

How Do We Teach for a Future We Cannot Know? Rethinking the Purpose of Education in an Age of Uncertainty

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ABSTRACT

The future has always been uncertain, but the accelerating convergence of artificial intelligence (AI), automation, biotechnology, climate change, geopolitical instability, demographic transformation, and the Fifth Industrial Revolution (5IR) has intensified the limits of prediction. Contemporary education discourse frequently emphasises *future-ready skills*, workforce preparedness, and the competencies that learners will supposedly require for emerging economies and occupations. However, such approaches risk positioning education around assumptions about a future that cannot be known with certainty. This conceptual paper critically examines the fundamental question: How can education prepare learners for a future that cannot be reliably predicted? Drawing on contemporary scholarship on futures literacy, uncertainty, human agency, lifelong learning, resilience, critical pedagogy, and human-centred education, the paper argues that the purpose of future-oriented education should move beyond forecasting specific technologies, occupations, and competencies towards cultivating the capacity to navigate, interpret, question, adapt to, and actively shape uncertain futures. The paper proposes a conceptual shift from *future prediction* to *future preparedness*, emphasising adaptability, critical thinking, creativity, ethical reasoning, collaboration, empathy, resilience, digital and AI literacy, and lifelong learning. Importantly, the paper distinguishes between preparing learners *for a particular future* and preparing them *for uncertainty itself*. It further argues that human agency must remain central in an increasingly AI-mediated educational landscape, where technological capability alone cannot determine desirable educational or societal futures. A contextual perspective is also advanced, highlighting the importance of cultural knowledge, Indigenous perspectives, relationality, and community resilience in developing meaningful approaches to uncertainty, particularly within small island developing states and Pacific education systems. The paper concludes that education cannot—and should not attempt to—predict the future with certainty. Rather, its enduring responsibility is to develop learners who possess the intellectual, ethical, social, and adaptive capacities to engage intelligently and confidently with futures that remain unknown. The paper consequently reframes future readiness not as the ability to know what comes next, but as the capacity to respond meaningfully to whatever comes next.

Keywords: future of education; uncertainty; futures literacy; future readiness; artificial intelligence; Fifth Industrial Revolution; human agency; adaptability; resilience; lifelong learning; human-centred education; educational transformation.

INTRODUCTION

Education has always been concerned with the future. Schools, universities, teachers, policymakers, and curriculum designers educate young people with the expectation that what they learn today will enable them to participate meaningfully in the social, economic, cultural, technological, and civic life of tomorrow. The future-oriented character of education is therefore not new. What has changed, however, is the degree to which the future has become difficult to anticipate with confidence. Rapid advances in artificial

intelligence (AI), automation, biotechnology, climate change, geopolitical instability, demographic transformation, economic volatility, ecological pressures, and social disruption are producing conditions in which linear assumptions about the future are increasingly problematic. The question facing education is consequently no longer simply *what knowledge and skills will learners need in the future?* but a more fundamental question: **How can education prepare learners for a future that cannot be reliably known?**

This question is particularly significant in the context of the accelerating technological transformation associated

with the Fourth and Fifth Industrial Revolutions (4IR and 5IR). While the 4IR has been characterised by digitalisation, automation, artificial intelligence, robotics, big data, the Internet of Things, and interconnected cyber-physical systems, the emerging discourse surrounding the 5IR places greater emphasis on human-centred technological development, collaboration between humans and intelligent machines, sustainability, ethics, creativity, and social wellbeing. These developments challenge conventional assumptions about educational preparation because technological change is occurring at a pace that can make curriculum decisions obsolete before learners complete their education. The World Economic Forum (2025), for example, estimates that a substantial proportion of workers' core skills will change by 2030, while technological change, economic uncertainty, and the green transition are simultaneously reshaping employment patterns. Such projections demonstrate both the usefulness and the limitations of attempting to identify future skills in advance. Even when current trends can be identified, the precise configuration of future occupations, technologies, social relationships, and knowledge requirements remains uncertain.

The contemporary educational response has frequently been framed around the language of *future readiness*, *21st-century skills*, *future skills*, *employability*, and *workforce preparedness*. International policy frameworks increasingly emphasise competencies such as critical thinking, creativity, collaboration, communication, problem-solving, adaptability, digital literacy, and social-emotional capabilities. The OECD's Future of Education and Skills 2030/2040 initiative, for example, places student agency, wellbeing, competencies, knowledge, skills, attitudes, and values at the centre of preparing learners to navigate changing environments (OECD, 2024). Importantly, the OECD conceptualisation does not simply prescribe fixed competencies for a predetermined future; rather, its Learning Compass uses the metaphor of navigation, emphasising learners' capacity to find direction in unfamiliar circumstances and to exercise agency in shaping their own futures. This represents an important movement away from education as the transmission of predetermined answers towards education as preparation for navigating complexity and change.

Nevertheless, the dominant discourse of future readiness continues to contain an implicit paradox. On the one hand, educational systems are encouraged to prepare learners for a rapidly changing and unpredictable world. On the other hand, they are frequently asked to identify in advance the specific competencies, technologies, occupations, and knowledge that learners will require. This creates an epistemological tension: how can education confidently prepare learners for conditions that cannot be confidently predicted? The problem is not that forecasting is inherently useless. Trend analysis, scenario planning, strategic foresight, and labour-market intelligence

can provide valuable information for educational planning. The problem arises when forecasts are treated as representations of *the* future rather than as interpretations of *possible* futures. The future is not a single predetermined destination waiting to be discovered; it is shaped by multiple interacting possibilities, choices, disruptions, human actions, technological developments, and unforeseen events.

This distinction has become increasingly important in contemporary futures scholarship. UNESCO's Futures of Education initiative argues that there is no single inevitable future and that multiple alternative futures are possible. Rather than treating trends as destiny, futures thinking encourages educational systems to consider different possibilities and to use them to make more informed decisions in the present (International Commission on the Futures of Education, 2021). Similarly, the OECD (2025) emphasises that trends are not necessarily linear and that futures thinking can help education systems consider alternative scenarios, anticipate disruptions, and act in ways that influence the future rather than simply respond to it. Such approaches suggest that the purpose of future-oriented education should not be to produce accurate predictions but to develop the intellectual and social capacity to engage with uncertainty.

The concept of futures literacy provides an important theoretical foundation for this shift. UNESCO describes futures literacy as the capability to understand and use the future in ways that enable individuals and societies to imagine possibilities, prepare for change, recover from disruption, and create alternative futures (UNESCO, n.d.). Its significance lies precisely in recognising that the future does not yet exist and therefore cannot be known in the same way as the past or present. People can nevertheless develop different ways of imagining and engaging with possible futures. Futures literacy therefore moves the educational conversation from *knowing the future* towards *learning how to use ideas about the future*. This distinction is particularly valuable in an era in which technological forecasting can create an illusion of certainty while simultaneously demonstrating how quickly assumptions can become outdated.

The emergence of generative AI provides a particularly powerful illustration of this challenge. Within only a few years, generative AI has moved from being a specialised technological capability to becoming an increasingly influential presence in education, employment, communication, research, creativity, and everyday life. UNESCO's AI Competency Framework for Students identifies human-centred mindsets, ethics of AI, AI techniques and applications, and AI system design as important dimensions of student competency

development (Miao et al., 2024). Similarly, UNESCO's AI Competency Framework for Teachers emphasises human-centred approaches, ethics, AI pedagogy, professional learning, and the protection of human agency (Miao & Cukurova, 2024). These frameworks are significant because they do not conceptualise AI competence merely as technical proficiency. Instead, they place human agency, ethical judgement, responsibility, and lifelong learning alongside technological knowledge.

The implications are profound for the purpose of education. If technological systems can increasingly generate text, images, code, explanations, predictions, and recommendations, then the educational value of simply transmitting information becomes more difficult to defend as the central purpose of schooling and higher education. This does not mean that knowledge is becoming irrelevant. On the contrary, knowledge remains essential for critical judgement, interpretation, creativity, ethical reasoning, and informed decision-making. However, education may need to reconsider the relationship between knowledge and capability. Learners require not only knowledge *about* the world but also the capacity to question information, evaluate evidence, recognise uncertainty, work collaboratively, make ethical decisions, learn continuously, and adapt when established assumptions no longer hold. In this sense, the challenge of the unknown future is not primarily a technological challenge; it is an educational and philosophical challenge concerning what it means to be an educated person.

The problem becomes even more significant when education is viewed through the lens of complex global disruption. Climate change, pandemics, geopolitical conflict, economic instability, migration, inequality, technological disruption, and ecological degradation interact in ways that cannot always be isolated or predicted independently. The OECD (2025) observes that contemporary education systems are being shaped simultaneously by geopolitical tensions, ecological crises, technological transformation, inequality, labour-market change, and changing social expectations. Such developments demonstrate that uncertainty is not simply an occasional interruption to an otherwise predictable trajectory. Rather, uncertainty is becoming a structural condition within which educational systems must operate.

Consequently, educational resilience cannot depend solely upon the ability to anticipate particular disruptions. A curriculum designed around currently visible technologies or occupational categories may become increasingly vulnerable to obsolescence. Preparing learners for a specific set of predicted occupations may be useful in the short term, but it does not necessarily provide them with the capacity to respond when those predictions fail. What may be more valuable is cultivating adaptive capacity: the ability to learn, unlearn, relearn, transfer knowledge across contexts, work with others, interpret emerging situations, make responsible

judgements, and respond constructively to unfamiliar problems. The OECD (2025) similarly highlights the growing importance of resilience, agility, flexibility, and lifelong learning as education systems respond to uncertain labour markets and broader societal transformations.

This argument also challenges a narrow economic conception of the purpose of education. Future-oriented educational discourse is frequently connected to employability and the needs of labour markets. While preparing learners for meaningful participation in economic life is an important educational responsibility, education has purposes that extend beyond producing adaptable workers. UNESCO's *Reimagining Our Futures Together* argues for a broader social contract for education grounded in human rights, social justice, human dignity, cultural diversity, solidarity, and education as a public and common good (International Commission on the Futures of Education, 2021). From this perspective, preparing learners for an uncertain future involves more than ensuring that they remain employable. It involves developing citizens capable of participating ethically in democratic societies, contributing to collective wellbeing, caring for the environment, maintaining cultural identities, engaging across differences, and exercising agency in shaping desirable futures.

This broader perspective is particularly important because the future is not merely something that happens *to* learners. Human beings participate in producing the conditions that constitute future realities. Technological systems, economic institutions, political decisions, educational policies, cultural practices, and collective choices all contribute to determining which futures become more or less possible. Education therefore occupies a paradoxical position: it must prepare learners for futures that cannot be known while simultaneously helping them acquire the capacity to influence what those futures become. UNESCO (2021) explicitly recognises this generative role of education, arguing that education is not merely shaped by external forces but can contribute to creating peaceful, just, and sustainable futures. Education consequently becomes both a response to uncertainty and a mechanism through which societies exercise agency over possible futures.

This perspective requires a reconsideration of the language of *future preparedness*. To be prepared for the future cannot reasonably mean knowing exactly what will happen. Nor can it mean equipping every learner with a fixed collection of supposedly future-proof skills. In a world characterised by rapid technological and social transformation, very few competencies can be assumed to remain unchanged indefinitely. Instead, preparedness may be better understood as the capacity to navigate

uncertainty without becoming paralysed by it. Such preparedness requires a combination of disciplinary knowledge, critical thinking, creativity, ethical reasoning, emotional and social capabilities, digital and AI literacy, adaptability, resilience, collaboration, imagination, and agency.

The metaphor of navigation is particularly useful in this regard. A navigator does not need to know every feature of the journey in advance. Rather, navigation involves having sufficient knowledge, tools, judgement, orientation, and adaptability to respond to changing conditions. The OECD Learning Compass similarly conceptualises learners as needing to navigate unfamiliar contexts rather than simply follow predetermined directions (OECD, 2024). This provides a useful conceptual departure point for rethinking future-oriented education. The central question becomes not *"How can we teach students what they will need in 2040 or 2050?"* but rather *"How can we develop learners who are capable of learning and acting responsibly when the conditions of 2040 or 2050 differ substantially from what we currently imagine?"*

Such a shift has significant implications for curriculum, pedagogy, assessment, teacher education, educational leadership, and policy. Curriculum design may need to prioritise transferable intellectual and human capabilities alongside disciplinary knowledge. Pedagogy may need to create greater opportunities for inquiry, experimentation, problem-solving, collaboration, reflection, and dealing with ambiguity. Assessment may need to move beyond measuring the reproduction of known answers towards evaluating reasoning, judgement, creativity, application, and the capacity to respond to novel problems. Teacher education will likewise need to support educators as lifelong learners who can themselves navigate technological and pedagogical change. UNESCO's (Miao & Cukurova, 2024) emphasis on teacher agency, ethical AI use, AI pedagogy, and continuing professional development reinforces the proposition that educators cannot prepare learners for uncertainty if teachers themselves are positioned merely as implementers of fixed curricula.

The question is also particularly important for educational systems in small island developing states and Pacific contexts. Future uncertainty in such contexts is intensified by climate vulnerability, geographic isolation, economic constraints, infrastructure inequalities, migration, demographic change, and the need to maintain cultural and linguistic identities while engaging with global technological developments. A universal model of future readiness based primarily on technologically advanced economies may therefore be inadequate. Education systems need approaches that recognise local histories, Indigenous knowledge, community relationships, cultural values, ecological realities, and locally defined aspirations. UNESCO's (2021) emphasis on cultural diversity and collective responsibility provides an important

basis for such contextualisation. Preparing for an unknown future should not mean reproducing a single technologically determined vision of progress; it should involve enabling communities to articulate and pursue futures that are culturally meaningful, socially just, environmentally sustainable, and locally relevant.

This argument also introduces an important ethical dimension. If education attempts to predict and prescribe the future, questions inevitably arise concerning *whose future* is being imagined, *whose knowledge* informs that imagination, and *whose interests* are served by particular visions of future readiness. Future-oriented education can unintentionally privilege technologically dominant economies, corporate labour-market priorities, or Western conceptions of progress. A critical approach must therefore recognise that futures are contested rather than neutral. Different communities may imagine desirable futures differently, and educational systems should create opportunities for learners to examine competing possibilities rather than simply accept dominant narratives about technological progress. UNESCO's futures work explicitly stresses that exploring alternative futures raises questions of ethics, equity, justice, and desirability (International Commission on the Futures of Education, 2021).

The central proposition of this paper is therefore that education should not attempt to predict the future as a condition of preparing learners for it. Rather, education should develop learners' capacity to understand uncertainty, imagine alternatives, critically evaluate possibilities, adapt to changing circumstances, exercise ethical judgement, collaborate with others, and participate actively in shaping preferred futures. This represents a movement from *prediction* to *preparedness*, from *certainty* to *capability*, and from *future-proofing* to *future-making*. It also requires recognition that the most valuable educational outcomes may not be those that remain unchanged as the world changes, but those that enable learners to continue learning and acting meaningfully as circumstances change.

Against this background, the present conceptual paper critically examines the proposition that the future cannot be known with certainty and therefore education should not be designed primarily around attempts to predict it. It explores the limitations of conventional future-skills discourse, examines the contribution of futures literacy and strategic foresight, considers the implications of AI and the 5IR for human agency and educational purpose, and develops a human-centred conception of education for uncertainty. The paper ultimately argues that the fundamental task of future-oriented education is not to produce learners who know what the future will be, but learners who possess the intellectual, ethical, social,

cultural, and adaptive capacity to respond to futures that remain unknown.

In this sense, the central educational challenge of the twenty-first century may be expressed in a deceptively simple question: If we cannot know what the future will be, what should we teach today? The answer proposed in this paper is not to abandon future-oriented education, but to redefine it. Rather than attempting to teach *the future*, education should teach learners how to learn, think, judge, adapt, imagine, collaborate, and act when the future does not conform to our expectations. The future may remain unknowable, but learners can become better prepared to encounter it, and, importantly, to participate in creating it.

LITERATURE REVIEW

Education and the Problem of Preparing for the Future

Education has traditionally been understood as an investment in the future. Individuals spend years acquiring knowledge, skills, values, and qualifications with the expectation that these will enable them to participate effectively in future social, economic, cultural, and civic life. This future-oriented function has become increasingly prominent as technological, economic, environmental, and social transformations accelerate. Contemporary policy discourse consequently places considerable emphasis on concepts such as *future readiness*, *future skills*, *21st-century competencies*, *employability*, *lifelong learning*, and *adaptability*. However, the increasing unpredictability of contemporary societies raises a fundamental question concerning the epistemological basis of future-oriented education: *if the future cannot be known with certainty, what does it actually mean to prepare learners for it?* Recent scholarship suggests that education's relationship with the future can be understood through several different orientations. Rasa (2025), for example, distinguishes between education that prepares learners to *adapt to the future*, education that enables learners to *change the future*, and education that explicitly introduces learners to the uncertainty and plurality of possible futures. This distinction is important because it challenges the assumption that future-oriented education necessarily means anticipating future labour-market requirements. Preparing learners for the future may instead involve developing their capacity to interpret change, imagine alternatives, exercise agency, and participate in determining desirable futures.

The distinction between *the future* and *possible futures* is particularly important. Conventional educational planning frequently uses forecasts to identify emerging technologies, occupations, skills, and economic trends. Such forecasting can provide valuable information for curriculum planning and policy development. Nevertheless, forecasts are inherently contingent upon assumptions about technological

development, economic conditions, political stability, social behaviour, and environmental circumstances. The problem therefore arises when a forecast is treated not as one possible trajectory but as a sufficiently reliable representation of what will happen. In conditions of rapid and interconnected change, such certainty becomes increasingly difficult to justify.

UNESCO's Futures of Education initiative provides an alternative perspective by emphasising that humanity does not have a single predetermined future. Rather, multiple futures remain possible and can be influenced by collective decisions, values, institutions, and human agency (International Commission on the Futures of Education, 2021). This perspective changes the role of education from preparing learners for *a known destination* to developing their ability to engage with alternative possibilities and contribute to shaping preferred futures.

From Future Skills to Future Readiness

The literature on future skills has expanded considerably in response to technological transformation and changing labour markets. Employers, governments, international organisations, and educational institutions increasingly emphasise capabilities such as critical thinking, creativity, problem-solving, communication, collaboration, digital literacy, adaptability, resilience, and lifelong learning. The World Economic Forum (2025), for example, identifies technological change, economic uncertainty, demographic transformation, and the green transition as major forces reshaping employment and skills requirements through 2030. The report consequently identifies analytical thinking, creative thinking, resilience, flexibility, agility, curiosity, and lifelong learning among capabilities of increasing importance.

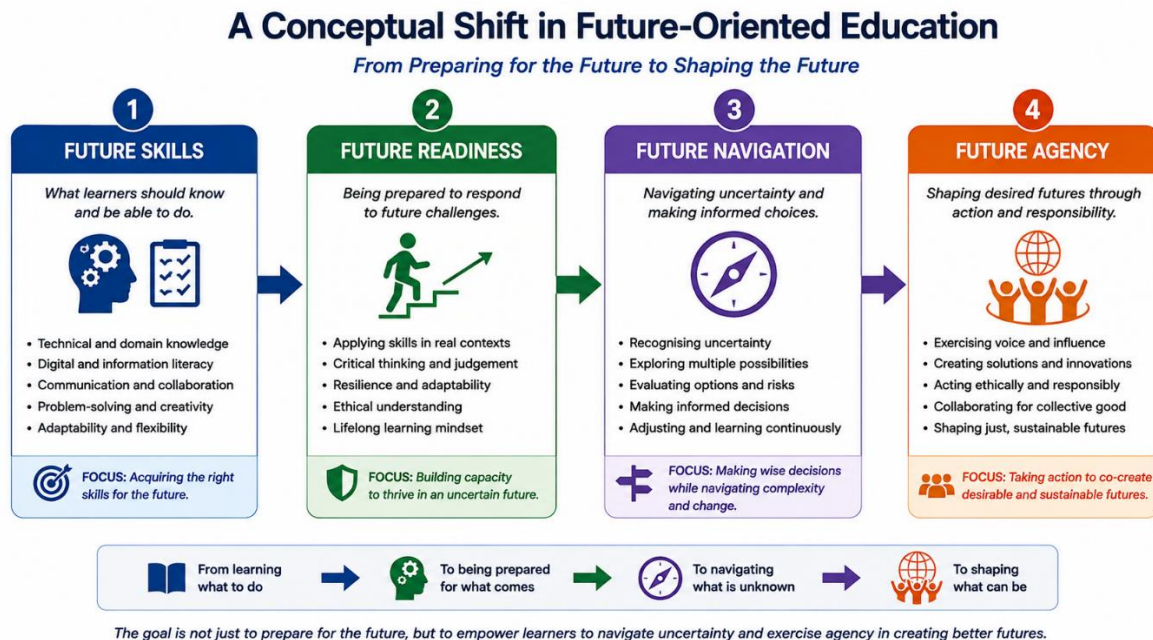
Such research provides a valuable rationale for educational reform, but it also reveals a conceptual problem. If particular skills are identified as "future skills," there is an implicit assumption that their future value can be sufficiently predicted. Yet the rapid emergence of generative AI illustrates how quickly technological developments can alter the value and meaning of particular skills. A competency considered distinctive today may become partially automated tomorrow, while entirely new forms of competence may emerge that are currently difficult to define.

Consequently, *future readiness* should arguably be distinguished from *future prediction*. Future readiness does not necessarily mean possessing a predetermined set of skills for a predetermined future. It may instead mean possessing the capacity to continue learning and adapting when circumstances change. The distinction is significant because it moves education away from a static skills model

towards a dynamic capability model.

The OECD's Future of Education and Skills 2030/2040 initiative provides a particularly useful conceptualisation through its Learning Compass. Rather than presenting learners as passive recipients of predetermined knowledge, the framework emphasises student agency, competencies, knowledge, attitudes, values, and the capacity to navigate

unfamiliar contexts (OECD, 2024). This metaphor of navigation is especially relevant to the present argument. A navigator does not need to know every condition that will be encountered; rather, navigation requires orientation, judgement, knowledge, tools, flexibility, and the capacity to respond to changing circumstances. This suggests a potentially important conceptual shift:



The implication is that education should not focus exclusively on identifying what learners will need to know but should also ask what learners need to be able to *do when they encounter situations that educators cannot currently anticipate*.

Futures Literacy and the Capacity to Engage with Uncertainty

Futures literacy provides one of the most important theoretical foundations for rethinking education under conditions of uncertainty. UNESCO conceptualises futures literacy as the capacity to understand and use ideas about the future to prepare for change, imagine alternatives, and influence how individuals and societies perceive and construct possible futures. This approach begins from the recognition that the future does not yet exist and therefore cannot be known in the same manner as the past or present. The significance of futures literacy lies in its rejection of the assumption that anticipation must equal prediction. Anticipating a future does not require claiming that a particular future will occur. Instead, anticipation can involve exploring possibilities, identifying assumptions, examining consequences, and considering alternative trajectories. Such an approach is highly compatible with education because learners can be encouraged to ask not only *what is likely to happen?* but also *what could happen?*, *what might happen if*

current assumptions change?, and *what kind of future should we seek to create?*

Recent scholarship strengthens this position. A 2025 study on futures literacy argues that education needs to move beyond merely adapting learners to change and instead cultivate capabilities that allow learners to navigate complexity, engage creatively, develop empathy, and participate actively in shaping alternative futures. The study explicitly identifies a gap between the increasing advocacy of futures literacy and its critically informed implementation in education (see the discussion in *Unlocking Futures Literacy*, 2025).

This is particularly relevant because conventional education tends to privilege certainty, correct answers, measurable outcomes, and established knowledge. Futures literacy introduces a different epistemological orientation in which uncertainty becomes something to investigate rather than eliminate. Learners can therefore develop the capacity to recognise that knowledge is provisional, that assumptions may be challenged, and that multiple futures may be possible.

Futures literacy consequently provides an important bridge between *knowing* and *not knowing*. It does not suggest that knowledge is unimportant. Instead, it recognises that knowledge must be accompanied by the capacity to question, reinterpret, transfer, and apply it

under changing conditions.

Uncertainty, Complexity, and the Limits of Prediction

The challenge of educating for an unknown future is closely related to scholarship on complexity and uncertainty. Contemporary societies are increasingly characterised by interdependence: technological change affects employment; climate change affects migration and education; geopolitical instability affects economies and communities; and AI development affects knowledge production, assessment, employment, and social interaction. These relationships make linear predictions increasingly problematic.

Educational responses to uncertainty have frequently emphasised adaptability. However, this concept requires critical examination. Biesta (2021), for example, cautions against assuming that adaptability is automatically an adequate response to uncertainty. If learners are simply trained to adapt to whatever circumstances emerge, education may inadvertently encourage passive acceptance of conditions rather than critical engagement with them. Adaptability can therefore be both empowering and problematic: it can help individuals cope with change, but it can also shift responsibility for systemic problems onto individuals.

This distinction is important for future-oriented education. A learner who can adapt to an exploitative labour market may be personally resilient, but education should also enable that learner to question whether the system itself should change. Similarly, a student who learns to adapt to algorithmic decision-making needs not only technological competence but also the capacity to question algorithmic bias, accountability, surveillance, privacy, and power.

Thus, education for uncertainty should involve both adaptive capacity and critical agency. Learners need to respond effectively to change while retaining the ability to question whether particular changes are desirable.

Artificial Intelligence and the Changing Nature of Educational Preparation

Artificial intelligence represents perhaps the most immediate contemporary challenge to assumptions about future education. AI is increasingly influencing teaching, learning, assessment, research, educational administration, personalised learning, tutoring, and knowledge production. A systematic review by Wang et al. (2024), based on 2,223 AI-in-education publications and detailed analysis of 125 studies, demonstrates the breadth of contemporary AI applications across adaptive learning, personalised tutoring, assessment, management, profiling, prediction, and emerging AI products. At the same time, the review identifies significant underexplored areas, demonstrating that the field remains

dynamic and theoretically fragmented.

The implications extend beyond the adoption of educational technologies. Generative AI challenges conventional distinctions between human and machine capabilities in areas such as writing, coding, translation, information retrieval, image generation, and problem-solving. Consequently, education cannot simply respond by adding AI tools to existing curricula. It must also reconsider what knowledge, judgement, creativity, authorship, and human capability mean in an environment where machines increasingly perform tasks previously associated with educated human beings.

Recent scholarship on AI literacy reflects this broader understanding. A 2025 systematic review of AI literacy research identified ethical and social implications, curriculum development, AI applications, and interdisciplinary AI literacy as major themes, emphasising that AI literacy extends beyond technical proficiency (see *Towards an AI-Literate Future*, 2025). Similarly, research published in 2026 identifies AI literacy as involving cognitive, emotional, psychological, and behavioural dimensions, including contextual knowledge and continuous professional growth for teachers and AI-related thinking capacity for students.

The literature therefore increasingly supports a multidimensional conception of AI literacy. Students need to understand what AI can do, but they also need to understand what it cannot do, how it can produce bias, how algorithms influence decisions, how data are collected and used, and how human judgement should interact with AI-generated outputs.

The development of generative AI literacy is particularly relevant. A 2025 systematic review identified five broad dimensions of GenAI literacy: understanding GenAI, using and applying it, evaluating and incorporating its outputs, understanding its ethical implications, and developing appropriate attitudes toward it. More recent research similarly identifies adaptability, collaboration, ethical reflection, critical thinking, and awareness of bias as components of GenAI literacy alongside technical competencies.

These findings reinforce the argument that future readiness cannot be reduced to technical skills. The more capable AI becomes, the greater the importance of human capacities involving judgement, responsibility, interpretation, values, ethics, empathy, creativity, and agency.

Human Agency in an AI- and Technology-Intensive Future

Human agency is therefore central to the question of how education should prepare learners for uncertainty. If

education becomes primarily concerned with ensuring that individuals remain competitive with machines, there is a danger that the purpose of education will be reduced to economic adaptation. A human-centred approach instead asks how technology can support human flourishing and collective wellbeing.

UNESCO's AI Competency Framework for Students places human-centred thinking, ethics, AI techniques, applications, and system design within a broader framework for student development (Miao et al., 2024). The corresponding framework for teachers emphasises human-centred attitudes, ethics, AI foundations and applications, AI pedagogy, and professional learning (Miao & Cukurova, 2024). These frameworks indicate an important movement from *technology-centred education* towards *human-centred technological competence*.

The distinction is crucial for an education system preparing learners for an unknown future. Technological tools will change, but the need for human beings to make ethical decisions, cooperate with others, resolve conflicts, care for communities, evaluate competing claims, and exercise responsibility is unlikely to disappear. The challenge is therefore not simply to identify the next technology but to cultivate human capabilities that remain meaningful across changing technological environments.

This is consistent with the broader human-centred orientation associated with the Fifth Industrial Revolution. Whereas technological transformation can emphasise efficiency, automation, productivity, and optimisation, a human-centred approach places greater emphasis on collaboration, sustainability, wellbeing, ethics, and the complementary relationship between human and technological capabilities.

Critical AI Literacy and the Need to Question Technological Futures

An important development in the literature is the emergence of *critical AI literacy*. Rather than teaching students merely to operate AI systems, critical AI literacy encourages learners to question the social, political, cultural, ethical, and economic consequences of AI.

Veldhuis et al. (2025), in a scoping review of critical AI literacy involving children and young people, found that existing educational activities increasingly seek to help learners critically examine AI's implications rather than simply acquire technical skills. The authors argue for approaches that enable children to question and potentially transform the social, political, cultural, and ethical consequences of AI.

This is highly relevant to education for the unknown. If future-oriented education simply teaches learners to use emerging technologies, it risks reproducing technological determinism—the assumption that technological

development is inevitable and society must simply adapt. A critical educational approach instead recognises that technological futures are socially constructed and politically contested.

Learners should therefore be able to ask:

- Who designs emerging technologies?
- Whose interests do they serve?
- Who benefits from technological change?
- Who may be excluded?
- What forms of knowledge are privileged?
- What human capabilities might be displaced?
- What ethical boundaries should exist?
- What kinds of technological futures are socially desirable?

Such questions reposition students from being consumers of future technologies to becoming informed participants in determining how those technologies should be used.

Adaptability, Resilience, and Lifelong Learning

Adaptability has become a central concept in future-oriented education because learners may encounter multiple career transitions, technological disruptions, and social changes during their lifetimes. Rather than acquiring a fixed body of knowledge for a single occupation, individuals increasingly need to learn continuously.

However, adaptability should not be interpreted narrowly as simply adjusting to external change. A more educationally meaningful conception involves the capacity to learn, unlearn, relearn, transfer knowledge, reinterpret experiences, and respond constructively to unfamiliar circumstances. Lifelong learning is therefore closely connected to future readiness.

Recent research on AI literacy further reinforces this position. The 2026 systematic review of school-based AI literacy identifies continuous professional growth as an important dimension for teachers and contextual adaptability as a significant component of AI literacy. A 2026 meta-analysis of AI literacy interventions similarly found stronger effects for knowledge than for skills, attitudes, and ethical outcomes, suggesting that educational interventions need to move beyond knowledge acquisition towards broader competencies and dispositions.

This distinction has significant implications for curriculum design. If knowledge becomes outdated more rapidly, education must provide learners with strong foundations while simultaneously cultivating the capacity to update those foundations. The goal is therefore not to teach everything learners might eventually need—a practically

impossible task—but to develop learners who can continue acquiring what they need when the circumstances arise.

Creativity, Critical Thinking, and Human Capabilities

The literature increasingly identifies creativity and critical thinking as important capabilities for uncertain futures. These capabilities are valuable precisely because they are not limited to a single technological environment. Critical thinking allows learners to evaluate information, challenge assumptions, recognise bias, and make reasoned judgements. Creativity enables them to generate alternatives, formulate new possibilities, and respond imaginatively to unfamiliar problems.

The importance of these capabilities increases in an AI-mediated environment. If AI systems can increasingly generate plausible answers, then education must place greater emphasis on determining whether those answers are accurate, appropriate, ethical, culturally relevant, and socially desirable. The educational challenge consequently shifts from merely producing answers to evaluating and interrogating them.

Similarly, creativity should not be understood simply as artistic production. In uncertain contexts, creativity involves the capacity to imagine alternatives and develop novel responses to problems that may not have established solutions. It therefore represents a critical component of future navigation.

Ethics, Values, and Education for Desirable Futures

Future readiness also has a normative dimension. Preparing learners for whatever future emerges is insufficient because not every possible future is desirable. Technological advancement can generate opportunities while simultaneously producing inequality, surveillance, misinformation, displacement, environmental costs, and new forms of exclusion.

UNESCO's Futures of Education initiative therefore frames educational transformation around broader questions of justice, solidarity, human rights, sustainability, and collective responsibility (International Commission on the Futures of Education, 2021). Education must not only ask *what future is likely?* but also *what future is desirable?* and *who gets to decide?* This introduces ethics into the concept of future readiness. A technologically competent learner who cannot distinguish between technically possible and ethically acceptable actions is not fully prepared for an uncertain future. Ethical reasoning, empathy, social responsibility, and respect for human dignity therefore become increasingly important.

This is particularly evident in AI education. Recent AI literacy research identifies ethics and societal implications as common dimensions across students, teachers, and other educational

stakeholders. The implication is that education must prepare learners not simply to live *with* AI but to participate in decisions concerning how AI should be developed and used.

Education as Future-Making Rather Than Future-Following

A further strand of literature challenges the idea that learners should merely adapt to future conditions. If education is exclusively oriented towards adaptation, learners may become responsive rather than transformative. Future-oriented education should instead recognise students as agents capable of contributing to social change.

This distinction can be conceptualised through three broad orientations:

Education for the future focuses on preparing learners for anticipated conditions.

Education about futures develops learners' capacity to understand uncertainty, possibility, and alternative futures.

Education to shape futures develops learners' agency to influence the social, technological, environmental, and cultural conditions of tomorrow.

Rasa's (2025) analysis is particularly relevant here because it distinguishes education concerned with adapting to future conditions from education concerned with changing futures and developing learners' understanding of multiple possible futures.

The third orientation is arguably the most consistent with a human-centred approach to uncertainty. If the future is partly constructed through human decisions, education should empower learners to become participants in that construction.

Cultural Context and Alternative Ways of Knowing the Future

The literature on future-oriented education also requires greater attention to culture and context. Many future-skills frameworks are developed within economically advanced countries and subsequently presented as globally relevant. While competencies such as critical thinking, creativity, collaboration, and adaptability have broad relevance, their meaning and educational application are not culturally neutral.

For Pacific and other small-island contexts, future uncertainty is experienced through particular realities, including climate change, geographic isolation, economic vulnerability, migration, digital inequality, cultural preservation, and the relationship between Indigenous

knowledge and formal education. Consequently, future readiness should not be reduced to technological competitiveness.

A culturally responsive conception of future education should recognise Indigenous knowledge, community relationships, collective responsibility, ecological knowledge, local languages, cultural identity, and intergenerational learning. The future should therefore be understood not only as an economic or technological horizon but also as a cultural and relational one.

This perspective is especially important because dominant technological narratives can unintentionally imply that modernisation requires the replacement of traditional knowledge systems. A human-centred and culturally responsive approach instead asks how technological innovation can coexist with cultural continuity and contribute to locally meaningful futures.

The Emerging Conceptual Synthesis

The literature reviewed above suggests that several previously separate areas of scholarship are converging. Futures literacy provides the capacity to imagine and interrogate possibilities; adaptability provides the capacity to respond to change; critical thinking enables evaluation of information and assumptions; creativity enables alternative possibilities; resilience supports continuity during disruption; AI literacy enables informed engagement with emerging technologies; ethics provides normative direction; and human agency enables learners to participate in shaping futures.

These dimensions can be synthesised into a broader conception of education for the unknown.

Rather than defining future readiness as mastery of a predetermined collection of future skills, education for the unknown can be conceptualised as the capacity to:

1. **Understand uncertainty** – recognise the limits of prediction and the provisional nature of knowledge.
2. **Imagine possibilities** – consider multiple and alternative futures rather than a single predetermined future.
3. **Navigate complexity** – interpret interconnected technological, social, economic, cultural, and environmental change.
4. **Think critically** – question assumptions, evaluate evidence, recognise bias, and challenge dominant narratives.
5. **Create and innovate** – develop novel responses to unfamiliar challenges.
6. **Adapt and learn continuously** – acquire, revise, and transfer knowledge throughout life.
7. **Exercise ethical judgement** – distinguish between what is technologically possible and what is socially desirable.

8. **Maintain human agency** – use technology as a means of enhancing human capability rather than surrendering decision-making to technological systems.
9. **Act collaboratively** – address complex challenges through collective rather than purely individual responses.
10. **Shape desirable futures** – participate actively in constructing more just, sustainable, inclusive, and culturally meaningful futures.

The literature therefore supports a conceptual movement from future prediction to future navigation and future agency. The central educational task is not to eliminate uncertainty but to cultivate the capacity to live, learn, and act responsibly within it.

LITERATURE GAPS

Despite the substantial growth of scholarship on future-oriented education, futures literacy, future skills, adaptability, AI literacy, and educational transformation, important conceptual and empirical gaps remain. These gaps provide the justification for the present paper.

The Prediction-Preparation Paradox Remains Underexamined

A major gap concerns the underlying assumption within future-oriented education that the future can be sufficiently anticipated to enable systematic preparation. Much of the future-skills literature focuses on identifying emerging competencies required by changing labour markets. While such work is valuable for curriculum planning, it does not sufficiently interrogate the epistemological assumption that future requirements can be identified with adequate reliability.

The critical question is therefore not simply whether particular skills are likely to become important, but whether education should be organised around *predictions of future skill demand at all*. The literature contains considerable discussion of future skills but comparatively less explicit examination of the prediction-preparation paradox: education is expected to prepare learners for uncertainty while simultaneously being encouraged to make increasingly specific predictions about what learners will need.

This paper addresses this gap by shifting the question from "What skills will the future require?" to "What capacities enable human beings to function when future requirements cannot be reliably known?"

Future Readiness Is Often Treated as a Skills Problem

A second gap concerns the tendency to conceptualise future readiness primarily through lists of competencies. Critical thinking, creativity, collaboration, communication, digital literacy, problem-solving, adaptability, resilience, and entrepreneurship are repeatedly identified as future-oriented skills.

The problem is not the value of these competencies. Rather, the problem is the tendency to treat them as a relatively stable checklist. Such an approach risks reproducing the very certainty that future-oriented education is attempting to overcome.

Future readiness may be better understood as a dynamic disposition and capability rather than a fixed inventory of skills. Learners need not only competencies but also the capacity to recognise when existing competencies are insufficient and to develop new capabilities accordingly.

Insufficient Integration Between Futures Literacy and Mainstream Education

Futures literacy has become increasingly prominent, but a gap remains between the conceptual advocacy of futures literacy and its systematic integration into mainstream curriculum, pedagogy, teacher education, and assessment.

Recent scholarship explicitly identifies the gap between advocacy and critically informed implementation of futures literacy in educational settings. This indicates that the literature has established the importance of futures thinking but has not yet fully resolved how futures literacy should become a normal feature of educational practice.

Questions remain concerning:

- How should futures literacy be embedded across school and university curricula?
- Should it be taught as a discrete subject or integrated across disciplines?
- How can teachers be prepared to facilitate uncertainty rather than provide predetermined answers?
- How can futures literacy be assessed?
- How can learners distinguish plausible, probable, possible, and preferable futures?
- How can futures literacy avoid becoming another generic "future skills" framework?

These questions remain insufficiently developed.

Limited Conceptual Integration of Futures Literacy, AI

Literacy, and Human Agency

A further gap concerns the fragmentation of relevant literature. Futures literacy research tends to focus on anticipation and alternative futures; AI literacy research increasingly addresses technological knowledge, ethics, and critical engagement; resilience research focuses on coping and adaptation; and human-centred education focuses on agency, values, and wellbeing.

However, these strands are rarely integrated into a unified conception of education for an unknowable future.

This is increasingly problematic because AI itself is changing the conditions under which future-oriented education operates. Recent AI literacy reviews demonstrate a rapidly expanding field, but they also identify fragmentation and underdeveloped theoretical and empirical foundations. The 2024 systematic review of AI in education found diverse applications and research traditions, while a 2025 umbrella review of 102 systematic reviews identified technological, pedagogical, ethical, and systemic barriers and noted continuing weaknesses in theoretical attention to AI education and literacy.

The gap, therefore, is not simply a lack of AI literacy research. Rather, there is insufficient conceptual integration between AI literacy, futures literacy, critical thinking, human agency, adaptability, and ethical decision-making.

Insufficient Attention to the Limits of Adaptability

Adaptability is frequently presented as an essential capability for uncertain futures. However, the literature does not always distinguish between *adaptive capacity* and *critical agency*.

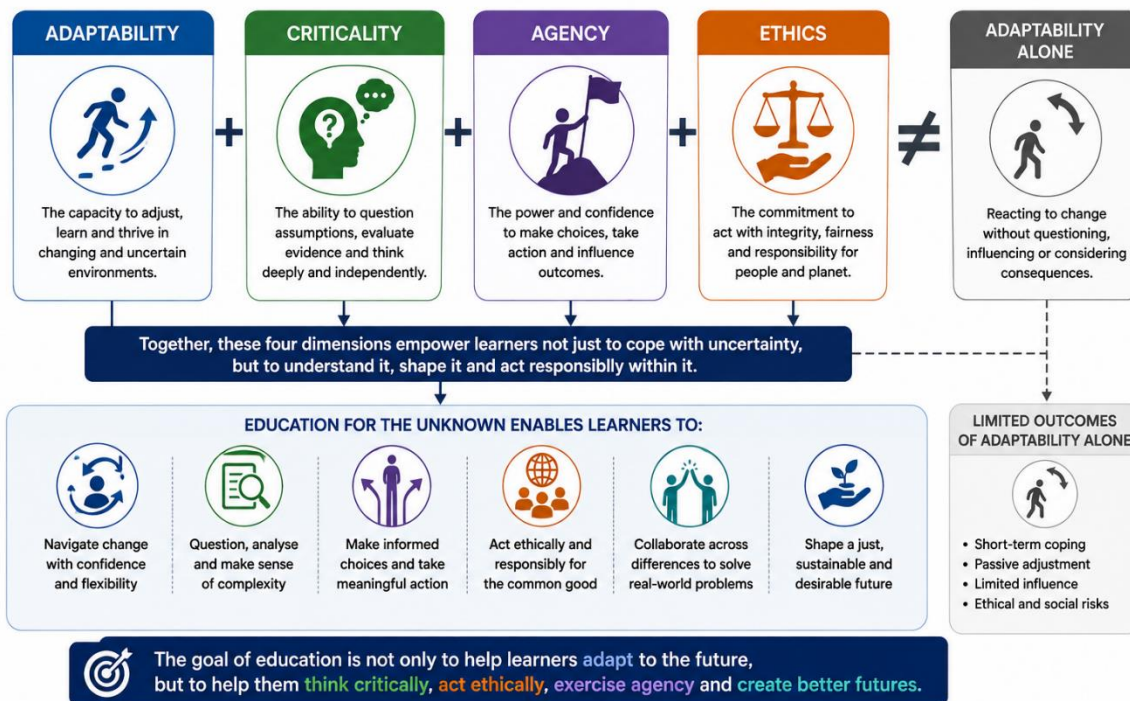
Preparing learners to adapt to every change may unintentionally normalise the idea that all changes are inevitable or desirable. As Biesta (2021) argues, educational responses centred uncritically on adaptability can become problematic because they may position learners primarily as individuals who must adjust to increasingly volatile environments.

There is therefore a need for a more balanced framework in which learners can both adapt to change and question change.

Education for the unknown should consequently incorporate:

Education for the Unknown: A More Complete Approach

Education for the unknown should incorporate:



Source: Author's conceptual synthesis, informed by UNESCO (2021) Futures of Education and UNESCO's Futures Literacy framework.

The "Human" Dimension of Future Readiness Requires Greater Theoretical Development

AI and automation have encouraged considerable attention to the skills that humans possess and machines supposedly lack. Yet the literature sometimes reduces human capabilities to an instrumental list of competencies.

There is an opportunity to develop a richer conception of human capability involving:

- ethical judgement;
- empathy;
- imagination;
- cultural understanding;
- moral responsibility;
- relationality;
- creativity;
- democratic participation;
- social responsibility; and
- the ability to determine what futures are desirable.

Recent AI literacy research increasingly acknowledges these dimensions. For example, contemporary reviews identify ethics, social implications, critical thinking, adaptability, and psychological dimensions alongside technical knowledge.

Nevertheless, these capabilities are not yet sufficiently integrated into a comprehensive theory of education for uncertainty.

The Literature Remains Predominantly Technology- and Economy-Oriented

A substantial proportion of future-oriented education discourse is driven by technological and labour-market concerns. The question often becomes whether graduates possess the skills required by emerging industries.

This perspective is understandable but incomplete. Education serves economic purposes, but it also serves cultural, democratic, ethical, social, ecological, and human purposes. A future-oriented educational framework that focuses predominantly on employability risks producing learners who are economically adaptable but insufficiently prepared to address questions of justice, sustainability, identity, citizenship, culture, and human wellbeing.

The gap is therefore a normative gap: insufficient attention has been given to the question of *what kind of future education should prepare learners to create* rather than merely *what kind of future labour market they should enter*.

Limited Attention to Alternative and Culturally Situated Futures

Another significant gap concerns cultural diversity in conceptions of the future. Global future-skills frameworks are often developed in technologically advanced economies and subsequently applied internationally. This creates a risk of treating one particular technological and economic trajectory as universal.

There remains a need for greater attention to Indigenous, Pacific, Global South, and culturally situated understandings of future-making. Such perspectives can challenge assumptions that progress is synonymous with technological acceleration, individual competitiveness, or economic productivity.

For Pacific education systems, for example, future readiness must be connected with cultural continuity, community resilience, Indigenous knowledge, environmental sustainability, collective wellbeing, and local agency. This is particularly important in contexts where climate change, geographic vulnerability, digital inequality, and cultural preservation intersect.

Limited Research on Education for "Unknown" Rather Than "Known" Futures

Perhaps the most fundamental gap is terminological and conceptual. Much of the literature speaks about:

- future skills;
- future-ready learners;
- future employability;
- future competencies;
- education for sustainable development;
- futures literacy;
- AI literacy; and
- adaptability.

However, comparatively little literature explicitly conceptualises education for the unknown as a distinct educational paradigm.

This distinction matters.

Education for a predicted future assumes that sufficient information exists to determine what learners should prepare for.

Education for possible futures recognises uncertainty and multiple trajectories.

Education for the unknown goes one step further: it begins from the proposition that some future conditions will remain fundamentally unknowable and therefore asks what forms of human capability remain valuable precisely because they enable learners to respond when prediction fails.

The latter represents an important conceptual opportunity.

Insufficient Attention to the Relationship Between Uncertainty and Assessment

Assessment represents another underdeveloped area.

Conventional assessment systems are generally designed around predefined learning outcomes, established knowledge, correct answers, and relatively stable criteria. However, education for uncertainty requires learners to deal with problems that may have multiple solutions, incomplete information, conflicting values, and unpredictable outcomes.

The literature has not sufficiently resolved how education systems can assess:

- judgement under uncertainty;
- ethical reasoning;
- creativity;
- adaptive learning;
- critical questioning;
- futures imagination;
- collaborative problem-solving;
- responsible AI use; and
- the ability to respond to genuinely novel situations.

This creates an important implementation gap. It is difficult to establish education for the unknown if assessment systems continue to reward primarily the reproduction of known knowledge.

Insufficient Attention to Teachers as Navigators of Uncertainty

Teachers are expected to prepare learners for rapidly changing futures, yet they themselves must operate within curriculum frameworks, assessment requirements, institutional policies, and professional development systems that may be slow to change.

Recent AI literacy research demonstrates the importance of teacher contextual knowledge and continuous professional growth. UNESCO's teacher competency framework likewise emphasises teacher development in AI pedagogy, ethics, human-centred approaches, and professional learning (Miao & Cukurova, 2024).

Nevertheless, more research is needed on how teachers can themselves become navigators of uncertainty rather than merely implementers of predetermined future-readiness frameworks.

Insufficient Empirical Evidence From Small Island and Pacific Contexts

The literature on future education and AI remains disproportionately concentrated in technologically and economically developed settings. Recent reviews of AI literacy and AI in education reveal strong research activity in regions such as China, the United States, and Europe, although research is increasingly expanding geographically.

There remains comparatively limited scholarship examining how education for uncertainty should be conceptualised in small island developing states and Pacific contexts.

This represents more than a geographic gap. Pacific contexts can contribute theoretically important perspectives because communities routinely negotiate environmental uncertainty, climate vulnerability, geographic isolation, resource constraints, cultural continuity, and rapid technological change. Their experiences can challenge universal assumptions about what constitutes "future readiness."

Limited Development of an Integrated Conceptual Framework

Finally, the literature lacks a sufficiently integrated framework connecting the following dimensions:

Existing frameworks tend to emphasise one or several of these dimensions. The present paper therefore identifies an opportunity to develop a more integrated conceptual understanding of education for an unknowable future.

The proposed contribution is not another list of future skills. Rather, it is a conceptual reframing of future readiness as a dynamic human capacity to navigate uncertainty and exercise agency under conditions that cannot be fully predicted.

Synthesis of the Literature Gaps

Taken together, the literature reveals a paradox. Education is increasingly expected to prepare learners for uncertainty, yet many future-oriented educational frameworks continue to rely on predictions about what the future will require. Futures literacy has challenged this assumption by emphasising possibility, anticipation, and agency, while AI literacy research has expanded the understanding of technological competence beyond technical skills towards ethics and critical judgement. However, these developments remain insufficiently integrated.

THEORETICAL FRAMEWORK

This paper is underpinned by an interdisciplinary theoretical framework that brings together Futures Literacy, Human Agency, Constructivist Learning Theory, and Pragmatism to explain how education can prepare learners for futures that cannot be reliably predicted. Together, these perspectives provide a foundation for moving beyond the conventional assumption that education should identify and transmit the skills required for a predetermined future.

Futures Literacy

Futures Literacy provides the primary theoretical foundation of the paper. It recognises that the future does not yet exist and therefore cannot be known with the same certainty as the past

or present. Instead, individuals and societies construct images of possible, probable, and preferable futures that influence present decisions (UNESCO, 2021). Futures literacy therefore shifts educational thinking from predicting the future towards understanding and navigating possibilities.

Within this paper, futures literacy is interpreted as the capacity of learners to recognise uncertainty, question assumptions, imagine alternative possibilities, and engage critically with different futures. This supports the central proposition that education should not attempt to teach *what the future will be*, but should develop learners' capacity to respond intelligently when the future differs from current expectations.

Human Agency

Human Agency provides the second theoretical pillar. Future-oriented education should not position learners as passive recipients who simply adapt to technological, economic, or social changes. Learners should be understood as active participants capable of influencing the conditions that shape future societies. The OECD (2024) similarly places student agency at the centre of its Future of Education and Skills framework.

Human agency is particularly important in the context of artificial intelligence and the Fifth Industrial Revolution. Technological development is not an inevitable force to which humans must simply submit; technological systems are designed, governed, adopted, regulated, and modified through human decisions. Education therefore has a responsibility to develop learners who can exercise judgement, ethical reasoning, creativity, and responsibility in determining how emerging technologies should be used.

Constructivist Learning Theory

Constructivist Learning Theory complements futures literacy by emphasising that learners actively construct knowledge through experience, inquiry, interaction, reflection, and interpretation rather than simply receiving predetermined information. This perspective is particularly appropriate for an uncertain future because learners cannot be given complete knowledge of circumstances that do not yet exist.

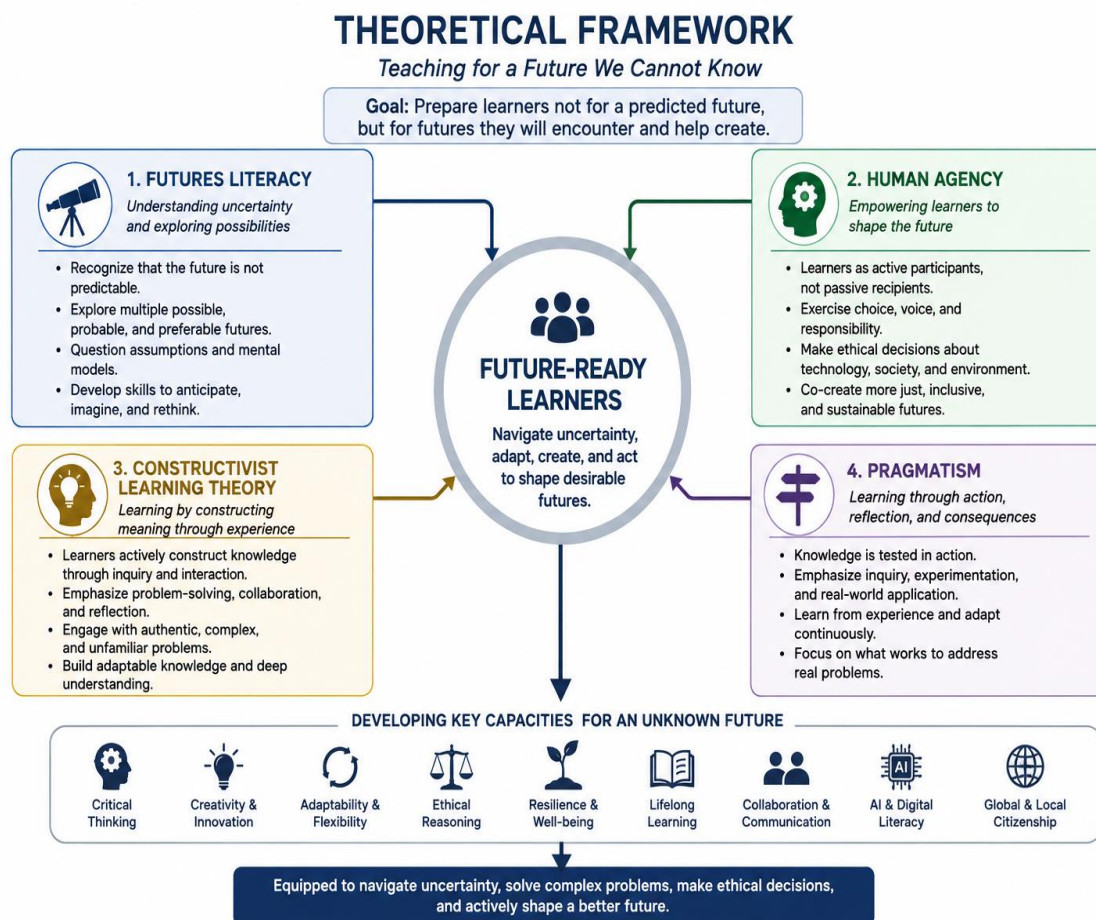
Constructivist education therefore encourages inquiry-based learning, problem-solving, collaboration, experimentation, reflection, and engagement with authentic and unfamiliar problems. Such pedagogies can help learners develop the capacity to construct meaning and develop responses when established solutions are unavailable.

Pragmatism

Pragmatism provides a further theoretical foundation by emphasising the practical consequences of knowledge and the importance of responding intelligently to changing circumstances. From a pragmatic perspective, knowledge is not simply something to be possessed; it is something that is tested, applied, revised, and reconstructed through experience.

This is particularly relevant to education for the unknown because learners will inevitably encounter situations for which existing knowledge and assumptions are insufficient. Pragmatic education therefore values experimentation, inquiry, reflection, problem-solving, adaptability, and learning from experience. It supports the proposition that education should prepare learners not for one predetermined future but for continuous learning and action under changing conditions.

Figure 1. Theoretical Framework for Teaching and Learning in an Unknown Future



Source: Author's own conceptualisation, informed by Futures Literacy (UNESCO, 2021), Human Agency and the OECD Learning Compass (OECD, 2024), Constructivist Learning Theory, and Pragmatism.

Theoretical Synthesis

The four perspectives collectively establish the theoretical position of this paper:

Futures Literacy → helps learners **understand uncertainty and imagine possibilities**.

Human Agency → enables learners to **exercise judgement and shape futures**.

Constructivism → enables learners to **construct knowledge through inquiry and experience**.

Pragmatism → enables learners to **test, adapt, and apply**

knowledge in changing circumstances.

Together, these theories support a shift from future prediction to future navigation and future-making. The theoretical framework therefore conceptualises future readiness not as mastery of a fixed set of predicted skills, but as a dynamic capacity involving critical thinking, creativity, adaptability, ethical reasoning, resilience, lifelong learning, collaboration, AI literacy, and human agency.

The central theoretical proposition is that because the future cannot be reliably known, education should focus

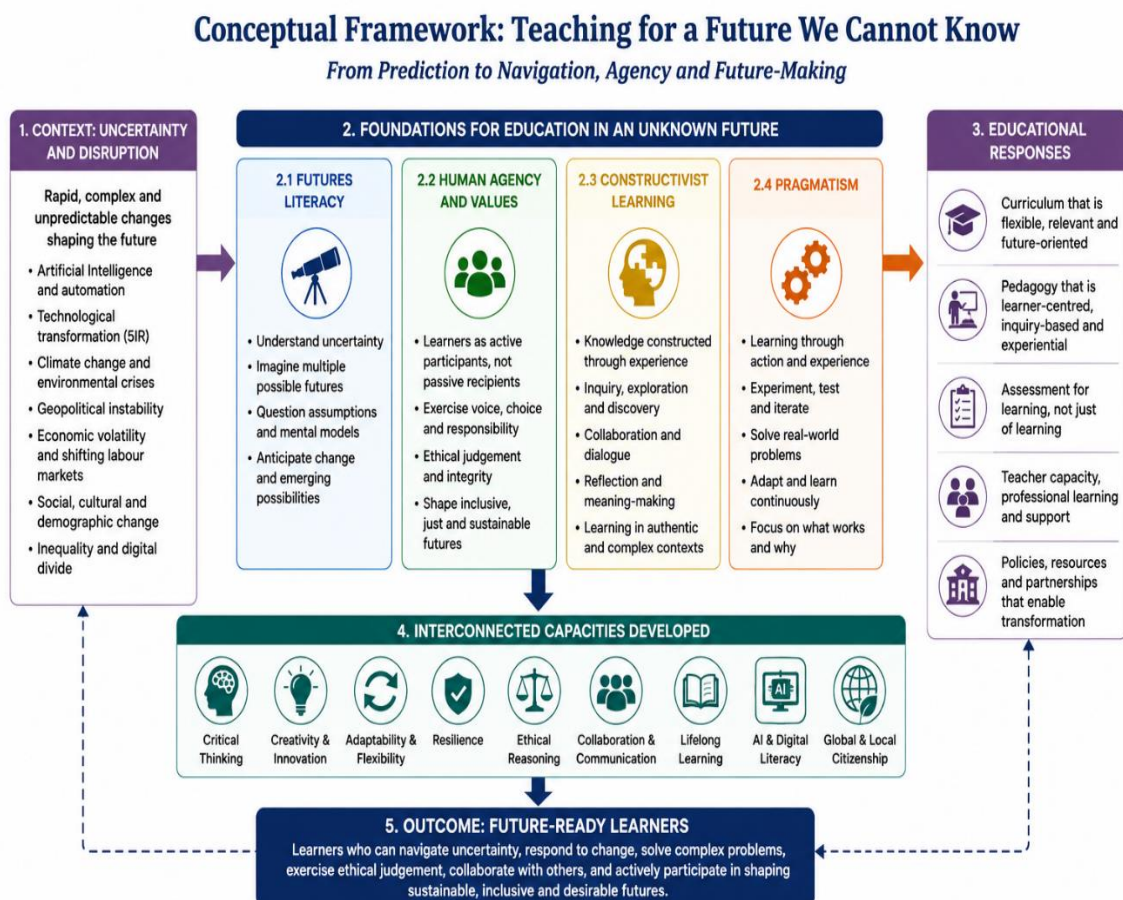
less on predicting what learners will encounter and more on developing their capacity to understand uncertainty, construct knowledge, adapt to change, exercise ethical judgement, and actively participate in shaping desirable futures.

CONCEPTUAL FRAMEWORK

The conceptual framework proposed in this paper positions education for the unknown as a shift from attempting to predict and prepare learners for a predetermined future towards developing their capacity to navigate, respond to, and shape multiple possible futures. The framework begins with the recognition of uncertainty and disruption arising from artificial intelligence, technological transformation, climate change, social and economic change, and other complex global developments. These conditions create a need for education systems to move beyond conventional future-skills approaches towards futures literacy and human-centred learning. Futures literacy enables learners to recognise uncertainty, imagine alternative possibilities, and question

assumptions, while human agency positions learners as active participants in shaping desirable futures. Constructivist learning contributes through inquiry, collaboration, reflection, problem-solving, and the active construction of knowledge, while pragmatism emphasises experimentation, practical application, continuous learning, and adaptation to changing circumstances. These foundations collectively contribute to the development of critical thinking, creativity, adaptability, resilience, ethical reasoning, collaboration, lifelong learning, AI and digital literacy, and social responsibility. The framework ultimately proposes that these interconnected capacities enable learners to navigate uncertainty, respond effectively to unfamiliar challenges, exercise informed and ethical judgement, and participate actively in creating more inclusive, sustainable, and desirable futures. Thus, the conceptual framework reframes future readiness not as the ability to predict what comes next, but as the capacity to remain capable, reflective, adaptive, ethical, and agentic when the future inevitably differs from what is expected.

Figure 2. *Conceptual Framework for Teaching for a Future We Cannot Know*



Source: Author's own conceptualisation informed by UNESCO (2021); OECD (2024); Miao et al. (2024); Constructivist Learning Theory; and Pragmatism (Dewey).

Source: Author's own conceptualisation, informed by UNESCO (2021), OECD (2024), Miao et al. (2024), Constructivist Learning Theory, and Pragmatism (Dewey).

DISCUSSION AND ANALYSIS

Reframing the Central Question: From Predicting the Future to Educating for Uncertainty

The central argument emerging from this paper is that education faces a fundamental paradox: it is inherently future-oriented, yet the future cannot be known with certainty. Educational systems are expected to prepare learners for technological, economic, social, environmental, and occupational conditions that have not yet materialised. At the same time, many educational policies continue to identify particular "future skills" as if the future can be sufficiently predicted to permit the design of a stable educational response. The analysis presented here challenges this assumption and proposes that the more appropriate purpose of future-oriented education is not prediction, but preparedness for uncertainty.

This argument is reinforced by recent international evidence. The OECD (2025) explicitly notes that trends do not simply continue linearly: they can accelerate, slow down, bend, or break, while unforeseen events can disrupt established trajectories. Its *Trends Shaping Education 2025* report therefore combines trend analysis with futures-thinking tools and alternative scenarios rather than treating forecasts as definitive descriptions of the future. Similarly, UNESCO's Futures of Education initiative deliberately uses the plural term *futures*, emphasising that multiple educational futures are possible and that no single trend should be regarded as destiny.

This distinction is theoretically important. If the future were predictable, education could legitimately focus on identifying the knowledge and skills that learners would require and then designing curricula around those anticipated requirements. However, when technological, environmental, economic, political, and social developments interact in complex and nonlinear ways, prediction becomes necessarily provisional. Education must therefore develop a different response: learners need the capacity to operate effectively when existing expectations prove inadequate.

The argument does not imply that forecasting, labour-market analysis, or strategic foresight should be abandoned. Rather, such approaches should be understood as decision-support mechanisms rather than promises about the future. Forecasts can inform educational planning, but they should not determine the totality of curriculum purposes. The distinction is between *using information about possible futures* and *assuming that a particular future can be known in advance*.

This is consistent with Rasa's (2025) recent conceptual analysis, which distinguishes among education concerned

with the future of education, education designed to adapt to future conditions, education intended to change the future, and education about futures. This taxonomy is especially relevant because it demonstrates that the phrase "education for the future" can conceal fundamentally different assumptions about prediction, agency, technology, and educational purpose.

The present analysis therefore advances a more critical proposition: education should not attempt to future-proof learners; it should future-enable them. Future-proofing implies that a sufficiently stable set of competencies can be identified that will remain valuable regardless of what happens. Future-enabling, by contrast, recognises that competencies themselves may evolve and therefore emphasises learners' capacity to continue learning, questioning, adapting, creating, and exercising judgement.

The Future Is Not a Destination but a Field of Possibilities

One of the most significant implications of the literature is the need to reconsider the singular language of *the future*. The future is not a single destination towards which societies are inevitably travelling. It consists of multiple possible, plausible, probable, and preferable trajectories influenced by human choices, technological developments, environmental conditions, political decisions, cultural values, and unexpected events.

UNESCO's futures-literacy approach is particularly important here. Futures literacy is based on the recognition that the future does not yet exist and therefore can only be imagined; developing the capacity to imagine and use different ideas about the future can strengthen people's ability to prepare, recover, and innovate as circumstances change.

This has a direct implication for curriculum design. Rather than presenting learners with a single narrative about what the future will look like, education should expose them to multiple possibilities. Students could examine alternative scenarios involving AI, climate change, employment, migration, demographic change, public health, sustainability, and technological development. The objective would not be to ask students to identify which scenario will definitely occur, but to explore assumptions, consequences, ethical implications, and possible responses.

Such an approach transforms the classroom from a space in which the future is described into a space in which the future is questioned and imagined.

This is particularly significant for younger learners. If

students are repeatedly told that certain technologies, occupations, or skills represent "the future," they may internalise a deterministic understanding of social change. Futures education should instead communicate that technological and social trajectories are shaped by human choices. The future is therefore both uncertain and open to influence.

The Future-Readiness Paradox: Teaching What We Know While Preparing for What We Do Not

The analysis identifies a fundamental tension between curricular stability and future uncertainty. Education requires knowledge, structures, standards, learning outcomes, assessment systems, and institutional continuity. Yet the future requires flexibility because the conditions in which learners will eventually live and work cannot be fully specified.

The solution is not to abandon foundational knowledge. Indeed, the opposite may be necessary. Learners require strong disciplinary knowledge precisely because critical thinking, problem-solving, creativity, and ethical judgement cannot operate effectively without substantive knowledge. The challenge is therefore to combine deep foundations with adaptive capabilities.

The OECD (2025) raises a similar issue when it asks how education systems can combine specific skills with broader competencies that enable people to continue learning throughout life, including metacognitive capabilities. This suggests that the educational response to uncertainty should not be a choice between knowledge and skills. Rather, education needs to establish a productive relationship between knowledge, metacognition, transfer, and lifelong learning.

The analysis therefore supports a layered conception of future readiness:

- Foundational knowledge provides intellectual grounding.
- Critical thinking enables evaluation.
- Creativity enables generation of alternatives.
- Adaptability enables response to change.
- Ethical reasoning provides normative direction.
- Lifelong learning enables continuous renewal.
- Human agency enables learners to influence rather than merely endure change.

This integrated conception is considerably stronger than a conventional list of "future skills."

Artificial Intelligence Changes the Question, Not Just the Curriculum

Artificial intelligence represents a particularly powerful test of the argument advanced in this paper. The educational

response to AI is often framed as a question of *what AI skills students need*. However, this framing may be too narrow. The deeper question is how AI changes the relationship among knowledge, intelligence, judgement, creativity, authorship, agency, and education itself.

UNESCO's AI Competency Framework for Students provides an important contemporary reference point. It identifies four dimensions—human-centred mindset, ethics of AI, AI techniques and applications, and AI system design—and three levels of progression: understand, apply, and create. The framework explicitly positions students as responsible users and co-creators of AI rather than merely consumers of AI tools.

This represents a significant shift in educational thinking. AI literacy is not simply about knowing how to operate ChatGPT or another AI system. It includes understanding the limitations of AI, critically evaluating outputs, considering ethical implications, recognising responsibilities as citizens, and developing the ability to participate in AI-enabled futures.

The implications for the present argument are substantial. If AI continues to evolve rapidly, teaching students to master today's specific AI tools may have limited longevity. Teaching students how to question, evaluate, verify, contextualise, and ethically use AI-generated information is likely to be more durable.

The educational question consequently shifts from:

How do we teach students to use today's AI?

to:

How do we educate students to remain capable human decision-makers as AI continues to change?

This distinction is central to education for the unknown.

Human Agency Becomes More Important as Technology Becomes More Powerful

Paradoxically, the increasing capability of AI may make human agency more important rather than less important. If technological systems can increasingly generate information, predictions, recommendations, designs, and solutions, education must place greater emphasis on determining when, why, and whether those outputs should be accepted.

UNESCO's AI Competency Framework for Teachers explicitly places human agency, accountability, social responsibility, ethics, AI pedagogy, and professional learning at the centre of teacher competence. This is important because it rejects a technologically deterministic model in which AI simply replaces existing educational roles.

Instead, the relationship can be conceptualised as:
Human judgement + AI capability → augmented

human intelligence

rather than:

AI capability → replacement of human judgement

This distinction has major implications for educational purpose. Students need to know not only how to obtain an AI-generated answer but also how to decide whether the answer is trustworthy, appropriate, culturally relevant, ethical, and useful. In other words, the educational value of judgement may increase as the availability of information increases.

The future-ready learner is therefore not necessarily the learner who knows the most technologies. It is the learner who can use technology without surrendering agency to it.

Critical Thinking Becomes More Valuable in an Information-Abundant World

The growth of AI and digital information also changes the meaning of critical thinking. In information-scarce environments, education traditionally focused heavily on acquiring information. In information-abundant environments, the challenge increasingly involves determining what information deserves attention and trust.

AI can produce fluent, convincing, and apparently authoritative responses even when those responses are inaccurate, biased, incomplete, or inappropriate. Consequently, learners need the capacity to interrogate information rather than simply receive it.

Critical thinking should therefore involve:

- questioning assumptions;
- evaluating evidence;
- identifying bias;
- distinguishing evidence from opinion;
- recognising uncertainty;
- checking sources;
- comparing competing explanations;
- identifying limitations;
- considering ethical implications; and
- revising conclusions when new evidence emerges.

This is precisely why UNESCO's student AI framework emphasises critical judgement of AI solutions alongside foundational AI knowledge and responsible citizenship.

The implication is profound: AI does not make critical thinking obsolete; it makes critical thinking indispensable.

Creativity Must Move Beyond Producing Novel Outputs

Creativity also requires reconsideration in an AI-enabled future. Generative AI can already produce essays, images, music, presentations, software code, and other outputs. If creativity is defined simply as producing a novel artefact, AI increasingly complicates the distinction between human and

machine creativity.

Education therefore needs to move towards a richer understanding of creativity involving:

1. identifying meaningful problems;
2. asking original questions;
3. imagining alternatives;
4. connecting ideas across domains;
5. evaluating possibilities;
6. making choices;
7. taking intellectual risks;
8. reflecting on consequences; and
9. producing work that reflects human purpose and values.

In this conception, creativity is not merely *generation*. It is intentional, reflective, contextual, and value-laden creation.

This reinforces the paper's central thesis. Students cannot be prepared for every future problem because many future problems have not yet been formulated. They can, however, develop the creative capacity to approach unfamiliar problems and generate possibilities when conventional solutions fail.

Adaptability Is Necessary—but Adaptation Alone Is Not Enough

The literature strongly supports adaptability as an important capacity for uncertain futures. The World Economic Forum (2025), for instance, identifies technological change, geoeconomic fragmentation, economic uncertainty, demographic shifts, and the green transition as major forces shaping labour markets through 2030. Its analysis indicates that employers expect substantial skills transformation while continuing to value human capabilities such as creative thinking, resilience, flexibility, agility, analytical thinking, leadership, and collaboration.

However, this paper argues that adaptability must be accompanied by critical agency.

If learners are simply taught to adapt to whatever conditions employers, technologies, or institutions create, education risks becoming an instrument of passive adjustment. Such an approach can place responsibility for navigating systemic problems entirely on individuals.

A stronger educational model would therefore distinguish between:

Adaptation: "How can I respond to this change?"
and

Agency: "Should this change occur, and how can I influence what happens next?"

This distinction is especially important for democratic education and social justice. Learners need the ability not only to survive changing conditions but also to question

unjust, unsustainable, or harmful conditions.

The future-ready learner should therefore be adaptable without becoming passive.

Resilience Should Be Understood as Collective as Well as Individual

Resilience is often presented as an individual psychological capacity—the ability to recover from disruption. While this dimension is important, the analysis suggests that resilience should also be understood institutionally and collectively.

Educational systems encounter disruptions such as pandemics, climate events, technological failures, economic shocks, political instability, and demographic change. Individual learners cannot be expected to overcome systemic weaknesses through personal resilience alone.

The OECD (2025) emphasises resilience and agility at the level of education systems as well as learners, particularly under conditions of uncertainty and rapidly changing labour markets.

Consequently, education for the unknown requires:

resilient learners + resilient teachers + resilient institutions + resilient communities.

This has particular importance for vulnerable and geographically isolated communities. Future readiness cannot be achieved simply by teaching students resilience if schools lack infrastructure, teachers lack professional support, communities lack resources, and educational policies cannot respond rapidly to disruption.

The Teacher's Role Changes from Knowledge Transmitter to Learning Navigator

The analysis also has important implications for teachers. If educators cannot know precisely what students will encounter in the future, their role cannot be reduced to transmitting predetermined knowledge about that future.

The teacher increasingly becomes a facilitator of inquiry, critical dialogue, reflection, experimentation, ethical reasoning, and lifelong learning.

UNESCO's AI Competency Framework for Teachers is highly relevant in this regard. It identifies human-centred mindsets, ethics, AI foundations and applications, AI pedagogy, and AI for professional learning as five major dimensions of teacher competence. It also emphasises progression from acquiring competencies to deepening and creating them.

This suggests that teachers themselves need to model the kind of learning they want students to develop. A teacher who communicates that knowledge is fixed and complete may unintentionally undermine education for uncertainty. Conversely, a teacher who demonstrates intellectual curiosity, acknowledges uncertainty, evaluates evidence, experiments with new approaches, and reflects on mistakes models lifelong

learning.

The teacher of the unknown future is therefore not the person who has all the answers. Rather, the teacher is the person who can help learners ask better questions when answers are uncertain.

Curriculum Must Become More Flexible Without Becoming Less Rigorous

The argument for education for the unknown should not be interpreted as a call for an unstructured curriculum. Flexibility does not mean abandoning standards or disciplinary knowledge. Instead, curriculum needs to become sufficiently flexible to allow learners to apply knowledge to emerging and unfamiliar problems.

A future-oriented curriculum should therefore combine:

stable foundations + flexible application + interdisciplinary learning + authentic problems + continuous revision.

For example, rather than teaching climate change solely as a body of scientific facts, students might examine its connections with economics, migration, politics, health, culture, technology, ethics, and community resilience. Rather than teaching AI merely as a computer-science topic, students could examine AI through mathematics, language, ethics, citizenship, economics, law, culture, and the arts.

Such interdisciplinary learning is particularly important because future problems are unlikely to respect disciplinary boundaries.

The OECD (2025) similarly highlights the need to combine specific skills with broader competencies that support lifelong learning and adaptation.

Assessment Must Also Prepare Learners for the Unknown

One of the strongest implications of the framework concerns assessment. Conventional assessment often rewards the ability to reproduce known knowledge under controlled conditions. Yet the unknown future will present learners with problems for which there may be no predetermined correct answer.

Assessment therefore needs to place greater emphasis on:

- reasoning processes;
- evidence-based judgement;
- problem-solving;
- creativity;
- inquiry;
- reflection;
- collaboration;
- ethical decision-making;

- application of knowledge to unfamiliar situations; and
- responsible use of AI.

This does not mean eliminating examinations or factual knowledge. Rather, it means balancing them with forms of assessment that evaluate how learners use knowledge when certainty is unavailable.

For example, a future-oriented assessment might ask students to analyse several possible scenarios, identify assumptions, evaluate evidence, propose responses, justify ethical choices, and reflect on uncertainty. Such assessment would measure not whether students know *the answer*, but whether they can reason responsibly when there is no single predetermined answer.

This represents a significant shift from assessment of recall to assessment of judgement.

From Future Skills to Future Capacities

The analysis suggests that the language of "skills" may itself require reconsideration. Skills can be taught and measured, but many of the capabilities required for uncertainty are developmental and relational.

For example, resilience is not simply a skill that can be acquired in a single lesson. Ethical reasoning develops through sustained engagement with complex dilemmas. Critical thinking develops through repeated questioning and reflection. Adaptability emerges through experience with changing circumstances. Agency develops when learners are given meaningful opportunities to make decisions.

Consequently, education for the unknown should emphasise capacities and dispositions alongside skills.

The conceptual distinction can be represented as:

Conventional future-readiness approach	Education for the unknown
Predict future skills	Develop adaptive capacities
Prepare for specific jobs	Prepare for lifelong transitions
Master technologies	Understand and critically use technologies
Adapt to change	Adapt, question, and shape change
Solve known problems	Navigate unfamiliar problems
Reproduce correct answers	Exercise judgement under uncertainty
Individual employability	Individual and collective wellbeing
Follow technological futures	Participate in shaping desirable futures

The second column more closely reflects the conceptual framework developed in this paper.

Human-Centred Education Becomes Central to the 5IR

The argument has particular relevance to the Fifth Industrial Revolution. If the 4IR accelerated automation, connectivity, datafication, and intelligent technologies, the 5IR discourse increasingly emphasises the relationship between technological capability and human values.

Education therefore has an opportunity to ensure that technological advancement remains connected to human flourishing. UNESCO's student AI framework explicitly incorporates a human-centred mindset, ethics, responsibility, and inclusive and sustainable AI design.

This supports a broader interpretation of 5IR education in which technological literacy is necessary but insufficient. Learners also require the capacity to determine what technology should be used for, under what conditions, for whose benefit, and with what consequences.

This is where human-centred education intersects with futures literacy. Learners need to imagine not merely technologically possible futures but ethically desirable

futures.

Education Should Prepare Learners to Shape Futures, Not Merely Survive Them

Perhaps the most important analytical finding is that future readiness should not be reduced to survival or employability. If learners are only prepared to cope with whatever future emerges, education risks becoming reactive.

A more ambitious conception is future-making.

UNESCO's Futures of Education initiative explicitly emphasises the possibility of shaping just and sustainable futures rather than treating trends as destiny. Rasa's (2025) distinction between "education to adapt to the future" and "education to change the future" further reinforces the importance of learner agency.

This means that learners should be encouraged to ask:

- What kind of society do we want?
- What kind of technology should we develop?
- What should remain human?
- How should AI be governed?

- How can technological progress contribute to sustainability?
- How can education reduce rather than reproduce inequality?
- How can local and Indigenous knowledge contribute to future-making?
- What does a desirable future look like for different communities?

These are educational questions, not merely technological or economic questions.

Equity: The Unknown Future Will Not Affect Everyone Equally

An important dimension of the analysis concerns equity. Future uncertainty is not distributed equally. Individuals and communities with greater financial, technological, educational, and social resources generally possess greater capacity to respond to disruption.

The OECD (2025) highlights inequality as a cross-cutting issue in contemporary educational futures and notes that vulnerable groups can be disproportionately affected by sudden shocks and crises.

Similarly, the World Economic Forum's (2025) labour-market analysis indicates that substantial numbers of workers will require reskilling or upskilling as occupational structures change.

This raises an important ethical question: Who has the capacity to adapt to uncertainty?

If future-oriented education focuses heavily on individual adaptability without addressing unequal access to technology, quality teaching, connectivity, professional learning, and educational opportunities, it may unintentionally reproduce existing inequalities.

Education for the unknown must therefore be an equity project as well as a pedagogical project.

Cultural and Indigenous Perspectives Challenge Universal Definitions of Future Readiness

The analysis also suggests that future readiness cannot be defined entirely through the assumptions of technologically advanced economies. Different communities possess different understandings of progress, wellbeing, knowledge, responsibility, and desirable futures.

UNESCO's Futures of Education framework emphasises cultural diversity and education as a public and common good. This provides an important foundation for recognising that there can be multiple legitimate educational futures.

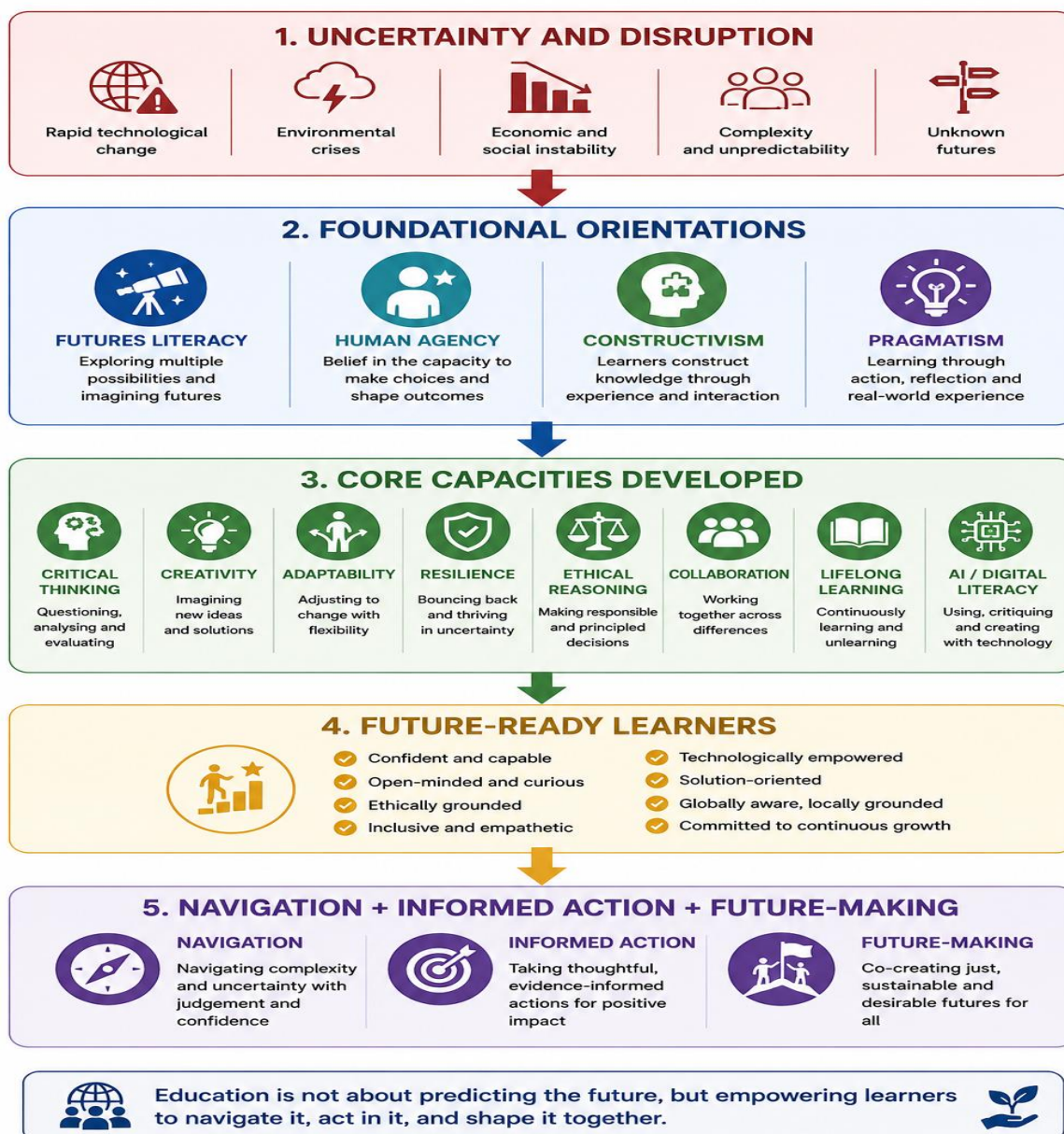
For Pacific contexts, this is particularly significant. A future-oriented educational model should not assume that technological acceleration, individual competitiveness, or labour-market productivity constitute the only measures of success. Future readiness may also involve cultural continuity, collective responsibility, ecological stewardship, relationality, community resilience, Indigenous knowledge, and intergenerational responsibility.

This broadens the meaning of "future-ready" from technologically capable to culturally grounded, socially responsible, environmentally conscious, and humanly capable.

Such an approach also challenges technological determinism. Technology should support cultural and human purposes rather than dictate them.

A New Conceptualisation: From Prediction to Navigation, Agency, and Future-Making

The discussion ultimately supports the conceptual framework developed in this paper. The framework proposes a progression:



This model is significant because it does not claim that education can eliminate uncertainty. Instead, it treats uncertainty as a fundamental condition within which education must operate.

The framework also integrates four theoretical perspectives in a complementary manner. Futures literacy enables learners to recognise and explore possibilities; human agency positions them as actors rather than passive recipients; constructivism explains how learners develop understanding through active engagement; and pragmatism emphasises learning through action, experience, experimentation, and reflection.

The resulting educational philosophy can therefore be summarised as:

We cannot teach learners what the future will be, but we can teach them how to think, learn, adapt, judge, create, collaborate, and act when the future is not what we expected.

This is the principal conceptual contribution of the paper.

Implications for Educational Policy and Practice

The analysis has several implications for educational policy and practice.

Curriculum

Curricula should move beyond narrowly defined future-job preparation towards a balance of foundational knowledge and transferable capacities. AI, climate change, sustainability, digital citizenship, ethics, creativity, and futures thinking should increasingly be integrated across disciplines rather than treated as isolated topics.

Pedagogy

Pedagogies should create opportunities for inquiry,

scenario exploration, problem-based learning, collaboration, experimentation, reflection, and engagement with authentic problems. Learners should encounter situations in which uncertainty is productive rather than something to be avoided.

Assessment

Assessment should increasingly evaluate reasoning, application, judgement, creativity, ethical decision-making, and responses to novel problems alongside disciplinary knowledge.

Teacher Education

Teachers require continuous professional development in AI literacy, futures literacy, inquiry-based pedagogy, ethical reasoning, and emerging technologies. UNESCO's (Miao & Cukurova, 2024) framework provides a useful international reference for this transition.

Educational Leadership

School and university leaders need to create cultures that tolerate experimentation and learning from failure. Institutions that demand certainty before allowing innovation may struggle to respond to uncertain futures.

Policy

Policies should avoid overcommitting educational systems to rigid forecasts about particular technologies or occupations. Strategic foresight should inform policy, but policies should retain sufficient flexibility to adapt when assumptions change.

Implications for Research

The conceptual argument developed in this paper also creates a substantial research agenda. Future empirical research should examine how education for the unknown can be translated into measurable educational outcomes.

Important research questions include:

1. How can futures literacy be systematically developed across primary, secondary, and tertiary education?
2. How can teachers be prepared to facilitate uncertainty and futures thinking?
3. How can education systems assess adaptive capacity and ethical judgement?
4. What pedagogies most effectively develop students' ability to respond to unfamiliar problems?
5. How does AI influence students' critical thinking, creativity, agency, and epistemic judgement?
6. How can Indigenous and local knowledge systems contribute to culturally grounded conceptions of future readiness?

7. How can education for uncertainty reduce rather than reproduce digital and socioeconomic inequalities?
8. How do learners in different cultural contexts conceptualise a "desirable future"?
9. What institutional conditions enable schools and universities to become more adaptive?
10. How can future-oriented education be evaluated without reducing it to another fixed competency checklist?

These questions indicate that the concept of education for the unknown is not simply philosophical. It provides a potentially productive research programme for educational theory, curriculum studies, teacher education, educational leadership, AI in education, and futures studies.

Overall Synthesis

The evidence and theoretical arguments examined in this paper converge on a central conclusion: the increasing uncertainty of the future does not make future-oriented education less important; it makes the conventional approach to future-oriented education inadequate.

The challenge is not that educators lack sufficiently accurate predictions. Rather, the deeper problem is the assumption that accurate prediction is the prerequisite for educational preparation.

Current evidence demonstrates that technological change, AI, labour-market transformation, geopolitical instability, environmental pressures, demographic change, and inequality are interacting in complex ways. The OECD (2025) explicitly argues for futures thinking, scenario exploration, resilience, and adaptability rather than reliance on linear projections. The World Economic Forum (2025) similarly demonstrates substantial anticipated transformation of jobs and skills while highlighting the continued importance of human capabilities such as creative thinking, resilience, flexibility, and collaboration. UNESCO's AI competency frameworks reinforce the need for human-centred AI education grounded in ethics, responsibility, critical judgement, and lifelong learning.

Taken together, these developments suggest that the future-ready learner should not be understood as someone who possesses a predetermined package of "future skills." Rather, the future-ready learner is someone who can learn continuously, think critically, imagine alternatives, work with uncertainty, adapt intelligently, exercise ethical judgement, collaborate with others, use technology responsibly, maintain human agency, and contribute to shaping desirable futures.

The fundamental shift proposed by this paper can therefore be expressed through five transitions:

From prediction → to possibility

From future skills → to future capacities

From adaptation → to agency

From technological competence → to human-centred capability

From preparing for the future → to participating in creating futures

The central message is consequently not that education should stop thinking about the future. On the contrary, education must become more deeply future-oriented—but in a different way. It must recognise that the future cannot be fully predicted, that multiple futures are possible, that technological change is neither inherently desirable nor inevitable in its consequences, and that learners are not simply future workers but citizens and human beings capable of shaping the societies they inherit.

The ultimate purpose of education for an unknown future is therefore not to provide learners with certainty about what lies ahead. It is to provide them with the intellectual courage, critical capacity, ethical judgement, creativity, adaptability, resilience, and agency to meet uncertainty without surrendering their capacity to influence what comes next.

In this sense, the most future-ready educational system may not be the one that predicts the future most accurately. It may be the one that prepares learners most effectively for the possibility that its predictions will be wrong.

CONCLUSION

The question “How do we teach for a future we cannot know?” represents one of the most important challenges facing education in the twenty-first century. Education has always been oriented towards the future, yet the conditions that learners will encounter are becoming increasingly difficult to anticipate. Artificial intelligence, automation, climate change, geopolitical instability, demographic shifts, economic transformation, social disruption, and rapidly changing technologies are interacting in complex and nonlinear ways. Consequently, the central challenge is no longer simply to determine which knowledge and skills learners will need for a predicted future. Rather, education must reconsider what it means to be prepared when the future itself remains uncertain (International Commission on the Futures of Education, 2021; OECD, 2025).

This paper has argued that education cannot reliably teach learners what the future will be, but it can develop their capacity to navigate what the future may become. This requires a fundamental shift from prediction to preparedness, from predetermined future skills to enduring human capacities, and from adaptation alone to agency and future-making. Futures literacy provides an important foundation for this shift because it encourages learners to recognise that the future is not a single predetermined reality but a field of

possibilities that can be imagined, questioned, and influenced (UNESCO, 2021). The purpose of futures-oriented education should therefore not be to produce certainty about tomorrow but to strengthen learners' capacity to engage intelligently with uncertainty.

The theoretical framework developed in this paper—drawing on Futures Literacy, Human Agency, Constructivist Learning Theory, and Pragmatism—provides a complementary foundation for this reconceptualisation. Futures literacy enables learners to explore multiple possibilities rather than depend upon a single prediction. Human agency positions learners as active participants capable of influencing social and technological developments. Constructivism emphasises the active construction of knowledge through inquiry, experience, interaction, and reflection, while pragmatism highlights experimentation, practical problem-solving, adaptation, and learning through experience. Together, these perspectives support an educational philosophy in which learners are prepared not simply to enter an existing future but to participate in creating future possibilities.

The discussion has also demonstrated that future readiness should not be reduced to a checklist of transferable skills. Although competencies such as digital literacy, AI literacy, communication, collaboration, creativity, and problem-solving remain important, they may not be sufficient on their own. What learners increasingly require are deeper and more enduring capacities: critical thinking, intellectual curiosity, adaptability, resilience, ethical reasoning, creativity, metacognition, collaboration, lifelong learning, and human agency. The OECD (2025) similarly emphasises the importance of combining specific knowledge and skills with broader capacities that enable individuals to continue learning and responding to changing circumstances. The World Economic Forum (2025) likewise identifies creative thinking, resilience, flexibility, analytical thinking, and collaboration among the capabilities that will remain important amid substantial labour-market transformation.

Artificial intelligence makes this argument particularly urgent. The rapid development of generative AI demonstrates the limitations of preparing learners only for particular technologies. Tools will change, platforms will disappear, new systems will emerge, and capabilities that appear technologically advanced today may become commonplace tomorrow. Consequently, education should move beyond teaching learners simply how to use AI towards teaching them how to question, evaluate, verify, contextualise, govern, and ethically use AI. UNESCO's AI Competency Frameworks for Students and Teachers reinforce this human-centred orientation by placing

human agency, ethics, critical judgement, responsibility, AI literacy, and professional learning at the centre of AI education (Miao & Cukurova, 2024; Miao et al., 2024).

An important conclusion emerging from this analysis is therefore that the more capable technology becomes, the more important human judgement becomes. When machines can increasingly generate information, images, text, predictions, recommendations, and solutions, the educational challenge is no longer primarily information acquisition. It is determining what information is trustworthy, what action is appropriate, what consequences may follow, and what choices are ethically defensible. Education must consequently preserve and strengthen those dimensions of human capability that cannot simply be reduced to technological efficiency. The future-ready learner should be capable of using technology without surrendering judgement or agency to technology.

The paper has further argued that adaptability must not be confused with passive adjustment. Preparing learners merely to adapt to technological and economic change risks positioning them as recipients of forces determined elsewhere. Education has a broader social responsibility. Learners should be able to ask whether a particular technological, economic, environmental, or social change is desirable, who benefits from it, who may be disadvantaged, and how alternative futures might be created. Futures education should therefore cultivate not only adaptive capacity but also critical agency. UNESCO's futures-oriented work similarly emphasises the possibility of collectively shaping more just and sustainable futures rather than treating current trends as inevitable (International Commission on the Futures of Education, 2021; UNESCO, 2021).

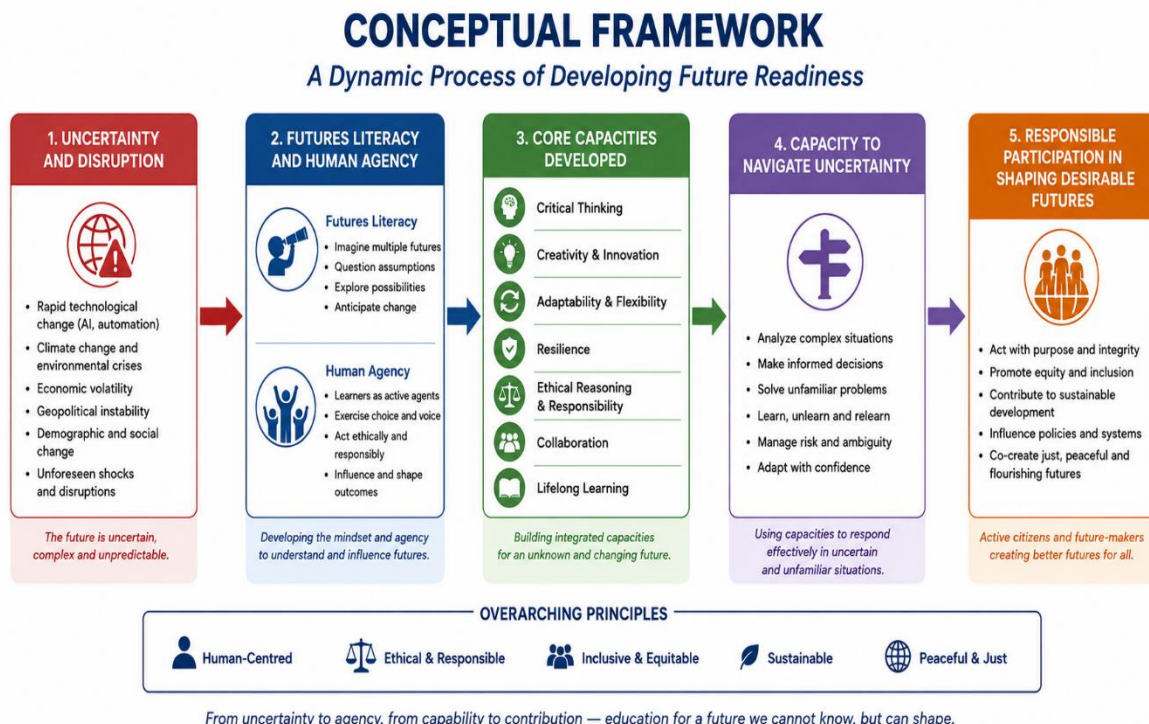
This distinction is particularly important for questions of equity and social justice. The ability to navigate an uncertain future is not equally distributed. Learners with reliable connectivity, quality education, supportive families, skilled teachers, and access to emerging technologies will have considerably greater opportunities to respond to disruption than learners who experience poverty, geographic isolation, digital exclusion, disability-related barriers, or inadequate educational infrastructure. Consequently, education for the unknown cannot become an individual responsibility alone.

Schools, universities, governments, communities, and technology providers share responsibility for creating the conditions that enable all learners to participate meaningfully in future possibilities. Otherwise, the discourse of adaptability may unintentionally place the burden of systemic uncertainty on those with the fewest resources.

The argument also has significant implications for curriculum, pedagogy, assessment, and teacher education. Curricula should combine strong disciplinary foundations with opportunities for interdisciplinary inquiry, scenario exploration, authentic problem-solving, creativity, reflection, and ethical reasoning. Pedagogy should provide learners with opportunities to confront unfamiliar problems rather than continually presenting predetermined questions with predetermined answers. Assessment should increasingly evaluate reasoning, application, judgement, creativity, reflection, and the ability to respond to novel situations alongside factual knowledge. Teachers, meanwhile, should increasingly function not only as transmitters of established knowledge but also as facilitators of inquiry, critical dialogue, experimentation, and lifelong learning. UNESCO's (2024) teacher competency framework similarly emphasises the importance of human-centred approaches, ethics, AI pedagogy, and continuous professional learning.

Perhaps the most significant conclusion is that education should prepare learners for multiple futures rather than for one presumed future. A technologically advanced future is possible, but it is not necessarily a socially just future. A highly automated future is possible, but it does not necessarily guarantee human wellbeing. A digitally connected future is possible, but connectivity alone does not eliminate inequality. Education must therefore ask not only *"What future is likely?"* but also *"What future is desirable, for whom, and why?"* This moves education from forecasting towards ethical and democratic future-making.

The conceptual framework developed in this paper consequently positions future readiness as a dynamic process:



This framework challenges the assumption that the primary purpose of future-oriented education is to make learners "ready" for a particular technological or occupational environment. Instead, it proposes that education should develop learners who remain capable even when their expectations about the future prove wrong. This is a more demanding but potentially more enduring conception of future readiness.

The argument is not that schools and universities should abandon forecasting, labour-market analysis, technological literacy, or strategic planning. These remain valuable. Rather, forecasts should be treated as provisional resources for decision-making rather than definitive descriptions of the future. As the OECD (2025) demonstrates, educational futures require attention to trends while also recognising that trends can accelerate, slow, break, or interact in unexpected ways. Education systems therefore need both strategic foresight and the institutional flexibility to respond when assumptions change.

The paper ultimately proposes five fundamental shifts in educational thinking:

1. From prediction to possibility – recognising that multiple futures are possible.
2. From future skills to future capacities – developing capabilities that remain valuable across changing circumstances.
3. From adaptation to agency – enabling learners not merely to respond to change but to influence it.

4. From technological competence to human-centred capability – ensuring that technology remains connected to ethics, purpose, culture, and human wellbeing.
5. From preparing for the future to participating in creating futures – positioning learners as citizens and future-makers rather than passive recipients of tomorrow's conditions.

The central conclusion, therefore, is both simple and profound: we cannot teach the future because we do not know what it will be; we can, however, teach learners how to face uncertainty intelligently, ethically, creatively, and courageously. The purpose of education should not be to give learners confidence that they know what comes next. It should give them the confidence and capability to respond when what comes next is different from what anyone expected.

In an age characterised by uncertainty, the most future-ready education system may consequently not be the one that predicts the future most accurately. It may be the one that prepares learners most effectively for the possibility that its predictions will be wrong. Such an education would not attempt to eliminate uncertainty. Instead, it would transform uncertainty into an opportunity for inquiry, imagination, learning, agency, and collective action.

Ultimately, the question "How do we teach for a future we cannot know?" should lead to a deeper question: "What kind of human beings do we want education to develop, regardless of what future arrives?" The answer proposed by this paper is learners who can think critically, imagine

alternatives, learn continuously, act ethically, collaborate across differences, use technology responsibly, remain resilient amid disruption, and exercise agency in shaping the world around them. In this sense, the enduring purpose of education is not to predict tomorrow. It is to ensure that learners are capable of meeting tomorrow—and capable of helping to make it better.

WAY FORWARD

The central argument of this paper—that we cannot teach learners what the future will be because the future cannot be known with certainty, requires a fundamental reorientation of educational thinking. The way forward is not to abandon future-oriented education, but to move beyond the assumption that educational systems can identify a fixed set of knowledge and skills that will guarantee future success. Instead, education must develop learners who are capable of learning, adapting, questioning, creating, collaborating, and exercising responsible agency under conditions of uncertainty.

This shift requires education systems to move from a predictive model of future preparation towards a capacity-building model of future readiness. Forecasts of technological developments, labour-market requirements, demographic changes, and environmental pressures remain useful for planning, but they should be treated as provisional rather than definitive. The OECD (2025), for example, emphasises the importance of futures thinking and scenario approaches because contemporary trends can accelerate, slow, interact, or break in unexpected ways. Education systems therefore need sufficient flexibility to respond when assumptions about the future prove incorrect.

The way forward can consequently be conceptualised around five interconnected transitions:

Prediction → Possibility → Capacity → Agency → Future-making

Education should help learners understand possible futures, develop capacities to navigate uncertainty, exercise agency in responding to change, and participate in creating desirable futures. This is consistent with UNESCO's (2021) argument that education should contribute to a more just, sustainable, and peaceful future rather than merely reproduce existing systems.

Institutionalizing Futures Literacy

Futures literacy should become a more explicit component of education at primary, secondary, and tertiary levels. Rather than teaching students a single narrative about what the future will look like, education should expose learners to **multiple possible, probable, and preferable futures**.

Classrooms can use scenario-building, futures mapping,

horizon scanning, "what-if" questions, alternative-future exercises, and problem-based learning. Students could examine questions such as:

- What happens if AI transforms most knowledge-based occupations?
- What happens if climate-related migration increases?
- What would education look like without traditional examinations?
- What should remain distinctly human if machines become increasingly intelligent?
- What kind of society do we want technological development to create?

Such activities would help students recognise that the future is neither predetermined nor entirely predictable. UNESCO's Futures Literacy approach provides an important foundation for developing this capacity to imagine and critically engage with alternative futures (UNESCO, 2021).

Reorienting Curriculum Towards Enduring Human Capacities

Curriculum development should place greater emphasis on capacities that remain valuable even when specific technologies, occupations, or social conditions change. These include:

- critical thinking;
- creativity and innovation;
- adaptability and flexibility;
- resilience;
- ethical reasoning;
- communication;
- collaboration;
- problem-solving;
- metacognition;
- lifelong learning;
- digital and AI literacy; and
- human agency.

This does not mean reducing the importance of disciplinary knowledge. Rather, knowledge and capabilities should be integrated. Students need substantive knowledge to think critically, but they also need opportunities to apply that knowledge to unfamiliar and complex situations.

The OECD (2025) similarly argues for combining specific skills with broader capabilities that support lifelong learning and adaptation. This suggests that future-oriented curriculum reform should focus less on producing students who can reproduce predetermined answers and more on developing learners who can construct informed responses to problems that have no

predetermined answers.

Preparing Learners for AI Without Making Education AI-Dependent

Artificial intelligence represents one of the clearest examples of why education cannot rely on predictions about specific technologies. AI systems will continue to evolve, and today's tools are unlikely to represent the full technological landscape that current learners will encounter throughout their lives. The priority should therefore be AI readiness rather than AI tool mastery.

Students should learn to:

1. understand fundamental AI concepts;
2. critically evaluate AI-generated information;
3. recognise bias, misinformation, and limitations;
4. verify AI outputs against credible evidence;
5. understand ethical and social implications;
6. protect privacy and data;
7. use AI creatively and responsibly;
8. recognise when human judgement is necessary; and
9. maintain agency when interacting with intelligent systems.

UNESCO's *AI Competency Framework for Students* places human-centred thinking, ethics, AI techniques, and AI system design at the centre of student preparation (Miao et al., 2024). Similarly, the *AI Competency Framework for Teachers* emphasises human agency, ethics, AI pedagogy, and professional learning (Miao & Cukurova, 2024).

The goal should therefore not be to create learners who are dependent upon AI, but learners who are capable of working intelligently with AI while retaining independent judgement.

RECOMMENDATIONS

Recommendation 1: Establish Futures Literacy as a Core Educational Capability

Education ministries, curriculum authorities, schools, and universities should explicitly incorporate **futures literacy** into curriculum frameworks.

Students should be provided with structured opportunities to:

- explore alternative futures;
- question assumptions about the future;
- analyse emerging trends;
- distinguish possibilities from predictions;
- identify uncertainty;
- imagine preferable futures; and
- consider their role in shaping those futures.

Futures literacy should not be restricted to a single subject. It

can be integrated across science, social sciences, technology, economics, environmental studies, humanities, business, and teacher education.

Rationale: Learners need to understand that the future is open, uncertain, and influenced by human decisions rather than predetermined.

Recommendation 2: Replace the "Future Skills Checklist" with a Future Capacities Framework

Educational policy should move away from repeatedly identifying lists of supposedly permanent "future skills." While such lists are useful, their usefulness declines when technologies and labour-market conditions change.

A more sustainable framework should emphasise a combination of:

Knowledge + Critical Thinking + Creativity + Adaptability + Resilience + Ethical Reasoning + Agency + Lifelong Learning.

These capacities are more likely to remain relevant across multiple possible futures.

Rationale: The future may make particular technical skills obsolete, but the capacity to learn new skills can remain valuable.

Recommendation 3: Develop Human-Centred AI Education

AI education should be incorporated across educational levels with a strong emphasis on human agency, ethics, critical evaluation, and responsible use.

AI education should address not only *how AI works* but also:

- who develops AI;
- how AI systems make decisions;
- what data they use;
- how bias can emerge;
- who benefits from AI;
- who may be disadvantaged;
- what privacy risks exist;
- when AI should not be used; and
- what responsibilities humans retain when using AI.

This aligns closely with UNESCO's (2024) human-centred approach to AI competency.

Rationale: Technological literacy without ethical and critical literacy may produce technically capable but socially unprepared citizens.

Recommendation 4: Transform Pedagogy from Answer-Seeking to Inquiry

Teachers should increasingly use pedagogies that expose

learners to complex, unfamiliar, and open-ended problems.

Approaches should include:

- inquiry-based learning;
- problem-based learning;
- project-based learning;
- design thinking;
- interdisciplinary learning;
- scenario-based learning;
- collaborative learning;
- experiential learning; and
- reflective learning.

Students should occasionally encounter questions for which there is no single correct answer.

Rationale: Learners cannot develop confidence in navigating uncertainty if their educational experience continually removes uncertainty from the learning process.

Recommendation 5: Reform Assessment to Measure Judgement, Not Only Recall

Assessment systems should move towards a more balanced model that evaluates both what students know and how they use knowledge when circumstances are uncertain.

Assessment should increasingly include:

- authentic problem-solving;
- scenario analysis;
- case studies;
- research projects;
- portfolios;
- reflective tasks;
- collaborative projects;
- ethical decision-making;
- interdisciplinary problem-solving; and
- responsible AI-supported work.

Traditional examinations can continue to assess foundational knowledge, but they should be complemented by assessments that examine learners' ability to apply knowledge to unfamiliar situations.

Rationale: If education claims to prepare students for uncertain futures while assessment rewards only predictable answers, a fundamental contradiction remains within the system.

Recommendation 6: Strengthen Teacher Education and Continuous Professional Learning

Teachers are central to any transition towards education for the unknown. They cannot be expected to prepare learners for emerging futures without themselves having opportunities to

develop new capabilities.

Teacher professional development should therefore include:

- futures literacy;
- AI literacy;
- digital pedagogy;
- critical thinking;
- interdisciplinary teaching;
- inquiry-based learning;
- scenario development;
- ethical reasoning;
- inclusive education; and
- reflective professional practice.

Professional development should move beyond one-off workshops towards continuous, collaborative, practice-based learning.

Rationale: Teachers need to model the lifelong learning and adaptability that they expect from their students.

Recommendation 7: Strengthen Human Agency and Student Voice

Learners should be given meaningful opportunities to participate in decisions about their education and their communities. This includes student-led projects, participatory research, community engagement, peer collaboration, and opportunities to identify and solve authentic problems.

The OECD's Learning Compass places student agency and co-agency at the centre of future-oriented education (OECD, 2019).

Students should therefore be positioned not merely as:

learners → future workers

but as:

learners → citizens → decision-makers → creators → future-makers.

Rationale: A learner who is never given meaningful agency in school may struggle to exercise agency in society.

Recommendation 8: Make Education for the Unknown Equity-Centred

Future readiness must not become an advantage available only to learners with access to technology, high-quality teachers, reliable connectivity, and well-resourced schools.

Governments and education systems should prioritise:

- equitable digital infrastructure;
- affordable connectivity;
- access to devices;

- inclusive learning resources;
- teacher capacity in disadvantaged communities;
- support for learners with disabilities;
- rural and remote education;
- gender-responsive digital education; and
- culturally responsive curricula.

This is especially important because technological transformation can deepen existing inequalities when access to emerging technologies is uneven.

Rationale: It is ethically problematic to tell disadvantaged learners to "adapt to the future" while denying them the resources required to participate in that future.

Recommendation 9: Integrate Indigenous and Local Knowledge into Future-Making

Future-oriented education should not be constructed exclusively around Western technological and economic assumptions. Indigenous and local knowledge systems can provide important perspectives on sustainability, community, relationality, ecological stewardship, collective responsibility, and intergenerational learning.

Future education should therefore ask not only:

"What technologies will shape the future?"

but also:

"What knowledge, values, relationships, and cultural practices should we carry into the future?"

This is particularly important in Pacific educational contexts, where cultural continuity, community relationships, environmental stewardship, and Indigenous knowledge are integral to conceptions of wellbeing and development.

Rationale: A technologically advanced future is not automatically a desirable future. Education must allow communities to define what a desirable future means for themselves.

Recommendation 10: Develop Flexible and Adaptive Education Policies

Education policies should avoid becoming excessively dependent upon rigid predictions about particular technologies, occupations, or economic trends.

Instead, policy frameworks should incorporate:

- scenario planning;
- regular environmental scanning;
- policy experimentation;
- periodic review;

- stakeholder consultation;
- rapid feedback mechanisms; and
- adaptive implementation.

The OECD (2025) provides strong justification for such approaches because contemporary educational environments are characterised by interconnected and unpredictable changes.

Rationale: If the future cannot be predicted with certainty, educational policy must be designed to learn and adapt.

Recommendation 11: Develop Future-Ready Educational Leadership

School and university leaders should cultivate institutional cultures that encourage:

- experimentation;
- innovation;
- interdisciplinary collaboration;
- responsible risk-taking;
- reflection;
- learning from failure;
- teacher autonomy; and
- continuous improvement.

Leadership should move away from a culture in which uncertainty is interpreted as failure and towards one in which uncertainty becomes an opportunity for inquiry and institutional learning.

Rationale: Future-ready learners require future-ready institutions.

Recommendation 12: Reframe the Purpose of Education Beyond Employability

Employment remains an important purpose of education, but it should not become the sole measure of educational success.

The future will require not only workers but also:

- citizens;
- parents;
- community leaders;
- researchers;
- innovators;
- caregivers;
- environmental stewards;
- democratic participants; and
- ethical decision-makers.

Education should therefore balance economic relevance with human flourishing, social justice, cultural continuity,

democratic participation, and sustainability.

This broader understanding is consistent with UNESCO's (2021) conception of education as a public and common good and with its call for a new social contract for education.

A Proposed Action Framework

The recommendations can be translated into a practical action framework:

Level	Priority Action	Desired Outcome
Policy	Embed futures literacy and human-centred AI principles	Flexible and future-oriented education systems
Curriculum	Integrate enduring human capacities with disciplinary knowledge	Learners capable of transfer and adaptation
Pedagogy	Expand inquiry, projects, scenarios and authentic problems	Learners capable of navigating unfamiliar situations
Assessment	Evaluate judgement, creativity, application and reflection	Evidence of deeper future-readiness
Teacher Education	Continuous development in AI, futures literacy and innovative pedagogy	Future-ready teachers
Technology	Promote responsible, equitable and human-centred AI use	Technology that enhances rather than replaces human agency
Equity	Address digital, geographic, socioeconomic and disability-related barriers	Inclusive access to future opportunities
Culture	Integrate Indigenous and local knowledge	Culturally grounded futures
Leadership	Develop adaptive and innovative institutions	Resilient education systems
Research	Evaluate future-oriented pedagogies and capacities	Evidence-informed future education

A Proposed Educational Philosophy for the Unknown Future

The recommendations ultimately point towards a broader educational philosophy that can be summarised as follows:

Do not teach learners what to think about the future; teach them how to think when the future is uncertain.

This philosophy requires education to cultivate five fundamental dispositions:

- 1. Curiosity** – the willingness to ask questions about what might be possible.
- 2. Criticality** – the capacity to question assumptions and evaluate evidence.
- 3. Creativity** – the ability to imagine alternatives and develop new possibilities.
- 4. Agency** – the confidence and capability to influence decisions and outcomes.
- 5. Responsibility** – the commitment to use knowledge and technology ethically for individual and collective wellbeing.

Together, these dispositions provide a stronger foundation for future readiness than any fixed list of occupational competencies.

Final Way Forward

The way forward is therefore not to make education more predictive, but to make it more adaptive, reflective, human-centred, ethical, inclusive, and future-literate.

Education systems should accept that uncertainty is not an educational failure to be eliminated. It is a fundamental characteristic of the world for which learners are being prepared. The objective should consequently be to create learning environments in which students can encounter uncertainty safely, investigate it critically, imagine alternatives, make informed decisions, learn from failure, and take responsible action.

The ultimate transition can be expressed as:

From teaching answers → to teaching questions
From predicting futures → to exploring possibilities
From fixed skills → to enduring capacities
From adaptation → to agency
From technological dependence → to human-centred intelligence
From preparing for one future → to shaping multiple desirable futures
From future-proofing learners → to future-enabling learners.

The most important recommendation of this paper is therefore a philosophical one: education should stop promising learners that it can prepare them for a future that nobody can accurately know. Instead, it should promise something more realistic and more empowering—that it can help them become capable of learning, adapting, questioning, creating, collaborating, and acting responsibly whatever future eventually emerges.

That may be the most responsible way to educate for an unknown future.

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