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Teacher professional standards across leading education systems

Ahmad Aseery

ahmaseeri@ksu.edu.sa

King Saud University

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Abstract

Teacher quality is the most significant school-related factor influencing student achievement and long-term outcomes. Recent reforms across many education systems have placed professional standards at the centre of teacher quality policies. This study conducts a comparative document analysis of professional teacher standards in nine education systems that updated their frameworks between 2020 and 2025. Documents from Australia, England, Scotland, New Zealand, Canada, Denmark, Finland, Saudi Arabia, and Colorado (United States) were examined. An inductive content analysis identified five common domains across systems: professional values and ethics, pedagogical knowledge, content knowledge, assessment and evaluation skills, and lifelong learning with continuing professional development. The findings reveal both convergence and divergence in how these domains are articulated, with cultural and contextual priorities shaping their expression. Standards in some systems emphasize stratified progression and credentialing, while others highlight autonomy, ethics, and inquiry. The study concludes that teacher professional standards reflect a global trend toward professionalisation, although differences remain in how nations define and operationalise professionalism.

Introduction

Teacher quality is arguably the most influential school-related factor related to the academic achievement of students and national education outcomes. Empirical studies have consistently shown that teacher quality is more relevant to students' academic outcomes than other school-related factors, such as class size, school resources, and neighborhood socioeconomic status (Darling-Hammond, 2000; Hanushek, 2011; Rivkin et al., 2005). Schools with higher-quality teachers exhibit superior results in students' reading and mathematics achievement at all levels (Rivkin et al., 2005). Additionally, students who graduate from such schools are more likely to achieve higher future incomes, underscoring the economic value of investing in teacher quality (Hanushek, 2011). Empirically, policies that seek to improve teacher quality are more likely to yield beneficial outcomes not only for students but also for society at large.

Background

One of the key indicators or correlates of teacher quality is teacher standards. Regardless of country or geographical region, professional teacher standards generally dictate teachers' required subject matter knowledge and readiness to teach (Phelps & Sykes, 2020). Regional teacher standards and credentialing policies significantly affect teacher quality and the capacities educators bring to their work (Darling-Hammond, 2000). Countries that have implemented strong quality assurance standards are more likely to have teachers with stronger knowledge of mathematics and pedagogy as well as higher performance on international mathematics achievement tests (Ingvarson & Rowley, 2017). Well-designed standards can also help exclude less-qualified teaching candidates and raise the lower tail of the teacher quality distribution (Larsen et al., 2020). The implication of these studies is that national or regional efforts to enhance the teaching profession should prioritise strengthening teacher professionalism.

Problem Statement

Professional teacher standards are widespread globally, but there is a lack of recent, accessible comparative analyses that synthesise international approaches and highlight their core similarities and differences. While several countries with leading education systems, such as Australia, Scotland, England, New Zealand, and Canada, have updated their standards and licensure systems within the last five years (Australian Institute for Teaching and School Leadership Limited, 2022; Department for Education, 2021; Ministry of Education, 2025), no updated integrative comparative analysis exists. This absence poses challenges for education policymakers seeking to align with best practices, especially given the resistance to professionalisation expressed by some practitioners.

Purpose

The purpose of this paper is to conduct a comparative analysis of current professional teacher standards across leading education systems worldwide. It aims to examine the most recent indicators of teacher professionalism to determine whether recent global shifts in education have led to a divergence or convergence of standards. The goal is to provide an updated account of how teacher professionalism is currently conceptualised.

Research Questions

1. What are the key features of contemporary teacher professional standards across selected international education systems?
2. What commonalities and differences exist among global teacher standards in terms of structure, content, and focus areas?
3. How do these standards reflect the professionalisation of teaching in their respective contexts?

Literature Review

In the past five years, countries have increasingly moved toward formalising and standardising professional teacher standards. This trend includes raising qualification requirements, standardising competency assessments, and mandating continuous professional development (Campbell, 2025). Such policies reflect a preference for performance-based accountability systems and evidence-informed regulation of professional roles (Organisation for Economic Co-operation and Development [OECD], 2020b). The World Bank reports that over 80% of countries have implemented national teacher accreditation and quality frameworks, and 60% are pursuing regional or global accreditation to enhance international recognition of their systems (as cited by Campbell, 2025). These developments suggest a policy convergence and shared recognition that codified teacher standards are central to educational quality assurance and workforce modernisation.

Theoretical Justification for Standards

The development of teacher professional standards is grounded in theories that emphasise both their functional and symbolic roles. From the perspective of professionalisation theory, standards serve as mechanisms through which teaching transitions from an occupation to a recognised profession defined by autonomy, ethical codes, and specialised knowledge (Forsyth & Danisiewicz, 1985; Freidson, 2001). This

transition is vital for distinguishing teaching from informal caregiving or vocational labor and for justifying public trust and professional authority.

Sociological theories of professionalism also underscore the normative dimension of standards. As Adoniou and Gallagher (2017) argued, standards define not only what teachers do but also who they are expected to be. In this way, standards shape the social identity of teachers as competent, accountable, and reflective practitioners by codifying expectations about pedagogy, ethics, and subject knowledge. Consequently, the theoretical justification for teacher standards transcends administrative efficiency—it rests on the premise that clearly articulated professional norms are essential for legitimacy, identity formation, and ethical practice in education.

Much of the existing literature and policy on teacher professional standards has focused on the cognitive roles of teachers, such as developing subject matter expertise and pedagogical skill, as well as their social roles, such as fostering collaboration and civic engagement (Adoniou & Gallagher, 2017; Darling-Hammond et al., 2017; Darling-Hammond & Bransford, 2012). However, less attention has been paid to what Biesta (2022) called the existential or self-related role, also referred to as the non-cognitive role or subjectification. Teachers play a vital role in shaping students into individuals capable of responsibility, active participation, conscious choice, and value-driven awareness and independence (Biesta, 2022). This dimension extends beyond measurable academic outcomes to include ethical leadership, role modelling, and the cultivation of students' well-being and self-awareness. These qualities remain essential in an era when artificial intelligence is increasingly capable of performing many cognitive instructional tasks (Escalona-Márquez et al., 2024; Zhang et al., 2024). Some educational systems, such as Saudi Arabia's updated teacher standards, explicitly incorporate existential elements by requiring teachers to act as role models and promote student well-being (OECD, 2020a). This suggests that professional standards are evolving towards a more holistic vision that integrates cognitive, social, and non-cognitive dimensions of teacher professionalism.

Quality, Accountability, and Teacher Development Arguments

One of the most compelling arguments in favour of teacher standards and licensing is their impact on teacher quality. Large-scale studies on teacher certification, such as the U.S. National Board Certification, have shown that teachers who meet rigorous professional standards tend to be more effective, as measured by their students' test scores (Knoeppel et al., 2005). Certified teachers also demonstrate deeper curriculum knowledge and stronger classroom management skills.

Econometric analyses have further revealed wide disparities in teacher quality within schools, with higher-quality teachers – often those meeting or exceeding professional standards – generating significantly greater learning gains (Hanushek & Rivkin, 2006). According to Hanushek and Rivkin (2006), the impact of teacher quality on learning outcomes is comparable to that of substantially reducing class sizes. Given these findings, it is unsurprising that policy documents and educational frameworks, such as the United Kingdom's Teacher's Standards (Department for Education, 2021), explicitly link teacher standards with high-quality education.

Teacher standards are also closely tied to public trust and professional accountability. According to Adoniou and Gallagher (2017), a teaching license signals professional credibility and commitment. For parents, students, and the wider community, it affirms that an educator has met recognised standards of practice. Bromley (2023) argued that teacher standards provide a foundation for evaluating performance and holding

educators accountable. Hitz (2008) added that teacher standards build public confidence in the education system by ensuring children are taught by professionals who are held accountable to high standards.

The United Kingdom's Teachers' Standards explicitly require teachers to uphold public trust by maintaining high standards of ethics and behaviour both inside and outside school (Department for Education, 2021). This includes treating pupils with dignity, safeguarding their well-being, respecting others' rights, and upholding democratic values and the rule of law. Teachers must also act within statutory frameworks and maintain professional conduct, collectively reinforcing public confidence in the profession.

Teacher standards also provide an effective framework for teachers' professional growth through clear guidance, reflective practice, and continuous development. Structured professional development is linked to standards (Darling-Hammond et al., 2017). Darling-Hammond et al. (2017) reviewed 35 studies and found that effective professional development is structured around clear goals that improve teacher knowledge and instructional practice – goals often aligned with professional standards. Leibur et al. (2021) reported that professional standards provide a common framework for teachers to self-assess their competencies and reflect critically on their practice. This self-analysis fosters self-efficacy, responsibility, and motivation for ongoing learning. In a qualitative study on the implementation of Learning Forward's 2022 professional learning standards, Hurla (2023) found that teachers' professional capital and collective efficacy grew through ongoing, connected learning activities grounded in shared standards. Collaboration, feedback, and a supportive school culture were identified as essential for enabling mid-career teachers to thrive professionally.

Teacher standards are also important in opening better teaching opportunities for teachers and raising the status of the profession. Possession of a teaching license provides access to more and better-paid job opportunities both domestically and internationally (Darling-Hammond & Bransford, 2012). Schools that value high professional standards typically require licensed teachers, while unlicensed teachers often face limited job prospects and reduced job security. Licensure is also a prerequisite for permanent employment and career advancement in established or developed educational systems. With respect to raising the bar of the profession, rigorous education standards and licensure requirements elevate and professionalise teaching (Adoniou & and Gallagher, 2017; Hitz, 2008). In addition to enhancing the public image of teaching, they attract individuals who are committed to excellence and continued growth.

Challenges in Teacher Standards

Although teacher professional standards are widely promoted to improve quality, accountability, and professional development, some teachers question their necessity and implementation. Many teachers resist high-stakes licensure exams and rigid competency frameworks that reduce teaching to a checklist of behaviours rather than a reflective and relational practice (Sahlberg, 2016). Critics argue that standardised assessment systems often fail to account for the contextual and emotional dimensions of teaching, which can lead to demoralisation and burnout (Day & Gu, 2010). Others warn that poorly designed standards may erode teacher agency and creative autonomy, turning professionals into mere implementers of policy (Buchanan, 2015; Robinson, 2012). Scholars have noted that this tension must be addressed if standards are to be viewed as authentic practice and used formatively rather than punitively. Standards must therefore strike a balance between external accountability and internal professional trust.

Gap in Knowledge

Despite the growing body of research on teacher professional standards, much of the literature from the past five years has focused on individual country contexts. While global trends, theoretical foundations, and implementation challenges are well documented, there is a notable absence of up-to-date cross-national analyses systematically comparing how different education systems define and operationalise teacher professionalism. This knowledge gap limits the ability of policymakers, researchers, and practitioners to identify shared practices or adapt successful models to local contexts. The present study seeks to address this gap by undertaking a comparative document analysis of teacher professional standards across education systems that have updated their standards in the past five years.

Conceptual Framework

This study adopts the theory of professionalisation as a conceptual framework. This theory focuses on how occupations evolve to be recognised and governed by regulations, formal standards, and ethical or moral codes (Forsyth & Danisiewicz, 1985). According to Darling-Hammond and Bransford (2012, p. 472), 'teachers must engage in professional standard-setting if teaching is to make good on the promise of competence that professions make to the public'. The theory emphasises that the teaching profession requires clear and rigorous standards to elevate its status beyond an inherited shared professional identity. From the perspective of this framework, teacher standards are not merely regulatory tools but foundational elements that define what it means to be a teacher and guide career progression. The theory of professionalisation provides a lens for analysing how the standards under review articulate expectations for teacher knowledge, practice, values, and ethics.

Research Methodology

To conduct this comparative study, document analysis was used as a qualitative research method. Document analysis entails systematically reviewing or evaluating data in both printed and electronic materials to elicit meaning, gain understanding, and develop empirical knowledge (Bowen, 2009). As an unobtrusive research method, document analysis is recognised as offering an innovative strategy for collecting and assessing data. It is a preferred qualitative method because it utilises publicly available materials, is cost-effective to collect, and allows for multiple reviews (Bowen, 2009). Guided by seminal as well as recent methodological studies on document analysis (Bowen, 2009; Hani, 2022; Salminen et al., 1997), this study developed a rigorous set of steps, from domain definition to data analysis.

Data Collection

Data sources in systematic document analysis fall into either informal or formal categories (McMillan & Schumacher, 2013). In the context of teacher professional standards, informal documents include internal memos, proposals, unpublished reports, and teachers' personal notes and reflections. These documents provide contextual and practice-based insights through their descriptions of functions, values, and norms. Conversely, formal documents include national and international policy documents, public statements, newsletters, legal and regulatory documents, professional and curriculum documents, teacher assessment and appraisal records, certification and registration documents, and accreditation reports. This study collected only formal, publicly accessible documents. Formal documents were preferred because they provide authoritative articulation of teacher professional standards and regulatory expectations.

Documents were searched using the Google search engine. Key search terms included ‘national teacher professional standards’, ‘teacher registration’, ‘teacher certification’, and ‘teacher licensing’. Documents were sourced from websites of national ministries or departments of education, teacher regulatory agencies, professional teacher associations and unions, specialised education foundations, regional and international organisations such as the United Nations Educational, Scientific and Cultural Organisation and the International Task Force on Teachers, accreditation and quality assurance authorities, and educational research and policy portals. Publicly accessible policy, regulatory, and curriculum documents were treated as external communications. For recency and comparability, only documents published or officially revised between 2020 and 2025 and available in English were included in the sample.

Retrieved documents were screened for relevance based on their stated purpose and issuing authority. Following a review for recency and comparability, standards documents were found for the United States, the United Kingdom, Denmark, Scotland, Canada, Australia, and Saudi Arabia. These countries are diverse in terms of geography, language, education system structure, and level of economic development. Each accepted document was maintained with metadata including publication year, issuing institution, document type, and URL. Documents were assigned identification codes and organised into country-specific folders for systematic analysis. Importantly, documents were reviewed independently within their national context, without presuming uniformity across systems. This approach allowed for an inductive understanding of how teacher standards are articulated and organised before comparative coding.

Data Analysis

Qualitative content analysis was used to examine the content and structure of teacher professional standards documents across multiple national education systems. Content analysis is a systematic approach to examining and interpreting textual data to identify patterns, themes, and meanings (Kawamoto et al., 2023). An inductive coding approach was employed to allow themes and categories to emerge from the data. The analysis focused on identifying recurring domains and priorities across the documents. Through open coding, key elements were identified and iteratively grouped into emergent categories: 1) professional values and ethics, 2) pedagogical knowledge, 3) content knowledge, 4) assessment and evaluation skills, and 5) lifelong learning and continuing professional development. These categories reflect commonly emphasised competencies in teacher standards and were central to the discourse on teacher professionalisation.

Each standards document was reviewed line by line, and meaning units were labelled with codes that captured significant concepts and practices. These were then organised using a comparative coding matrix. Salient content was extracted and entered into a country-specific analysis table that mapped each emerging domain against the depth, structure, and emphasis of coverage in the document. These tables enabled structured comparisons across countries and facilitated identification of both overlapping and distinctive features. The coded data were then analysed thematically to address the three research questions. Table 1 illustrates the sources of data and the methods used to analyse each question.

Table 1

Sources of Data and Methods Used to Answer the Research Questions

Research Questions	Sources of Data	Methods Used to Answer Research Questions
1. What are the key features of contemporary teacher professional standards across selected international education systems?	National teacher professional standards frameworks, licensing and certification policy documents, competency-based teaching profiles, and teacher registration guidelines (2020–2025)	Descriptive content analysis using open coding to identify structural components and emergent domains within each standard.
2. What commonalities and differences exist among global teacher standards in terms of structure, content, and focus areas?	Comparative matrices synthesised from coded content of teacher standards documents	Thematic cross-case comparison of coded domains (e.g. ethics, pedagogy, assessment, inclusion), identifying patterns of convergence and divergence
3. How do these standards reflect the professionalisation of teaching in their respective contexts?	Conceptual and value-oriented sections of standards documents, including mission statements, guiding principles, teacher role definitions, and ethics statements	Interpretive content analysis guided by the theory of professionalism, focusing on how teacher identity, autonomy, ethics, and accountability are conceptualised

Findings

In the first section of the findings, the key domains identified through an inductive content analysis of teacher professional standards across seven countries are reported. This section highlights areas of convergence and divergence and, where relevant, draws attention to culturally specific adaptations or omissions, offering insight into how teacher professionalism is conceptualised and operationalised across diverse education systems. The second section examines how these standards reflect the professionalisation of teaching.

Contemporary Teacher Professional Standards and Convergence

The first phase of the content analysis identified five inductive domains that recurred consistently across teacher professional standards documents from the nine included education systems (Table 2). These domains are professional values and ethics, pedagogical knowledge, content knowledge, assessment and evaluation skills, and lifelong learning and continuing professional development. They formed the analytical framework for comparing teacher standards and understanding how teacher professionalism is operationalised internationally.

Table 2

Country	Professional Values and Ethics	Pedagogical Knowledge	Content Knowledge	Assessment and Evaluation Skills	Lifelong Learning & Continuing Professional Development
Australia	- Meet professional ethics and responsibilities (7.1), - Comply with legislative and organisational requirements (7.2) - Engage with parents and communities (7.3-7.4)	- Know students and how they learn - Plan and implement effective teaching - Maintain safe learning environments	- Know content and how to teach it - Literacy/numeracy strategies - Use Information and Communications Technology (ICT) in teaching - Indigenous content (2.4)	- Assess student learning - Provide feedback - Use and interpret student data - Report achievement	- Identify learning needs - Engage in learning - Apply professional learning to improve teaching
England	- Uphold public trust - High ethical standards in/out of school - Safeguard pupils - Respect for others	- Set high expectations - Promote outcomes - Plan and teach lessons - Adapt teaching to needs - Behaviour management	- Good subject and curriculum knowledge - Promote literacy and articulacy - Early reading and phonics (if applicable)	- Use assessment productively - Formative/ summative assessment - Data-driven instruction - Pupil feedback	- Take responsibility for professional development - Reflect on practice - Participate in appraisals
Scotland	- Social justice, integrity, commitment - Equality and diversity - GTCS Code of Conduct	- Pedagogical and curricular knowledge - Planning and delivery - Positive classroom relationships	- Deep curricular knowledge - Literacy, numeracy, digital skills - Interdisciplinary understanding	- Use varied assessment strategies - Timely feedback - Assessment-informed teaching	- Ongoing reflective learning - Career-long development - Collaborative practice
Colorado	- Ethical conduct and professionalism [T2: Element A] - Leadership in school and community [T2: Element D] - Reflective practice and professional	- Instructional planning aligned with standards [T3: Element A] - Lesson development and integration [T3: Element B] - Inquiry and instructional	- Mastery in literacy and mathematics - Content-specific inquiry [T3: Element C] - Competences based on evaluations and feedback	- Formal and informal student assessments [T2: Element B] - Using data to inform instruction and feedback [T2: Element B]	- Linking professional growth to goals [T2: Element B] - Responding to complex environments [T2: Element C] - Ongoing self-reflection and

Country	Professional Values and Ethics	Pedagogical Knowledge	Content Knowledge	Assessment and Evaluation Skills	Lifelong Learning & Continuing Professional Development
	goal linkage [T2: Element B]	practices [T3: Element C]	- Skills in development of school culture through collaboration - Core subjects in respective level at primary, secondary, and upper secondary education - Vocational and academic content in VET and higher education	- Conduct individual learning plans	refinement - Critical thinking and research skills - Willingness and competence for continuous learning - Participation in learning communities - Leadership skills for school-level activities - Transformative agency and innovative orientation
Finland	- Allow students' active participation in democratic society - Provide equal access to education - Reducing social background impact on academic results	- Extensive knowledge in subject matter - Use differentiated teaching methods - Interdisciplinary activities - Project work at all levels	- Competences based on evaluations and feedback - Core subjects in respective level at primary, secondary, and upper secondary education - Vocational and academic content in VET and higher education	- Conduct individual learning plans	- Critical thinking and research skills - Willingness and competence for continuous learning - Participation in learning communities - Leadership skills for school-level activities - Transformative agency and innovative orientation - Lifelong learning - Continuing vocational training and

Country	Professional Values and Ethics	Pedagogical Knowledge	Content Knowledge	Assessment and Evaluation Skills	Lifelong Learning & Continuing Professional Development
					part-time higher education
Denmark	- General pedagogical knowledge - Contextual and curriculum knowledge - Knowledge about learners and their learning - Collaboration and interaction skills - Digi-knowledge and skills	- Use differentiated teaching methods - Interdisciplinary activities - Project work at all levels	- Pedagogical content knowledge - General pedagogical knowledge - Contextual and curriculum knowledge	- Using data to inform instruction and feedback	- Lifelong learning - Continuing vocational training and part-time higher education
Ontario (Canada)	- Commitment to students and student learning - Leadership in learning communities (ethical principles upheld)	- Professional knowledge (learning theory, pedagogy, curriculum, ethics) - Professional practice (application of pedagogy and technology)	- Professional knowledge (being current in curriculum and educational research)	- Professional practice (assessment and evaluation strategies)	- Ongoing professional learning (self-directed, research-informed)
Saudi Arabia	- Professional ethics and responsibility - Respect for national (Islamic) norms - Interaction with colleagues and society	- Understanding students and their learning - Curriculum knowledge - How to teach the curriculum (pedagogical strategies)	- Pedagogical content knowledge - Literacy, numeracy, and digital skills	- Formative assessment of student learning - Use of classroom observation and exam performance in evaluation	- Continuous professional development - Career-level system (Practitioner, Advanced, Expert) linked to promotion - Portfolio-based evidence for career advancement - Mentorship and collaborative

Country	Professional Values and Ethics	Pedagogical Knowledge	Content Knowledge	Assessment and Evaluation Skills	Lifelong Learning & Continuing Professional Development
					learning roles at higher levels
New Zealand	- Commitment to tangata whenuatanga and Te Tiriti o Waitangi partnership - Recognising tangata whenua and cultural heritages - Inclusion, empathy, cultural safety - Fostering diverse learner identity	- Designing culturally responsive, evidence-based learning - Teaching with curriculum and pedagogical knowledge - Classroom relationships and culture - Learner agency, collaboration, self-regulation	- Research-informed content knowledge - Curriculum knowledge - Learning progressions - National policies and priorities	- Gathering and using assessment data - Feedback and next steps - Clear communication of assessment - Assessment-informed guidance for learners	- Inquiry and reflection - Collaborative problem-solving - Research-informed learning - Responding to feedback from learners and peers

Professional Values and Ethics

Professional values and ethics are emphasised across all nine education systems, although the moral foundations and cultural expressions of these standards vary. In Scotland, the 2021 General Teaching Council (GTC) standards prioritise social justice, trust, integrity, and inclusion, positioning ethical conduct as central to teacher identity (GTC, 2021). In contrast, England's 2021 Teachers' Standards focus on public trust and the safeguarding of students, requiring teachers to act lawfully and ethically both inside and outside school (Department for Education, 2021). Saudi Arabia's standards, rooted in Islamic principles, frame professionalism through moral discipline, religious respect, and national loyalty, aligning teaching with broader social and spiritual goals (OECD, 2020a).

New Zealand adopts a bicultural ethical model based on the Treaty of Waitangi (*Te Tiriti o Waitangi*), requiring teachers to uphold Māori values and affirm diverse learner identities (Teaching Council of Aotearoa New Zealand, 2020). Canada's provincial standards, particularly in Ontario, integrate ethical practice with a focus on reconciliation, anti-racism, and culturally responsive pedagogy (Ontario College of Teachers, 2025). In Finland, although there is no formal set of standards, the national teacher education aims from 2022 articulate ethics through civic commitment, empathy, and sustainable development (Lavonen, 2022). Finland expects teachers to act as moral agents in democratic society.

Denmark's revised teacher standards call for professional autonomy and responsible citizenship, requiring teachers to embody authority and act with care for students and the community (Ministry of Higher Education and Science et al., 2021). Australia's standards similarly emphasise respectful engagement with students and parents, integrity, and legal obligations, particularly regarding child safety (Australian Institute for Teaching and School Leadership Limited [AITSL], 2022). In Colorado, the Teacher Quality Standards (2024) highlight ethical

conduct through transparency, professionalism, and a commitment to fairness and equity in all school-related interactions (Colorado Department of Education, 2024). Despite variations, all nine systems frame ethical professionalism as foundational. However, ethical professionalism is expressed through diverse national and cultural frameworks.

Pedagogical Knowledge

Pedagogical knowledge is universally recognised as a core standard across all systems, although instructional philosophies and preparation models differ. Denmark's 2022 reform emphasises practice-oriented pedagogy with four years of in-school training to bridge theory and classroom realities, requiring mastery of lesson planning, authority, and interdisciplinary collaboration (Ministry of Higher Education and Science et al., 2021). In Finland, pedagogical competence is described as an integration of content, emotional intelligence, learner understanding, and democratic classroom practices, with teachers acting as facilitators of active, inclusive learning (Lavonen, 2022).

The standards in Australia, England, and Scotland include planning for effective instruction, creating supportive environments, and differentiating instruction according to learner needs. Australian standards align with the national curriculum and emphasise digital integration and Indigenous perspectives (AITSL, 2022). England focuses on lesson delivery, classroom management, and adaptability, particularly for pupils with special education needs, disabilities, and for whom English is a second language (Department for Education, 2021). In Scotland, pedagogy is framed around curriculum design, assessment integration, and creating positive relationships that foster inclusion and engagement (GTC, 2021).

In New Zealand, Canada, and Saudi Arabia, pedagogy is culturally anchored. Teachers are expected to employ *ako* (reciprocal learning), foster learner identity, and apply Māori and Pasifika values (Teaching Council of Aotearoa New Zealand, 2020). Canada's provincial standards emphasise pedagogical responsiveness, especially the ability to integrate anti-oppressive education, trauma-informed practices, and culturally relevant content (Ontario College of Teachers, 2025). In Colorado, the framework prioritises lesson development aligned with state standards, use of inquiry-based methods, and inclusive learning environments (Colorado Department of Education, 2024). Saudi Arabia's pedagogy is more formally structured, with a strong emphasis on instructional strategies tied to the national curriculum, teacher-led classroom control, and religious appropriateness (OECD, 2020a). Teachers are assessed through *Qifayat*. Across systems, pedagogy reflects cultural values, learner diversity, and national educational priorities.

Content Knowledge

Content knowledge is clearly a priority in all nine systems, but the scope, depth, and method of validation differ. Saudi Arabia formally evaluates content knowledge through the *Qifayat* test, a high-stakes licensing exam that assesses both subject matter and pedagogical expertise (OECD, 2020a). In England, teachers must demonstrate strong subject and curriculum knowledge, particularly in early reading, phonics, and literacy, especially at the primary level (Department for Education, 2021), reflecting a strong emphasis on accountability.

Australia, Scotland, Colorado, Finland, and Denmark focus on curriculum knowledge. Australia's standards require teachers to know the content and how to teach it, emphasising literacy, numeracy, and digital

technologies (AITSL, 2022). This includes content relevant to Aboriginal and Torres Strait Islander histories and cultures. Scotland expects teachers to demonstrate deep curriculum knowledge and subject-specific planning aligned with national priorities (GTC, 2021). Similarly, Colorado emphasises mastery of academic content, interdisciplinary connections, and inquiry-based, student-centred instruction (Colorado Department of Education, 2024). Finland requires deep disciplinary expertise along with the ability to integrate knowledge across subjects. Teachers must understand curriculum structures and support learners in developing critical thinking and sustainability-oriented knowledge (Lavonen, 2022). Denmark's standards also require strong subject specialisation and an ability to connect subject matter with civic education and learner development (Ministry of Higher Education and Science et al., 2021).

New Zealand and Ontario extend content knowledge to culturally and linguistically responsive curricula. In New Zealand, teachers are required to understand students' cultural backgrounds and weave them into content delivery (Teaching Council of Aotearoa New Zealand, 2020). This is also true in Canada, particularly in the province of Ontario, which emphasises the integration of Indigenous knowledge systems and anti-racist content across subjects (Ontario College of Teachers, 2025). Canada and New Zealand extend content expertise into justice-focused pedagogies. Across systems, content expertise reflects each nation's epistemological values and socio-political priorities.

Assessment and Evaluation Skills

All nine education systems expect teachers to demonstrate effective assessment and evaluation practices, although the emphasis and use of assessment data vary widely. England ties assessment closely to accountability, requiring formative and summative strategies to measure students' progress and inform instruction (Department for Education, 2021). Data-driven instruction and pupil feedback are integral to performance evaluation. Similarly, Saudi Arabia's *Qifayat* framework mandates assessment literacy and periodic reassessment of teacher proficiency to ensure quality and accountability (OECD, 2020a).

Finland, New Zealand, and Denmark adopt more holistic approaches to assessment. In Finland, assessment guides learning rather than measuring teacher performance, using informal assessment, self-evaluation, and peer feedback. New Zealand emphasises culturally responsive assessment, affirming learner identity and collaboratively involving families. Canada's provincial standards promote inclusive, transparent assessment that supports equity, integrating both academic achievement and social-emotional development. Denmark's standards require teachers to use varied assessment strategies aligned with learning objectives, balancing formative feedback and summative evaluation.

Other systems vary in approach. In Colorado, teachers are required to use student performance data to modify instruction, set goals, and develop individual learning plans, in alignment with state standards and district-wide performance systems (Colorado Department of Education, 2024). Australia links assessment to reporting and planning, emphasising timely feedback (AITSL, 2022). In Scotland, assessment is part of professional judgment, with teachers expected to integrate assessment within the planning process and to use feedback to support student progress and reflective practice (GTC, 2021). Generally, while all systems agree on the importance of assessment, they diverge on whether it primarily serves learning, accountability, or both.

Lifelong Learning and Continuing Professional Development

Whereas the expectation for ongoing professional growth appears embedded across all systems, there is considerable variance in the structure and philosophy of continuing professional development. While some systems expressly require professional development, others make it optional. In Ontario, Canada, provincial standards mandate that teachers engage in ongoing learning related to equity, technology integration, and reconciliation, often facilitated through professional learning communities (Ontario College of Teachers, 2025). England's standards include continuing professional development as a professional responsibility, while Scotland frames lifelong learning as an ethical obligation, expecting teachers to engage in career-long professional learning, collaborative inquiry, and reflective dialogue (Department for Education, 2021; GTC, 2021).

Lifelong learning is a means of professional advancement. For example, Australia's tiered standards define career stages – graduate, proficient, highly accomplished, and lead (AITSL, 2022) – with each stage having specific professional development expectations. Saudi Arabia also uses a career-level system, ranging from practitioner to expert, which is tied to promotion and mentorship (OECD, 2020a). Advancement in both systems requires evidence portfolios and engagement in ongoing professional learning.

Overall, both the structure and underlying philosophy of continuing professional development vary considerably. Finland's education strategy supports transformative agency through professional research, critical reflection, and innovation in schools, reinforcing the notion of teachers as knowledge creators (Lavonen, 2022). In New Zealand, continuing professional development is strongly tied to cultural competence, with expectations for teachers to respond to feedback from learners, colleagues, and communities as part of their professional growth. Denmark's revised teacher standards promote professional autonomy and school-based inquiry, emphasising international experience and a willingness to learn in diverse contexts. Finally, Colorado encourages professional development through state-funded initiatives, peer observation, and alignment with school improvement goals. In essence, all systems treat professional development as central to teaching but differ in whether it is structured through career stages, collaborative practices, or system-level mandates.

Reflection of Professionalisation in Teacher Standards

The content analysis revealed that all nine national and subnational teacher standards documents examined contain elements reflecting the professionalisation of teaching. These elements were most commonly expressed through formal role expectations, ethical and regulatory codes, qualification requirements, and career development structures. Across the documents, professionalisation was conveyed through structured teacher identities, references to teaching as a specialised field of knowledge and practice, and language emphasising accountability, growth, and ethical conduct. Although common features were identified, the emphasis and articulation of professionalisation varied across systems.

In Australia, professionalisation is operationalised through a clearly defined career stage model. AITSL (2022) categorises teachers as graduate, proficient, highly accomplished, or lead, with each stage encompassing progressively complex competencies. This categorisation reflects a structured professional path with specific expectations for instructional skill, collaboration, and leadership. The standards describe teaching as a career that evolves through evidence-based professional learning, peer collaboration, and increased responsibility. Similarly, Saudi Arabia's standards define a multi-level professional pathway linked to certification outcomes, with advancement requiring portfolio-based evidence and mentorship experience. The requirement to pass the

Qifayat examination further demonstrates a performance-based model of professionalism emphasising standardised competence.

Standards in England, Scotland, and Denmark reflect professionalisation by formally linking entry to the profession with the achievement of teachers' standards. In England, the Qualified Teacher Status (QTS) specifies minimum levels of subject knowledge, teaching ability, and ethical conduct (Department for Education, 2021). Professionalism is associated with reflective practice, legal compliance, and contributions to school-wide goals, all of which are explicitly detailed in the document. In Denmark, the 2022 revised standards for teacher education outline professionalism through increased academic rigour, subject specialisation, and an expanded role for practice-based learning. Teachers are required to complete a bachelor's thesis and pass both oral and written evaluations, demonstrating professional mastery rooted in classroom contexts (Ministry of Higher Education and Science et al., 2021). In Scotland, the GTC outlines professional standards that combine technical expectations with a strong emphasis on values such as social justice and integrity. Standards for middle leadership and headship illustrate a view of the profession as hierarchical and developmental (GTC, 2021). Teachers are expected to demonstrate increasing levels of judgement, curricular leadership, and collaborative inquiry.

The standards in Colorado present a professional framework that integrates instructional effectiveness with leadership and ethical conduct. Teachers are expected to connect classroom teaching with school culture, respond to student needs using data, and participate in broader professional networks (Colorado Department of Education, 2024). The standards include leadership roles beyond the classroom, such as mentoring, school-wide planning, and participation in policy implementation, reinforcing teaching as both a professional and civic responsibility.

In New Zealand and Canada, teacher standards explicitly define teaching as a profession grounded in bicultural responsibility, collaborative learning, and culturally responsive pedagogy. Teachers in New Zealand are described as active participants in ongoing inquiry, reflection, and school-based innovation (Teaching Council of Aotearoa New Zealand, 2020). Professional learning is presented as an embedded expectation rather than an optional activity. Similarly, in Ontario, Canada, teacher standards define professionalism in terms of ethical responsibility, ongoing self-assessment, and commitment to anti-oppressive, inclusive education (Ontario College of Teachers, 2025). Teachers are expected to integrate Indigenous knowledge, address structural inequalities, and engage in lifelong learning informed by current research and community feedback.

In summary, the analysis shows that all nine standards documents contain structural elements aligning with key indicators of professionalisation, including ethical codes, formal qualifications, structured career expectations, and collaborative development. However, the construction of professionalisation varies by country. Some systems, such as those in Australia, Saudi Arabia, and England, emphasise stratified progression and credentialing (AITSL, 2022; Department for Education, 2021; OECD, 2020a). Others, such as those in Finland, Scotland, and New Zealand, emphasise autonomy, inquiry, and ethical commitments (Lavonen, 2022; Teaching Council of Aotearoa New Zealand, 2020; GTC, 2021). Although Finland lacks a central standards document comparable to other countries, its 2022 national aims for teacher education articulate professional expectations in similarly structured terms, portraying teachers as research-informed practitioners with expertise in pedagogy, ethics, digital competence, and school improvement. The aims emphasise transformative agency and position teachers as curriculum developers and community contributors. Overall,

these variations reflect differing national understandings of what it means to be a professional teacher, even as a shared international framework emerges.

Discussion

The analysis of teacher standards across nine education systems confirms that professionalisation theory provides a useful lens for interpreting convergence and divergence in teacher professionalism. Forsyth and Danisiewicz (1985) noted that occupations achieve professional status when their roles are codified through standards, ethics, and specialised knowledge. The recurrence of five domains across the sampled systems–values and ethics, pedagogy, content knowledge, assessment, and professional development–suggests that teaching has increasingly conformed to these expectations. At the same time, Freidson (2001) highlighted that professionalism also functions as a means of establishing legitimacy. This explains why each country frames these domains in ways that reflect local cultural and political priorities rather than universal definitions.

Professional values and ethics illustrate this dynamic most clearly. In Saudi Arabia, standards emphasise Islamic principles, which reflects the integration of teaching with moral and religious life. In Scotland, the General Teaching Council situates professionalism within commitments to social justice and equality. Such contrasts affirm Adoniou and Gallagher's (2017) position that standards define what teachers must do as well as construct who they are expected to be. Ethical professionalism therefore carries both functional and symbolic weight because it positions teachers as role models within national identity projects as well as within professional frameworks.

Pedagogical knowledge shows similar tensions between global and local conceptions of professionalism. England highlights classroom management and accountability to measurable outcomes, which is consistent with the performance-based accountability systems described by the OECD (2020b). Finland, by contrast, emphasises democratic participation and learner autonomy, which somehow resonates with Biesta's (2022) view of the teacher's existential role in fostering responsible citizenship and independence. These contrasting emphases show how pedagogy is shaped by national philosophies of education. Systems grounded in autonomy and inquiry, such as Finland, treat pedagogy as a means of cultivating civic responsibility, while accountability-driven systems view pedagogy as a mechanism for delivering quantifiable achievement.

Assessment and evaluation practices further highlight the dual role of standards in supporting both accountability and growth. England and Saudi Arabia's reliance on formal testing reflects what Hanushek and Rivkin (2006) described as the central role of teacher quality in measurable outcomes, linking teacher accountability directly to student achievement. In contrast, Finland and New Zealand employ formative assessment as a way to guide learning and support student well-being; this reflects Darling-Hammond et al.'s (2017) findings that standards are most effective when connected to reflective practice and professional development rather than punitive measures. These differences show how the same domain can be used to either reinforce external control or to build teacher agency.

The expectation of lifelong learning was evident across all systems but with divergent structures. Australia and Saudi Arabia employ tiered career progression models tied to certification and promotion. This reflects the structured approach to professional growth documented by Darling-Hammond and Bransford (2012), who argued that standards can serve as a framework for clearly defined expectations at different stages of a

teacher's career. In their view, progression models provide transparency about what constitutes professional expertise, guiding teachers from novice to advanced levels of practice. Scotland and New Zealand, however, emphasise career-long inquiry and collaboration. This is consistent with Leibur et al.'s (2021) findings that professional standards can foster self-reflection and collective responsibility. This suggests that continuing professional development can either operate as a hierarchical mechanism of advancement or as an embedded ethic of collaborative inquiry.

Overall, the comparative findings illustrate the potential and the challenges of professional standards. On the one hand, they affirm Phelps and Sykes' (2020) claim that standards shape the capacities teachers bring to their work by codifying knowledge, skills, and ethical responsibilities. On the other hand, they echo Buchanan's (2015) concern that when standards are narrowly implemented as compliance mechanisms, they may reduce teacher agency and creativity. The contrast between accountability-driven systems such as England and Saudi Arabia and autonomy-oriented systems such as Finland and Scotland highlights this tension. In the first case, professionalism is defined through external regulation and measurable outcomes, while in the second, it is expressed through reflective practice, inquiry, and civic responsibility. The coexistence of these models suggests that global convergence in domains does not necessarily mean uniformity in practice. Instead, standards serve as a site where international trends and national identities interact. They produce varied forms of teacher professionalism that reflect both shared expectations and local priorities.

Conclusion

This study compared professional teacher standards across nine education systems and found a recurring set of five domains that define teacher professionalism globally. These domains confirm the centrality of codified standards in legitimising teaching as a profession, while also showing that cultural and political contexts shape how professionalism is expressed. In some contexts, such as England and Saudi Arabia, standards are closely tied to accountability and credentialing, whereas in Finland and Scotland they emphasise autonomy, ethics, and reflective inquiry. Together, these findings suggest that while teacher standards reflect international convergence, they are locally adapted to serve broader national goals.

This paper contributes to the literature by updating the understanding of how professionalisation is articulated in policy frameworks. It shows that standards function not only as regulatory mechanisms but also as symbolic instruments that construct teacher identity and shape public trust. For policymakers, the findings highlight the importance of balancing external accountability with professional autonomy so that standards support growth rather than restrict agency. For practitioners, the study underscores the need to see standards as opportunities for reflection and identity formation rather than as technical checklists.

This study has limitations. It was restricted to publicly available documents, which may not capture all versions of national standards. The focus on formal texts means that the analysis reflects policy intentions rather than classroom realities. Future research could investigate how teachers themselves interpret and enact standards, and how these frameworks influence professional identity in practice. Such work would extend the present study by bridging the gap between policy documents and lived professional experiences.

Declarations

Competing interests

The author declares no competing interests and there are no conflicts of interest to declare.

Ethical approval

Not applicable

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Author Contribution

Ahmad Aseery conceived the study, collected and analyzed the data, and wrote the manuscript.

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Data availability

All data analyzed in this study are publicly available in the cited sources. No new datasets were generated.

References

1. Adoniou, M., & and Gallagher, M. (2017). Professional standards for teachers—What are they good for? *Oxford Review of Education*, *43*(1), 109–126. https://doi.org/10.1080/03054985.2016.1243522
2. Australian Institute for Teaching and School Leadership Limited. (2022). *Australian professional standards for teachers*. AITSL. https://www.aitsl.edu.au/standards
3. Biesta, G. (2022). *World-centred education: A view for the present*. Taylor & Francis.
4. Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, *9*(2), 27–40. https://doi.org/10.3316/QRJ0902027
5. Bromley, M. (2023, September 18). *DfE's teachers' standards: Promote high-quality education*. The National College. https://nationalcollege.com/news/dfe-s-teachers-standards
6. Buchanan, R. (2015). Teacher identity and agency in an era of accountability. *Teachers and Teaching*, *21*(6), 700–719. https://doi.org/10.1080/13540602.2015.1044329
7. Campbell, P. (2025, April 17). *Global trends in education quality standards: What institutions need to know*. International Education Accreditation Council. https://www.ieac.org.uk/43-Global-Trends-in-Education-Quality-Standards-What-Institutions-Need-to-Know-blog.php

8. Colorado Department of Education. (2024). *State model evaluation system for teachers*. https://www.cde.state.co.us/educatoreffectiveness/smes-teacher#TQS
9. Darling-Hammond, L. (2000). Teacher quality and student achievement. *Education Policy Analysis Archives*, *8*(1), 1–44. https://doi.org/10.14507/epaa.v8n1.2000
10. Darling-Hammond, L., & Bransford, J. (2012). *Preparing teachers for a changing world: What teachers should learn and be able to do*. John Wiley & Sons.
11. Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute. https://eric.ed.gov/?id=ED606743
12. Day, C., & Gu, Q. (2010). *The New Lives of Teachers*. Routledge. https://doi.org/10.4324/9780203847909
13. Department for Education. (2021, December 13). *Teachers' standards*. GOV.UK. https://www.gov.uk/government/publications/teachers-standards
14. Escalona-Márquez, L. N., Cedeño-Tapia, S. J., Camputaro, L. A., Aparicio-Escalante, C. O. O., Escalona-Márquez, L. N., Cedeño-Tapia, S. J., Camputaro, L. A., & Aparicio-Escalante, C. O. O. (2024). Teachers in the age of artificial intelligence: Preparation and response to challenges. In S. Kadry (Ed.), *Artificial intelligence and education—Shaping the future of learning*. IntechOpen. https://doi.org/10.5772/intechopen.1005172
15. Forsyth, P. B., & Danisiewicz, T. J. (1985). Toward a theory of professionalization. *Work and Occupations: An International Sociological Journal*, *12*(1), 59–76.
16. Freidson, E. (2001). *Professionalism, the third logic: On the practice of knowledge*. University of Chicago Press.
17. Hani, M. (2022). Conducting a qualitative document analysis. *The Qualitative Report*, *27*(1), 64–77. https://doi.org/10.46743/2160-3715/2022.5044
18. Hanushek, E. A. (2011). The economic value of higher teacher quality. *Economics of Education Review*, *30*(3), 466–479. https://doi.org/10.1016/j.econedurev.2010.12.006
19. Hanushek, E. A., & Rivkin, E. G. (2006). Teacher quality. In E. A. Hanushek & F. Welch (Eds.), *Handbook of Economic of Education* (Vol. 2, pp. 1051–1078). Elsevier. https://doi.org/10.1016/S1574-0692(06)02018-6
20. Hitz, R. (2008). Can the teaching profession be trusted? *Phi Delta Kappan*, *89*(10), 746–750. https://doi.org/10.1177/003172170808901012
21. Ingvarson, L., & Rowley, G. (2017). Quality assurance in teacher education and outcomes: A study of 17 countries. *Educational Researcher*, *46*(4), 177–193. https://doi.org/10.3102/0013189X17711900
22. Kawamoto, M., Koizumi, M., & Yoshikane, F. (2023). Proposal of a qualitative content analysis process for a solo researcher. *Libri*, *73*(2), 139–152. https://doi.org/10.1515/libri-2022-0068
23. Knoeppel, R. C., Logan, J. P., & Keiser, C. M. (2005). Measuring teacher quality: Continuing the search for policy-relevant predictors of student achievement. *University Council for Educational Administration Annual Convention*, 1–43. files.eric.ed.gov/fulltext/ED526999.pdf
24. Larsen, B., Ju, Z., Kapor, A., & Yu, C. (2020). *The effect of occupational licensing stringency on the teacher quality distribution* (Working Paper No. 28158). National Bureau of Economic Research. https://doi.org/10.3386/w28158
25. Lavonen, J. (2022). *Characteristics of a professional teacher in the context of Finnish education*. University of Helsinki MOOC Center. https://courses.mooc.fi/org/uh-edu/courses/uncover-finnish-education/chapter-5/teachers-as-professionals

26. Leibur, T., Saks, K., & Chounta, I.-A. (2021). Towards acquiring teachers' professional qualification based on professional standards: Perceptions, expectations and needs on the application process. *Education Sciences*, *11*(1), 1–19.
27. McMillan, J. H., & Schumacher, S. (2013). *Research in education: Evidence-based inquiry: pearson new international edition* (7th ed.). Pearson Education.
28. Ministry of Education. (2025, January 10). *Our teachers*. Government of Singapore. http://www.moe.gov.sg/education-in-sg/our-teachers
29. Ministry of Higher Education and Science, Ministry of Children and Education, & Ministry of Culture. (2021, December). *The Danish education system*. Stibo Complete. https://ufm.dk/en/publications/2022/files/the-danish-education-system.pdf
30. Ontario College of Teachers. (2025). *Standards of practice*. https://www.oct.ca/public/professional-standards/standards-of-practice
31. Organisation for Economic Co-operation and Development. (2020a). *Education in Saudi Arabia* [OECD Publishing]. Reviews of National Policies for Education. https://doi.org/10.1787/76df15a2-en.
32. Organisation for Economic Co-operation and Development. (2020b). *TALIS 2018 results (volume II)*. OECD Publishing. https://doi.org/10.1787/19cf08df-en
33. Phelps, G., & Sykes, G. (2020). The practice of licensure, the licensure of practice. *Phi Delta Kappan*, *101*(6), 19–23. https://doi.org/10.1177/0031721720909582
34. Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, *73*(2), 417–458. https://doi.org/10.1111/j.1468-0262.2005.00584.x
35. Robinson, S. (2012). Constructing teacher agency in response to the constraints of education policy: Adoption and adaptation. *The Curriculum Journal*, *23*(2), 231–245. https://doi.org/10.1080/09585176.2012.678702
36. Sahlberg, P. (2016). The global educational reform movement and its impact on schooling. In K. Mundy, A. Green, B. Lingard, & A. Verger (Eds.), *The handbook of global education policy* (pp. 128–144). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118468005.ch7
37. Salminen, A., Kauppinen, K., & Lehtovaara, M. (1997). Towards a methodology for document analysis. *Journal of the American Society for Information Science*, *48*(7), 644–655. https://doi.org/10.1002/(SICI)1097-4571(199707)48:7<644::AID-ASI12>3.0.CO;2-V
38. Teaching Council of Aotearoa New Zealand. (2020). *Our code, our standards*. Teaching Council of Aotearoa New Zealand. https://teachingcouncil.nz/professional-practice/our-code-our-standards/
39. The General Teaching Council for Scotland. (2021, September 13). *The standard for full registration*. https://www.gtcs.org.uk/documents/the-standard-for-full-registration
40. Zhang, S., Diao, J., Ma, X., Tang, X., & Ding, X. (2024). What qualities do teachers need in the era of artificial intelligence: Analysis based on international experience. *STEM Education Review*, *2*(3), 1–9. https://doi.org/10.54844/stemer.2024.0557