**International Journal of Social Science and Humanities**
**www.humanitiesjournals.com**
**Online ISSN: 2664-8628 Print ISSN: 2664-861X**
**Received: 04-04-2023, Accepted: 05-05-2023, Published: 20-05-2023**
**Volume 5, Issue 2, 2023, Page No. 39-44**

# Teacher competencies for 21st century learning: Facilitating AI and design thinking integration

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**Abstract**
The combination of Artificial Intelligence (AI) and Design Thinking (DT) has become a revolutionary paradigm for teaching, learning, and innovation in the quickly changing field of 21st-century education. This essay explores the critical role that educators play in promoting this integration, highlighting the skills needed to create learning experiences that are human-centred, innovative, and data-driven. Through adaptive technology, predictive analytics, and evidence-based reflection, it examines how educators may use AI to improve each stage of the Design Thinking process: empathizing, defining, ideating, prototyping, and testing. The study highlights the collaborative process between AI and DT as a dynamic interplay of human creativity and machine intelligence, enabling continuous improvement and personalized learning. Particular attention is given to the Test phase, where AI-driven analytics provide real-time feedback and iterative refinement, transforming assessment into a meaningful learning loop. Furthermore, the paper outlines strategies for building teacher competencies, including professional development programs, design-based pedagogy, innovation labs, and reflective practices that cultivate empathy, collaboration, and ethical awareness. By fostering these competencies, teachers evolve from traditional knowledge transmitters to facilitators of innovation and critical inquiry. Ultimately, this paper argues that integrating AI and Design Thinking in education not only enhances instructional effectiveness but also equips both teachers and learners with the creative problem-solving and technological fluency essential for navigating complex, interconnected global futures.

**Keywords:** Artificial intelligence, design thinking, teacher competencies, 21st century learning

## Introduction

The 21st century has brought us a period of unparalleled technological, social, and economic change that has drastically changed the goals and methods of education. The traditional paradigm of teaching where knowledge was transmitted unidirectionally from teacher to student is being replaced by collaborative, technology-mediated, and innovation-oriented learning environments (Fullan & Langworthy, 2014) [5]. In this emerging landscape, Artificial Intelligence (AI) and Design Thinking (DT) stand out as transformative forces that promise to reshape how learning is designed, delivered, and experienced.

Modern education systems are increasingly guided by the Framework for 21st Century Learning (P21, 2019), which emphasizes the acquisition of '4Cs'- *critical thinking*, *communication*, *collaboration*, and *creativity* as essential competencies for lifelong learning and employability. These skills are reinforced by the growing demand for digital literacy, adaptability, and innovation, which are indispensable in a globalized and AI-driven economy. In this setting, educators are expected to develop students' higher-order thinking and problem-solving abilities in addition to mastering new technology (OECD, 2019). From a specialist field of computer science, artificial intelligence has quickly developed into a potent teaching tool that facilitates data-informed training, real-time assessment, and individualized learning. By providing insights into student performance and learning needs, AI-based solutions like adaptive learning platforms, intelligent tutoring systems, and predictive analytics are transforming classroom dynamics (Holmes, Bialik, & Fadel, 2019) [8]. Teachers can optimize learning paths, improve engagement, and customize instruction with the help of these tools. However, for AI to be used in education effectively, instructors who are AI literate must be able to comprehend, assess, and use AI tools in an ethical and pedagogical manner (UNESCO, 2021) [23]. Without these skills, technology runs the risk of being misused or underutilized, which would increase rather than decrease educational disparities. In parallel, Design Thinking (DT), a human-centred approach to problem-solving that is based on empathy, creativity, and iterative experimentation, has become an essential pedagogical framework for classrooms in the twenty-first century. Design Thinking fosters creativity and social awareness by encouraging students to define problems, come up with solutions, prototype, test results, and sympathize with users (Brown, 2009). When adopted in educational contexts, it transforms classrooms into innovation ecosystems, where students become active creators of knowledge rather than passive recipients (Razzouk & Shute, 2012) [18]. Teachers practicing design-thinking pedagogy cultivate a culture of experimentation, resilience, and reflective inquiry qualities indispensable for lifelong learning and innovation. The integration of AI and Design Thinking represents a powerful synthesis between technological intelligence and human-centred creativity. AI provides data-driven insights, automation, and analytical precision, while Design Thinking emphasizes empathy, ethics, and contextual understanding. Together, they promote intelligent creativity the ability to use technology to design innovative, ethical, and socially relevant solutions (Anderson & Rainie, 2023) [1]. However, realizing this integration in educational practice depends critically on the competencies of teachers their ability to understand, apply, and balance these paradigms within the learning environment. Despite this potential, most teachers are insufficiently prepared to integrate AI and Design Thinking in their pedagogical practice (Zawacki-Richter *et al.*, 2019) [25]. Teacher education programs often emphasize

theoretical knowledge over innovation, creativity, or technological adaptability (Darling-Hammond *et al*., 2017) [2] Furthermore, ethical challenges related to AI including bias, data privacy, and transparency underscore the need for ethical and reflective competencies in educators (UNESCO, 2021) [23]. Thus, developing teacher competencies for 21st-century learning involves a multidimensional shift encompassing technological fluency, pedagogical innovation, ethical reasoning, collaboration, and adaptability.

In this context, the role of the teacher extends beyond facilitating knowledge acquisition to orchestrating human–machine collaboration for learning. Teachers must act as learning designers, mentors, and reflective practitioners who leverage AI tools and design-thinking principles to cultivate creativity, critical inquiry, and empathy among learners. Future-ready education must 'develop the capacities of critical thinking, creativity, and problem-solving,' according to India's National Education Policy (NEP 2020) (Ministry of Education, 2020, p. 35) [13]. Giving educators the skills, they need to successfully negotiate the nexus of technology and humanity is essential to realizing this vision. Thus, this study examines the teacher competences needed to include Design Thinking and Artificial Intelligence in 21st-century classrooms, emphasizing their theoretical underpinnings, critical skill domains, implementation obstacles, and professional development initiatives. It seeks to add to the conversation on rethinking teacher duties at a time when human creativity and technical proficiency must coexist peacefully in order to prepare students for a future that is changing quickly.

**Theoretical/Conceptual Background of Study**

The theoretical foundation for understanding teacher competencies in facilitating the integration of Artificial Intelligence (AI) and Design Thinking (DT) within 21st-century learning environments is deeply rooted in the convergence of Constructivist, Connectivist, and Experiential learning paradigms that emphasize active, learner-centred, and technology-enhanced education. The rapid transformation of global knowledge economies, coupled with technological innovations and shifting societal needs, has redefined the role of education from the transmission of static knowledge to the cultivation of *adaptive, creative, and problem-solving capacities* (Fullan & Langworthy, 2014) [5]. Within this evolving educational landscape, teachers are no longer mere transmitters of information but *designers of learning experiences*, mediators of human–machine interaction, and facilitators of students' creative and critical engagement with technology. The integration of AI and DT into pedagogy therefore represents both a pedagogical innovation and a theoretical paradigm shift one that necessitates a holistic understanding of how knowledge is constructed, mediated, and applied through digital and human-centred means. The 21st-century learning framework serves as the overarching conceptual backdrop for this discussion. The Partnership for 21st Century Skills (P21, 2019) [16] highlights that students need to have information literacy, media literacy, digital skills, and the so-called '4Cs'—critical thinking, communication, collaboration, and creativity—in addition to core academic competences. These competencies are crucial in preparing learners to navigate an increasingly interconnected and AI-driven global society. Similarly, the OECD Learning Compass 2030 framework expands on this perspective by identifying *transformative competencies* — such as agency, co-agency, and reflective thinking as central outcomes of modern education (OECD, 2019). These frameworks support constructivist theories of learning, which contend that rather than being passively absorbed, knowledge is actively created via experience, social interaction, and introspection (Piaget, 1972; Vygotsky, 1978) [17, 24]. Teachers, therefore, must cultivate the ability to create dynamic and interactive learning environments that empower students to become self-directed, reflective, and innovative learners. Such a role requires not only pedagogical and content expertise but also advanced competencies in integrating emerging technologies like AI and applying innovative methodologies such as Design Thinking. Over the past ten years, artificial intelligence in education (AIED) has grown dramatically, providing new chances for individualized, data-driven, and adaptable learning. AI includes systems that are capable of learning, reasoning, solving problems, and making decisions (Russell & Norvig, 2020) [19]. Artificial intelligence (AI) tools including chatbots, intelligent tutoring systems, adaptive learning platforms, and predictive analytics are being employed more frequently in educational settings to customize training to the needs of specific students. (Holmes, Bialik, & Fadel, 2019) [8]. These tools analyse learner data to provide feedback, identify learning gaps, and suggest customized pathways — thereby enhancing engagement and academic performance. However, the pedagogical effectiveness of AI integration depends on the teacher's ability to interpret AI-generated data and integrate it meaningfully into instruction (Zawacki-Richter *et al*., 2019) [25]. This is consistent with Mishra and Koehler's (2006) [14] Technological Pedagogical Content Knowledge (TPACK) framework, which views successful technology integration as the meeting point of three knowledge domains: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). In the AI era, this framework is further expanded to include *ethical and data literacy*, underscoring the necessity for teachers to understand both the capabilities and limitations of AI technologies (UNESCO, 2021) [23]. Without adequate AI literacy, educators may either underutilize AI's potential or misapply it, thereby exacerbating digital divides and ethical risks such as data misuse, algorithmic bias, and loss of learner agency. Design Thinking (DT), a revolutionary pedagogical approach that is consistent with constructivist and experiential learning theories, has surfaced concurrently with the development of artificial intelligence. Design Thinking, which is based on the ideas of human-centred design, enables students to tackle issues by using empathy, creativity, experimentation, and iteration (Brown, 2009). Empathize, define, ideate, prototype, and test are the five essential phases of this process according to the Stanford D. School model (Razzouk & Shute, 2012) [18]. In the context of education, Design Thinking gives students the ability to recognize real-world issues and create creative, user-centred solutions. It encourages creative confidence, which is the conviction that each person is capable of coming up with and implementing original ideas (IDEO, 2015) [9]. When included into the curriculum, DT promotes higher-order thinking abilities including problem analysis, teamwork, resilience, and reflection—all of which are essential for learning in the twenty-first century. For teachers, applying

Design Thinking means adopting a mindset of experimentation and empathy, where they act as facilitators guiding students through inquiry-driven processes rather than as authoritative sources of knowledge (Kolb, 1984) [10]. This pedagogical orientation requires educators to be comfortable with ambiguity, to value student voice, and to design iterative learning experiences that blend creativity with analytical reasoning.

The synergy between Artificial Intelligence and Design Thinking represents a powerful paradigm for 21st-century education, combining the precision of machine intelligence with the empathy and creativity of human-centred design. AI can enhance each phase of the design-thinking process by providing tools for data analysis, pattern recognition, simulation, and predictive modelling. For instance, AI systems can help students *empathize* by analysing user data, *define* problems by identifying trends, *ideate* through generative design tools, *prototype* using simulations, and *test* through virtual feedback mechanisms (Anderson & Rainie, 2023) [1]. Conversely, Design Thinking humanizes AI by ensuring that technology-driven solutions remain ethically sound, socially relevant, and contextually appropriate. This interplay highlights the need for teachers who can bridge the divide between technological expertise and human-centred pedagogy. Such teachers must not only understand AI's technical and ethical dimensions but also apply creative, iterative, and empathetic approaches to instructional design. From a theoretical perspective, integrating AI and DT aligns closely with connectivism, a learning theory proposed by Siemens (2005) [21], which posits that knowledge exists within networks both human and digital and learning occurs through the ability to navigate, connect, and apply information across these networks. In the AI-driven classroom, connectivism underscores the idea that teachers and students co-construct knowledge in partnership with intelligent systems. Teachers thus require competencies that enable them to manage these networks, curate learning resources, and guide students in making ethical and effective use of AI tools. This expands the teacher's traditional role to include that of a *learning designer*, *data interpreter*, and *ethical steward* (Holmes *et al*., 2019) [8]. Moreover, by integrating Design Thinking into this networked learning environment, educators can nurture *creativity, empathy, and problem-solving* alongside digital literacy ensuring a holistic and human-centred approach to education. Furthermore, contemporary educational policies reinforce the necessity for such integrated competencies. The promotion of 'critical thinking, creativity, scientific temper, communication, collaboration, and ethical reasoning' is emphasized in India's National Education Policy (NEP 2020) (Ministry of Education, 2020, p. 35) [13]. These goals are in line with the combined potential of AI and design thinking, where technology facilitates learning personalization and design-thinking pedagogy fosters creativity and empathy. Hence, the teacher's role in 21st-century education is to harmonize these dimensions to balance technological intelligence with humanistic insight. The theoretical foundation therefore rests on the recognition that teacher competencies must evolve dynamically encompassing technological literacy, ethical awareness, creative problem-solving, reflective thinking, and adaptability. The theoretical background of this study reveals that effective integration of AI and Design Thinking requires a multidimensional framework of teacher competencies, informed by constructivist, experiential, and connectivist learning theories. Teachers must not only master technological tools but also embrace the philosophical shift from instructing to designing, from controlling to facilitating, and from teaching content to cultivating innovation. As education continues to evolve within the broader framework of the Fourth Industrial Revolution, teacher preparation must be guided by an integrated understanding of AI as an enabler of intelligence and Design Thinking as a catalyst for creativity and empathy. Together, they represent a transformative vision of education that prepares learners and their teachers to thrive in an age of complexity, uncertainty, and innovation.

**Collaborative Process of AI and Design Thinking**

The collaborative process of Artificial Intelligence (AI) and Design Thinking (DT) represents a transformative approach to problem-solving and learning that integrates the precision of machine intelligence with the empathy and creativity of human-centred design. In educational contexts, this convergence fosters a dynamic ecosystem where human and artificial intelligences interact synergistically to enhance innovation, personalization, and meaningful learning outcomes (Holmes, Bialik, & Fadel, 2019) [8]. While AI contributes through data analytics, automation, and adaptive feedback, Design Thinking adds the essential human dimensions of empathy, creativity, ethical reasoning, and iterative improvement. The collaboration between these paradigms enables both teachers and learners to co-create solutions that are not only efficient but also deeply relevant to human needs and societal challenges (Brown, 2009; Luckin, 2018) [12]. At its core, the collaborative process of AI and Design Thinking operates through an iterative cycle involving data-informed empathy, intelligent ideation, prototype generation, and continuous evaluation.

1. **Empathize Stage:** In the *Empathize* phase, AI technologies such as natural language processing, sentiment analysis, and data mining help teachers and learners analyze large sets of qualitative data to understand user experiences, emotions, and learning patterns (Zawacki-Richter *et al*., 2019) [25]. This AI-assisted empathy allows educators to identify nuanced learner needs and social issues that may not be visible through traditional observation alone. For example, AI-driven analytics can reveal learning bottlenecks or engagement drops, guiding educators to design interventions that are emotionally and cognitively responsive (Holmes *et al*., 2019) [8].

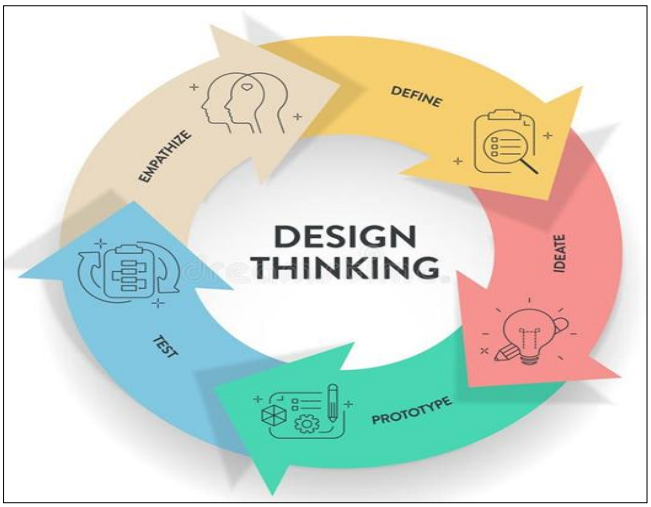


**Fig 1:** Stages of Design Thinking

2. **Define Stage:** In the Define stage, AI contributes by processing complex data to clarify problem statements and identify patterns or correlations. Teachers and students can use AI tools to analyse educational datasets or real-world information to pinpoint the root causes of a problem. This process ensures that design challenges are grounded in evidence-based insights rather than assumptions (Long & Magerko, 2020) [11]. Simultaneously, the reflective, human-centred nature of Design Thinking ensures that the problem remains connected to ethical and social dimensions. The collaboration of AI's computational accuracy and Design Thinking's empathic framing allows educators to define problems that are both technically solvable and humanly meaningful.

3. **Ideate Stage:** During the *Ideate* phase, AI can act as a co-creator by providing inspiration, generating ideas through large language models, or suggesting alternative solutions based on existing datasets. Teachers can use AI-based brainstorming tools to explore diverse possibilities, while Design Thinking encourages open-minded exploration, collaboration, and creativity among students (Anderson & Rainie, 2023) [1]. The teacher's role in this process is to mediate between AI's efficiency and the students' divergent thinking, ensuring that human creativity is augmented, not replaced. Through this human AI collaboration, ideation becomes a hybrid process data-informed yet driven by empathy and imagination.

4. **Prototype and Test Stage:** The *Prototype* and *Test* phases further illustrate the symbiotic relationship between AI and Design Thinking. AI-enabled simulation tools and virtual environments can accelerate prototype development, allowing learners to test models in real-time or predict outcomes through machine learning algorithms (Luckin, 2018) [12]. Meanwhile, Design Thinking emphasizes iterative refinement based on user feedback, ensuring that the solution evolves through cycles of experimentation and empathy. In this collaborative context, AI acts as a feedback generator analysing results, identifying improvement areas, and providing predictive insights while human participants interpret these results within ethical and emotional frameworks. The fusion of these processes cultivates reflective innovation, where technology enhances efficiency and humans ensure meaning and purpose (Fischer & Dwyer, 2020) [4].

From a pedagogical standpoint, the collaborative process of AI and Design Thinking promotes constructivist and socio-cultural learning paradigms, where knowledge is co-constructed through interaction, reflection, and iteration. Teachers serve as learning architects, designing tasks where AI systems provide analytical support and students engage in empathic, creative problem-solving (Fullan & Langworthy, 2014) [5]. For example, students may employ Design Thinking to create sustainable community solutions after using AI techniques to analyze environmental data. This method is similar to Vygotsky's (1978) [24] Zone of Proximal Development (ZPD) theory, in which the instructor fosters collaborative, human-centered inquiry while AI serves as a scaffolding agent that expands the learner's cognitive capacity. Critical 21st-century skills like AI literacy, ethical reasoning, systems thinking, and creative problem-solving are developed through the cooperative integration of AI and Design Thinking in teacher education (UNESCO, 2021) [23]. Teachers must understand how to orchestrate AI tools effectively within the design process leveraging data while fostering empathy, iteration, and collaboration. This involves cultivating *meta-design skills*, where teachers design not just lessons but *learning ecosystems* that evolve dynamically through human–AI interaction. The result is a learning culture grounded in *data-informed creativity* a balance between technological precision and human intuition. The collaboration between AI and Design Thinking also transforms educational assessment and reflection. Traditional assessments focus on static knowledge, but AI-enhanced design projects allow for continuous, formative evaluation based on real-time data. Teachers can monitor student progress using AI analytics, while students reflect on their learning journeys through design journals or prototypes. This creates a feedback-rich environment where learning is iterative, transparent, and adaptive (Darling-Hammond *et al*., 2017) [2]. Furthermore, the ethical and empathetic components of Design Thinking ensure that assessment values creativity, collaboration, and societal impact alongside technical performance. Another key feature of this collaboration is the humanization of AI through design. Design Thinking ensures that AI solutions remain aligned with human values equity, inclusion, and empathy. Teachers, acting as facilitators, encourage students to question algorithmic biases, understand the social implications of AI, and design technology that serves humanity rather than replaces it (Fischer & Dwyer, 2020) [4]. This critical engagement nurtures a generation of learners who are not just *AI consumers* but *ethical innovators* capable of designing human-centred technologies for the future. Ultimately, the collaborative process of AI and Design Thinking represents a new educational paradigm where technology and creativity co-exist symbiotically. It challenges traditional hierarchies between human and machine intelligence by positioning both as partners in discovery. Teachers play a pivotal role in orchestrating this collaboration ensuring that AI enhances, rather than diminishes, human learning potential. By merging the analytic capabilities of AI with the empathic and iterative mindset of Design Thinking, education can move towards a future where learning is personalized, creative, ethical, and socially responsive. The synergy between these two forces redefines not only how students learn but also how teachers teach, emphasizing that the ultimate goal of education in the AI era is not automation, but augmentation the elevation of human potential through intelligent collaboration.

**Strategies for developing the Teacher competencies in Design Thinking (DT)**

In the 21st-century educational landscape, teacher competencies in Design Thinking (DT) are essential for fostering creativity, innovation, problem-solving, and empathy among learners. As education shifts from rote memorization toward experiential, inquiry-based, and human-centred learning, teachers must evolve from content transmitters to designers of learning experiences (Razzouk & Shute, 2012) [18]. Developing such competencies requires intentional strategies that combine pedagogical, technological, and reflective practices. Building these capacities not only transforms classroom instruction but also strengthens teachers' ability to nurture the 4Cs: creativity, critical thinking, collaboration, and communication—among students (Trilling & Fadel, 2009) [22]. The integration of Design Thinking into teacher competencies is not automatic; it requires a structured approach through professional development, institutional support, collaborative practice, and reflective engagement. The following strategies provide a framework for building and sustaining teacher capacity in Design Thinking for 21st-century learning environments.

1. **Embedding Design Thinking in Teacher Education and Professional Development**

The first and most foundational strategy involves embedding Design Thinking principles in pre-service and in-service teacher education programs. Teacher preparation curricula should move beyond traditional lesson planning and include human-centred design methods, problem-framing, prototyping, and iterative feedback mechanisms (Henriksen, Richardson, & Mehta, 2017). Pre-service teachers should engage in project-based learning experiences that challenge them to design solutions for authentic classroom problems. In-service professional development should emphasize hands-on workshops, hackathons, and innovation labs, where teachers collaboratively apply the Design Thinking cycle—

empathize, define, ideate, prototype, and test—to real educational challenges (Brown, 2009). For instance, teachers could reimagine assessment methods or design inclusive learning environments using Design Thinking principles. The iterative and reflective nature of such experiences fosters adaptability, creative confidence, and empathy—key competencies for modern educators (Henriksen *et al*., 2017).

**2. Establishing Innovation and Design Labs in Schools**

To sustain Design Thinking practices, schools and teacher education institutions should create Innovation and Design Labs—dedicated spaces where educators can experiment, collaborate, and implement new pedagogical ideas. These labs serve as creative ecosystems for teachers to explore interdisciplinary projects and test prototypes of new learning activities (Fullan & Langworthy, 2014) [5]. Design labs encourage teachers to view challenges as opportunities for innovation rather than barriers to progress. For example, a teacher might work with colleagues to prototype an AI-assisted lesson plan or a sustainable classroom model addressing local environmental issues. Such spaces promote risk-taking and cultivate a growth mindset, enabling teachers to embrace failure as an essential step in the learning process (Dweck, 2015) [3]. Institutionalizing these environments ensures continuous engagement with Design Thinking principles beyond formal training sessions.

**3. Collaborative Learning Communities and Peer Mentorship**

Collaboration is the cornerstone of Design Thinking, and teachers develop stronger competencies when they learn in community rather than isolation. Schools should promote Professional Learning Communities (PLCs) where teachers co-design, share feedback, and reflect on their instructional innovations. Within these communities, experienced educators can mentor peers in applying Design Thinking strategies to specific teaching contexts (Hargreaves & Fullan, 2012) [7]. Such collaboration can be enhanced through interdisciplinary projects where teachers from different subjects work together to design integrated units. For instance, a science and social studies teacher could co-develop a sustainability project using DT frameworks. Digital collaboration platforms and online communities of practice also allow teachers to connect globally, exchange ideas, and gain diverse perspectives. This fosters not only innovation but also empathy and inclusivity—two pillars of Design Thinking.

**4. Integrating Design Thinking with Emerging Technologies**

Modern classrooms increasingly rely on digital technologies, making it vital for teachers to integrate Design Thinking with technological literacy. Teachers should be trained to use AI tools, digital prototyping software, and virtual collaboration platforms as part of the DT process (Holmes, Bialik, & Fadel, 2019) [8]. For example, teachers might use AI analytics to empathize with learners' needs, or digital simulation tools to prototype and test instructional strategies. Technology serves as both a medium and a catalyst for design-based innovation. Integrating DT with digital competence empowers teachers to personalize learning, collect feedback efficiently, and encourage students to engage with real-world, data-driven problems. In line with frameworks like TPACK (Technological Pedagogical Content Knowledge), put out by Mishra and Koehler (2006) [14], this combination increases instructors' potential for technological-pedagogical innovation.

**5. Encouraging Reflective Practice and Action Research**

Reflection is central to Design Thinking, as it allows educators to learn from experiences, evaluate outcomes, and iterate continuously. Teachers should be encouraged to adopt reflective journals, digital portfolios, and action research projects as part of their professional growth. Through reflection, teachers can analyze how Design Thinking principles influence their teaching effectiveness and student engagement (Schön, 1983). Action research where teachers identify classroom issues, design interventions, and study their impact aligns naturally with the iterative nature of DT. By documenting their design processes and findings, teachers contribute to a knowledge base of practice, helping others replicate successful innovations (Darling-Hammond *et al*., 2017) [2]. Reflection transforms Design Thinking from a methodology into a mindset one grounded in curiosity, empathy, and continuous improvement.

**6. Policy and Institutional Support for Teacher Innovation**

Sustainable competency development in Design Thinking requires systemic and policy-level support. Educational institutions and governments must prioritize innovation through policy frameworks, funding mechanisms, and recognition systems that encourage teachers to experiment with new pedagogical designs (UNESCO, 2021) [23]. Policies should mandate the inclusion of Design Thinking modules in teacher education curricula and allocate time for collaborative design-based professional development. Furthermore, institutions should recognize and reward innovative teachers through grants, awards, and career advancement opportunities. Such systemic backing legitimizes creative risk-taking and embeds Design Thinking as a valued aspect of professional identity (Fullan, 2021) [6].

**7. Fostering a Culture of Empathy and Human-Centred Education**

Empathy the first stage of Design Thinking is not only a skill but also a cultural value that must be cultivated within schools. Building teacher competencies in empathy means training educators to understand students' experiences, perspectives, and emotions deeply. Professional programs should include social–emotional learning (SEL), inclusive education, and culturally responsive pedagogy to reinforce the human-centred foundation of Design Thinking (Anderson & Rainie, 2023) [1]. Teachers who practice empathy in their classroom design processes are better equipped to create inclusive and equitable learning environments. This aligns with UNESCO's vision for education that balances technological innovation with human dignity and social well-being (UNESCO, 2021) [23].

**8. Continuous Learning and Lifelong Professional Growth**

Finally, developing and sustaining Design Thinking competencies is a lifelong process. Teachers must be encouraged to view themselves as ongoing learners, continually adapting to evolving educational technologies, societal needs, and learner profiles. Lifelong learning can be promoted through micro-credentials, MOOCs, professional networks, and global educator exchanges that emphasize innovation and creativity in teaching (Fullan & Langworthy, 2014) [5]. Teachers who participate in continuous learning maintain the flexibility, introspection, and readiness for the future that are essential for helping students navigate the challenges of the twenty-first century.

**Conclusion**

More than just training is needed to develop teacher competencies in Design Thinking; educators' perceptions of their roles as designers, innovators, and compassionate problem solvers must change. Through integrated professional development, institutional support, collaborative learning, and reflective practice, teachers can internalize the principles of Design Thinking and apply them to craft meaningful, human-centred educational experiences. When combined with emerging technologies like AI, these competencies empower teachers to bridge creativity and data, emotion and analysis equipping learners not only to adapt to change but to design the future itself.

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