learners in applying content knowledge to real-world problems through the lens of interdisciplinary themes (e.g., financial literacy, environmental literacy).
5c	The teacher facilitates learners' use of current tools and resources to maximize content learning in varied contexts.
5e	The teacher develops learners' communication skills in disciplinary and interdisciplinary contexts by creating meaningful opportunities to employ a variety of forms of communication that address varied audiences and purposes.
5j	The teacher understands how current interdisciplinary themes (e.g., civic literacy, health literacy, global awareness) connect to the core subjects and knows how to weave those themes into meaningful learning experiences.

5q	The teacher is constantly exploring how to use disciplinary knowledge as a lens to address local and global issues.
5r	The teacher values knowledge outside his/her own content area and how such knowledge enhances student learning.
5s	The teacher values flexible learning environments that encourage learner exploration, discovery, and expression across content areas.

3.1.3. NSTA/ASTE Standards for Science Teacher Preparation

The NSTA and ASTE (2020) joint standards guide science teacher preparation. Although the standards strongly emphasize science and engineering practices, crosscutting concepts, and disciplinary core ideas, they include only limited references to connections with mathematics. Standard 1 highlights the importance of connecting disciplinary core ideas, crosscutting concepts, and practices. Standard 2 requires science teachers to design equitable, culturally responsive instruction that includes connections to crosscutting concepts and practices. Standard 5 emphasizes that effective teachers provide evidence of students' ability to apply core ideas, crosscutting concepts, and practices. Despite references to applications and cross-disciplinary connections, explicit guidance on integrating science and mathematics is absent.

3.1.4. NCTM Standards for Preparing Teachers of Mathematics

The NCTM (2020) standards for preparing secondary mathematics teachers emphasize modeling, applications, and the use of technology. For example, Standard 2 highlights candidates' ability to engage in mathematical modeling processes and apply technology in mathematical contexts. While these standards encourage authentic applications of mathematics, they stop short of requiring integration with science. A more recent NCTM publication (2024) has highlighted statistics and modeling, which may suggest emerging opportunities for cross-disciplinary integration, but this emphasis is not present in the 2020 standards.

3.1.5. AMTE Standards for Preparing Teachers of Mathematics

The AMTE standards emphasize both deep mathematics content knowledge and the ability to connect mathematics to other disciplines and contexts. The standards also highlight applications and modeling. Some references explicitly mention applications to the sciences and arts. For example, the standards cite curricular materials developed by the COMAP & SIAM (2016), many of which are interdisciplinary. However, the standards do not frame this work as integrated STEM or STEAM preparation. Instead, modeling is positioned as a mathematical practice with possible cross-disciplinary connections, but without explicit policy guidance on integration.

In Early Childhood standards (EC.1), teachers are expected to recognize mathematical structures that also connect to the sciences and the arts, such as composing and decomposing shapes and spatial structuring. In the Upper Elementary standards (UE.1), teachers are encouraged to draw on mathematical practices in contexts that can extend to science (e.g., measurement in experiments).

For middle-level preparation, the AMTE standards highlight two areas of connection. Standard ML.4 calls for engaging learners in meaningful and interdisciplinary contexts, explicitly noting connections between mathematics and other subjects such as science, language arts, and social studies. Standard ML.9 emphasizes that middle-level mathematics teachers should experience coursework or methods classes not only in mathematics,

but also in middle school science or other disciplines to strengthen their interdisciplinary preparation.

At the high school level, Standard HS.1 highlights the intersections between mathematics and computer science. It notes that while computer coding draws heavily on mathematical ideas and problem-solving, mathematics teachers must also recognize computer science as a distinct field requiring specialized preparation. Standard HS.2 calls for proficiency with tools and technology, including spreadsheets, computer algebra systems, statistical software, dynamic geometry environments, and other digital tools that could support interdisciplinary applications, including in science.

Overall, AMTE acknowledges interdisciplinary and cross-disciplinary opportunities, particularly in middle-level contexts (via modeling and science connections) and high school contexts (via computer science and technology). However, it stops short of advocating explicitly for integrated STEM or STEAM teacher preparation.

3.1.6. CBMS MET II

The CBMS Mathematical Education of Teachers II provides recommendations for mathematics teacher preparation (CBMS, 2012). We found no mentions of integrated, interdisciplinary, or transdisciplinary teaching of science and mathematics. References to STEM primarily referred to coursework for students (e.g., "STEM-intending high school students" or "STEM majors") rather than integrated STEM teaching.

The report notes that some teacher preparation programs lead to multi-subject certification (e.g., mathematics and science), but these were described as logistical structures rather than intentional integration of subject matter. The document also references preparing teachers to teach computer science and includes several examples of science applications in mathematics courses (e.g., calculus, differential equations, statistics). These examples illustrate the relevance of mathematics to science contexts but do not amount to guidance on integrated teacher preparation.

3.2. Certifications or Endorsements

Question 2a explores the states that offer dual or integrated endorsements. By law, each state sets its own licensure regulations. While the federal DOE has some policies that guide the process, and the Elementary and Secondary Education Act of 1965 defines "high-quality teachers," ultimately, each state defines how these laws and policies are interpreted and enacted. Our review found that while a handful of states, including Georgia, Mississippi, Nevada, Pennsylvania, and Rhode Island, offer integrated STEM endorsement areas, most states maintain separate content-area credentials. In other words, teachers must first gain licensure in one of the recognized areas of Mathematics, Science, English/Language Arts, Social Studies, or Elementary/Middle School. Iowa, New Jersey, and Utah have STEM endorsements for teachers for specific grade bands, commonly elementary and/or middle grades. South Carolina is the only state with STEAM offered as a recognized teacher endorsement.

Interestingly, states often offer more options for supplemental endorsements than initial licenses (e.g., Reading, Computer Science, STEM, or STEAM). Requirements for these endorsements also vary by state. Of note, we found that many of these supplemental endorsements emphasize pedagogy and coursework in multiple STEM fields, but without explicit integration of STEM/STEAM across the curriculum. Educational organizations such as STEM.org provide professional development (PD) certificates which may be used as continuing education credits required by most states; however, these certificates do not rise to the level of state credentials.

3.3. School Designations

Next, we provide the findings for question 2b, asking "which states designate PK-12 schools as integrated STEM or STEAM?" Understanding the requirements for STEM education in each state is complex. Although all states affirm the importance of STEM, implementation is largely left to districts. In many states, integrated STEM schools are designated through opt-in programs (e.g., magnet schools, academies), but these designations vary in rigor and oversight. Similarly, a review of schools within a state reveals different interpretations of the process as well as uneven integration into the schools. In all states, school districts implementing a STEM-infused curriculum typically develop programs that, according to what is written in the policy, align with the state priorities. In some states, these programs are closely evaluated by the state education specialists, but in other states, the school district simply files a plan.

Both selective and inclusive STEM-designated high schools operate across the United States. Currently, at least 15 states operate state-sponsored residential schools specializing in mathematics and science, which comprise part of the approximately 90 selective, elite STEM-focused high schools nationwide (Successful STEM Education Initiative, 2022). These are typically small prestigious public high schools with test scores and interview admission criteria. The National Consortium of STEM Schools [NCSS] now reports 100-member high schools located in 32 states (NCSS, 2025). In addition, every state offers Career and Technical Education (CTE) programs established under the federal Perkins Act, many with STEM pathways, which are designed to prepare students for STEM careers (Congressional Research Service, 2022).

While some states focus on specialized residential or selective STEM schools, others have implemented recognition and certification processes to strengthen STEM programs within existing schools. Indiana, Ohio, Tennessee, and Texas offer a STEM school or program recognition. This process is often seen as a way to make a school or program more desirable within the community. In Indiana, for example, the process includes an extensive set of criteria for schools seeking STEM certification. This is evaluated at the state level using a series of intricate rubrics. Schools that are successful in achieving the STEM designation are certified for five years prior to submission for renewal. The process in Indiana focuses on inquiry-based learning within the school, evidence of student-centered instruction, establishment of community partnerships, and out-of-school STEM opportunities for students. The Indiana process also requires intentional connections of the integrated STEM standards with curricula, teacher professional learning opportunities, and assessment tools.

3.4. PK-12 Science and Mathematics Standards

Question 2c examined the extent to which national standards for PK-12 curricula promote integration. Based on our review, only four states in the U.S. have explicitly integrated PK-12 STEM standards: Georgia, Indiana, Maryland, and Tennessee. The NGSS incorporates "Using mathematics and computational thinking" as one of the integrated Science and Engineering Practices (SEPs) (NGSS, 2013). To date, 20 states have fully adopted the NGSS, and approximately 40 have adopted modified versions of the NGSS (Achieve, 2018). In contrast, the CCSS-M do not have explicitly integrated PK-12 STEM standards, although there are several mathematical practices and mentions of applications of mathematical concepts. Both the NGSS and CCSS-M include process standards: the NGSS embed Scientific and Engineering Practices, while the CCSS-M outlines the Standards for Mathematical Practice.

Table 3. Mathematics, Science, and Engineering Practices

CCSS-M – Standards for Mathematical Practice (SMPs)	**NGSS – Science & Engineering Practices (SEPs)**

1. Make sense of problems and persevere in solving them	1. Asking questions and defining problems
2. Reason abstractly and quantitatively	2. Developing and using models
3. Construct viable arguments and critique others' reasoning	3. Planning and carrying out investigations
4. Model with mathematics	4. Analyzing and interpreting data
5. Use appropriate tools strategically	5. Using mathematics and computational thinking
6. Attend to precision	6. Constructing explanations and designing solutions
7. Look for and make use of structure	7. Engaging in argument from evidence
8. Look for and express regularity in repeated reasoning	8. Obtaining, evaluating, and communicating information

The NRC's (2012) Framework for PK-12 Science Education is the foundation upon which the NGSS was built. The Framework established the overarching vision and key principles for the NGSS, describing the three-dimensional model of learning which integrates science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts. The NGSS are the performance expectations that implement the concepts and vision that are laid out in the Framework. The Framework heavily stresses the integration of mathematics in science teaching at the PK-12 level. The term "mathematics" appears 130 times, along with "integrate or integration" 55 times, "interdisciplinary" three times, "science & mathematics" twice, and "application" 73 times. The document clearly positions mathematics as an essential tool for doing science, not just a parallel subject. The intent of the Framework was to make quantitative reasoning, data, and modeling inseparable from authentic science learning.

The many instances of the terms "mathematics" and "integration" in the NRC Framework occur in 4 contexts: 1) the science and engineering practices, 2) the crosscutting concepts, 3) the disciplinary core ideas, and 4) the curriculum and teacher preparation (NRC, 2012). Within the SEPs, analyzing and interpreting data explicitly calls for the use of statistics, probability, and proportional reasoning. Using mathematics and computational thinking is described as a core practice of science, alongside experimentation and modeling, and the use of equations, simulations, and graphs is presented as central to explaining scientific phenomena. In the crosscutting concepts, the use of ratios, proportionality, exponents, and logarithms, along with algebraic tools and quantitative reasoning, is recommended to analyze systems. In the DCIs, the integration of mathematics is emphasized within each discipline: the physical sciences rely heavily on algebra, functions, and graph interpretation; the life sciences utilize statistics and probability for genetics and ecosystems; and the earth and space sciences incorporate computational models, graphing, and geometric reasoning. Chapter 10 addresses curriculum and teacher preparation, noting that teachers are expected to develop mathematical and quantitative skills beyond their disciplinary training, yet it offers no plan for how such training should occur (NRC, 2012). The Framework calls for integrated professional development involving the collaboration of mathematics and science teachers but leaves such PD planning up to the approximately 13,000 individual school districts in the United States (U.S. Department of Education, National Center for Education Statistics [NCES], 2024) to implement and provides no guidance for doing so.

The CCSS-M uses standards for mathematical practice as overarching processes that are intended to crosscut all content areas. There were no explicit mentions of "STEM",

"STEAM", or "art". The word "integrate" was not used in the document in relation to integrating STEM or STEAM. The word "technology" was used 17 times in the text to describe assistive technology and tools for visualization, data generation, and data analysis. Some mentions of technology point to science type examples for use of technology to collect, generate, or analyze data. "Applications" had 4 specific mentions in the document and most directly pointed at using mathematics in their applied contexts.

4. Conclusion

This review highlights a chicken-and-egg dilemma. No single national policy provides clear guidance on preparing teachers to teach integrated science *and* mathematics. Moreover, PK-12 state-, district-, and school-level implementation of integrated standards is inconsistent. Although PK-16 science education policy recommends integrating mathematics and PK-16 mathematics policy recommends integrating science, there is no policy requiring teachers to take courses that prepare them to teach the disciplines using an integrated approach.

Recent federal actions have further complicated the policy landscape. In March 2025, President Trump signed an Executive Order initiating the closure of the U.S. Department of Education and transferring many of its functions to the states. Although the full dismantling of the Department would require congressional approval, this signals a significant shift in federal involvement in education policy and raises concerns about the future of coordinated efforts to support integrated STEM and STEAM education.

Few states provide explicit guidance or curricula for integrated science and mathematics instruction, and most CCSS and NGSS-adopting states use modified versions of the standards and lack policy guidance for teacher preparation to support the integration of mathematics and science. Without explicit and consistent policy backed by funding to support implementation, integration remains an aspirational goal, and siloed approaches persist. We recommend looking to the European Union as a model for future policy development.

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