



Online Teaching and Learning in South Asian Higher Education: Challenges and Emerging Opportunities for Teacher Education and Physical Education

Dr. Vikas Kundu

Principal, Geeta College of Education, Butana Kundu, District Sonapat, Haryana- 131302 (India)

(Affiliated to Deenbandhu Chhotu Ram University of Science & Technology- DCRUST, Murthal)

Email ID: dr.vikaskundu@gmail.com

ORCID: <https://orcid.org/0009-0000-0148-317X>

Abstract

Online teaching and learning has become a permanent component of higher education, yet its educational value depends on more than access to digital platforms. This critical integrative review examines the development of online higher education in South Asia and focuses specifically on its implications for teacher education and physical education. Drawing on recent regional reports, peer-reviewed reviews, policy documents and foundational theories of online learning, the review synthesises evidence concerning digital inequality, faculty competence, learner engagement, assessment, academic integrity, artificial intelligence, accessibility and quality assurance. The analysis shows that South Asian institutions have moved from pandemic-era emergency remote teaching toward a more complex phase of sustainable digital transformation, but progress remains uneven across countries and institutions. Teacher education requires explicit development of digital pedagogical competence, authentic assessment and supervised professional practice, while physical education requires a discipline-sensitive blended model because embodied, psychomotor and safety-related outcomes cannot be fully reproduced online. Generative AI offers emerging opportunities for personalised learning, feedback, multilingual support and professional development, but it also introduces risks related to privacy, bias, academic integrity and over-reliance. The review proposes a Context-Responsive Online Teaching and Learning Framework built around infrastructure readiness, pedagogical alignment, faculty competence, learner support, inclusive access, authentic assessment, discipline-sensitive design and responsible innovation. The article argues that the future of online higher education in South Asia should not be defined by the quantity of technology adopted, but by the quality, equity and educational purpose with which technology is integrated.

Keywords: *Online Higher Education; South Asia; Teacher Education; Physical Education; Generative Artificial Intelligence.*

1. Introduction

The expansion of online teaching and learning has moved from being a specialist concern of distance education to becoming a central issue in higher education policy, institutional planning and academic practice. The COVID-19 pandemic accelerated this transition, but the post-pandemic landscape is not simply a return to the pre-2020 classroom. Universities now operate in an environment in which learning management systems, video-conferencing, digital repositories, mobile learning, open educational resources, learning analytics, artificial intelligence (AI), recorded lectures and digitally mediated assessment coexist with face-to-face teaching. The more consequential question is therefore no longer whether higher education



should use digital technologies, but under what conditions online teaching can remain educationally meaningful, equitable, inclusive and academically credible.

This question has particular significance in South Asia. The region contains some of the world's largest and most socially diverse higher education systems, but it also contains sharp differences in connectivity, device ownership, institutional capacity, language, geography, income and digital skills. UNESCO's 2025 regional report on digital transformation in higher education identifies uneven progress across Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, with differences in organisational digital culture, infrastructure, digital skills, policy alignment and institutional capacity [1]. The distinction between online learning and emergency remote teaching is important. Emergency remote teaching describes a temporary response in which existing courses are rapidly moved to remote delivery because normal instruction has been disrupted [2]. Deliberately designed online learning, by contrast, involves planned course architecture, appropriate media selection, learner support, interaction design, assessment strategy, accessibility and faculty preparation. Treating emergency remote teaching as the benchmark for online education can lead institutions to mistake crisis survival for pedagogical quality. South Asian institutions have consequently entered a second phase: the task is to convert emergency digital experience into sustainable and pedagogically coherent online provision.

Teacher education and physical education deserve special attention within this transition. Teacher education is responsible for preparing future teachers to teach in digitally changing schools, yet online teacher education itself requires prospective teachers to develop digital pedagogical competence, reflective practice, communication skills, assessment literacy and supervised professional experience. Physical education presents an even more distinctive challenge because learning is partly embodied. Demonstration, movement, observation, corrective feedback, peer interaction, safety and practical assessment cannot always be reproduced through a conventional virtual classroom. A 2023 mixed-studies review of online physical education teacher education (PETE) found evidence that online instruction can support independent learning and flexible access, but also identified challenges involving relationships, online learning competence and the limited articulation of pedagogical principles [3]. More recent work continues to describe PETE as particularly difficult to move online because of its embodied character [4].

The emergence of generative AI adds a further layer. AI can support explanation, formative feedback, language assistance, content generation, adaptive learning and teacher professional development, but it also raises concerns about privacy, bias, academic integrity, authorship and over-reliance. UNESCO's 2024 AI Competency Framework for Teachers places human-centredness, ethics, AI foundations, AI pedagogy and professional learning at the centre of teacher competence [5]. Thus, digital transformation is not primarily a technology procurement problem; it is a problem of educational design, professional capacity and institutional governance.

Against this background, this critical integrative review examines online teaching and learning in South Asian higher education with particular attention to teacher education and physical education. It synthesises conceptual literature, regional policy evidence and recent research to identify persistent challenges, emerging opportunities and practical directions for institutions. The review asks four broad questions:

1. What Structural and Pedagogical conditions shape Online Higher Education in South Asia?
2. What distinctive implications does Online Learning create for Teacher Education?
3. Why does Physical Education require a different Online Pedagogical Strategy? and

4. How can AI and other Digital Technologies be integrated without Weakening Equity, Human Interaction or Academic Integrity?

The central argument is that effective online higher education in South Asia must be context-responsive rather than technology-centred. Its quality depends on the interaction of infrastructure, pedagogy, faculty competence, learner readiness, assessment, inclusion, disciplinary characteristics and responsible technology governance.

2. Review Approach and Scope

This article adopts a critical integrative review approach. The purpose is not to estimate a single effect size or claim a systematic review of every publication in the field, but to bring together conceptual frameworks, peer-reviewed research, recent reviews, regional policy documents and authoritative international reports in order to develop a coherent interpretation of online higher education in South Asia. An integrative approach is particularly appropriate for a topic that crosses higher education policy, educational technology, teacher education, physical education, assessment, equity and artificial intelligence.

The literature and documentary evidence were identified through targeted searches of Scholarly and Institutional sources available through Recognized Academic Publishers, UNESCO, National Higher Education Agencies and University Repositories. Search concepts included combinations of “Online Teaching”, “Online Learning”, “Higher Education”, “South Asia”, “Digital Transformation”, “Teacher Education”, “Online Teacher Education”, “Physical Education Teacher Education”, “Online Physical Education”, “Digital Competence”, “Online Assessment”, “Generative AI”, and “Academic Integrity”. Priority was given to research and policy documents published from 2023 to 2026, while foundational theoretical works were retained where they remained necessary for conceptual interpretation. Particular attention was given to regional evidence from India, Bangladesh, Nepal, Pakistan, Sri Lanka, Bhutan and Maldives, although the availability of comparable studies is uneven.

The review used four analytical lenses. The first was structural readiness, including connectivity, devices, platforms, institutional support and digital inequality. The second was pedagogical quality, including interaction, instructional design, learner engagement, assessment and feedback. The third was professional preparation, focusing on teacher education, faculty digital competence and the distinctive requirements of PETE. The fourth was responsible innovation, covering AI, privacy, accessibility, academic integrity and quality assurance.

Several limitations should be acknowledged. South Asia is not a homogeneous educational system, and national differences can be obscured by regional generalisation. Evidence is also uneven across countries and disciplines; there is considerably more literature on general online learning than on online PETE. In addition, many studies conducted during COVID-19 examined emergency remote teaching rather than deliberately designed online programmes. Consequently, findings from the pandemic period should not automatically be treated as evidence about mature online education. The review therefore distinguishes between emergency remote teaching, fully online learning, blended learning and hybrid provision wherever the evidence permits.

The resulting synthesis is interpretive. Claims are grounded in cited evidence, but the proposed framework and recommendations represent the author's analytical integration of that evidence rather than the output of a formal statistical meta-analysis. This distinction is important for methodological transparency and for preventing the review from overstating what the current South Asian evidence can establish.

3. From Emergency Remote Teaching to Sustainable Online Education

The pandemic exposed the difference between having digital tools and having an online educational system. During the initial disruption, institutions frequently relied on video-conferencing, messaging applications, recorded lectures, PDF materials and rapidly assembled learning management spaces. Such measures were understandable under emergency conditions, but the pedagogical assumptions behind them were often inherited from face-to-face teaching. A lecture that is effective in a classroom cannot simply be placed on a video platform and expected to produce the same learning experience. Online environments alter the timing of interaction, the visibility of learners, the role of the teacher, the organisation of attention and the possibilities for feedback.

Hodges and colleagues distinguished emergency remote teaching from carefully planned online education, arguing that the former should not be used as a proxy for the quality of the latter [2]. This distinction remains important in South Asia because pandemic experience can otherwise create two opposite misconceptions. One misconception is that online education has failed because students disliked improvised online classes. The other is that digital delivery is automatically successful because institutions were able to continue teaching during lockdown. Both conclusions are too simplistic.

A sustainable online model requires deliberate alignment among learning outcomes, content, pedagogy, technology and assessment. The Community of Inquiry framework is useful here because it emphasises cognitive presence, social presence and teaching presence as interconnected dimensions of a meaningful online educational experience [6]. Students need opportunities to construct and test ideas, interact with peers and teachers, and experience visible instructional leadership. The model helps explain why technically functional online courses can still feel educationally weak when social and teaching presence are underdeveloped.

Transactional distance theory offers another useful perspective. Online education creates a psychological and communicative distance that is not identical to physical distance. The extent of this distance is influenced by dialogue, course structure and learner autonomy [7]. South Asian learners may experience this distance differently depending on language, prior educational culture, confidence with independent learning and access to timely teacher support. Highly structured courses can help novice online learners, while advanced learners may benefit from greater autonomy. Therefore, online design must not assume a universal learner profile.

The transition to sustainable online education also requires institutional memory. Universities need policies for course design, faculty workload, technical support, accessibility, data protection, online assessment, student counselling and academic integrity. UNESCO's technology report emphasises that access to technology, governance and teacher preparation are system-wide conditions for educational technology to reach its potential [8]. The implication for South Asia is that digital transformation should be treated as a long-term institutional capability rather than a collection of temporary tools.

A mature online ecosystem can also coexist with campus education. Blended and hybrid approaches may be especially appropriate where practical work, laboratory activities, internships, micro-teaching and physical education require face-to-face engagement. The objective should therefore be pedagogical flexibility rather than the ideological replacement of the physical campus. Online education is most valuable when it expands access, supports learning continuity and enriches interaction without eliminating educational experiences that depend on physical presence.

4. South Asian Higher Education: Structural Conditions and the Digital Divide

South Asian higher education is characterised by scale, diversity and uneven capacity. Expansion in participation has increased the demand for flexible and affordable learning, while differences in institutional resources remain substantial. The digital transformation of universities therefore occurs within existing inequalities rather than outside them. UNESCO's 2025 regional analysis reports uneven institutional progress and identifies persistent gaps in connectivity, digital literacy and policy alignment [1]. The digital divide should consequently be understood as a layered phenomenon rather than a simple question of whether a student has internet access.

The first layer is physical access: reliable electricity, broadband or mobile connectivity, appropriate devices and affordable data. The second is quality of access. A learner who technically has a smartphone connection may still be disadvantaged if the connection is unstable, expensive or unsuitable for sustained video participation. The third layer is digital capability. Students and faculty need skills to search, evaluate, create, communicate and participate effectively online. The fourth layer concerns learning conditions: a quiet study space, family responsibilities, disability access, language support and time availability can determine whether connectivity actually becomes educational opportunity.

Evidence from Bangladesh, India and Pakistan during the pandemic illustrates how infrastructure, technology readiness, learning experience and institutional support interacted to shape online education [9]. These experiences are relevant beyond the pandemic because they reveal structural vulnerabilities that remain whenever universities depend heavily on synchronous video or high-bandwidth resources. A digital-first institution that assumes continuous broadband can unintentionally exclude students who rely on mobile data, shared devices or asynchronous access.

The regional challenge is not solved by simply distributing devices. Device provision must be connected to course design, technical support and digital literacy. A smartphone may be sufficient for reading, messaging and short formative activities but inadequate for extended writing, specialised software, video production or data analysis. Teacher education students may also require access to presentation tools, virtual classrooms and digital assessment environments, while physical education students may need cameras, sensors, wearable devices or adequate space for movement-based tasks. Consequently, "one device per learner" is not a complete digital-equity policy.

Language creates another dimension of inequality. Much of the academic and technological content used in online higher education is produced in English, while South Asian higher education includes learners working across English and multiple national, regional and local languages. Online platforms can support multilingual learning through captions, transcripts, translation and accessible resources, but language support must be intentionally designed. Otherwise, digital expansion can reproduce linguistic inequalities.

Disability inclusion should similarly be integrated into online design from the beginning. Captions, screen-reader compatibility, keyboard navigation, alternative text, flexible deadlines where justified and multiple ways of demonstrating learning are not optional additions for a small minority. They are components of universal design. This is particularly important in teacher education because future teachers should experience inclusive digital pedagogy as learners if they are expected to create inclusive learning environments for their own pupils.

The central policy implication is that digital equity should be evaluated at the level of meaningful participation rather than nominal connectivity. South Asian institutions need diagnostic data on who can access which technologies, under what conditions, and with what learning consequences. Such evidence can inform

targeted device lending, low-bandwidth course options, campus connectivity hubs, offline content, accessibility services and faculty support. Equity is therefore not merely a social objective; it is a quality condition for online higher education.

5. Pedagogical Foundations of Effective Online Teaching and Learning

Technology is educationally useful only when it is embedded in sound pedagogy. A major risk in online higher education is platform determinism: the assumption that the availability of a learning management system, video-conferencing application or AI tool constitutes innovation. Effective online learning begins instead with learning outcomes and asks what combination of explanation, practice, dialogue, collaboration, feedback and assessment will help students achieve them.

The Technological Pedagogical Content Knowledge framework provides a useful foundation for this alignment [10]. Teachers require knowledge not only of subject matter and pedagogy but of how technology interacts with both. For teacher educators, this means understanding how a concept such as classroom management, inclusive education or educational psychology can be represented and discussed online. For physical education educators, it means understanding how movement demonstration, observation, performance feedback and safety can be supported through video, mobile applications and other technologies without assuming that technology can reproduce the entire practical environment.

Online pedagogy also benefits from purposeful sequencing. A strong module may combine a short conceptual resource, guided reading, an interactive discussion, an applied task, formative feedback and a reflective activity. Synchronous sessions can then be used for dialogue, problem solving and clarification rather than simply repeating a recorded lecture. Asynchronous design can increase flexibility for students with variable connectivity and responsibilities. The balance between synchronous and asynchronous activity should be determined by learning needs rather than institutional preference.

Student engagement is particularly important because online environments can make passive participation deceptively easy. Attendance in a virtual room does not demonstrate cognitive engagement. Meaningful engagement requires tasks that ask learners to interpret, compare, create, critique and apply. Discussion forums are more useful when prompts demand evidence and response to peers rather than generic opinion. Short quizzes can support retrieval practice, while collaborative documents, peer review and problem-based tasks can create social and cognitive presence.

Feedback is another defining feature. Online learners may experience uncertainty when they cannot easily read the teacher's non-verbal cues or ask spontaneous questions. Timely formative feedback can reduce this uncertainty. Feedback should be specific enough to guide improvement and should be linked to transparent criteria. Audio, video or annotated feedback can be valuable, but text remains important where students have limited bandwidth.

Online learning also requires attention to cognitive load. Long synchronous lectures, dense slides, multiple platforms and unclear navigation can create avoidable extraneous cognitive load. Course organisation should therefore be predictable. Learning outcomes, weekly structure, required readings, activities and submission procedures should be visible. This is not a matter of reducing intellectual difficulty; it is a matter of reducing unnecessary complexity so that learners can focus on the intellectual task.

Finally, online pedagogy should preserve human relationships. UNESCO's technology guidance emphasises that digital technologies should support rather than replace human interaction [8]. The teacher's role does not disappear online. It changes from primarily delivering information to designing learning, facilitating

interaction, diagnosing misunderstanding, giving feedback and supporting learner autonomy. This shift is particularly important for teacher education, where the educational relationship itself is part of what students are learning to enact as future teachers.

6. Faculty Digital Competence and Professional Development

A recurrent lesson from South Asian online education is that institutional access to platforms does not guarantee faculty readiness. Teachers may know how to use email, presentation software or a video-conferencing application without knowing how to design an effective online learning experience. Digital competence therefore needs to be treated as a multidimensional professional capability.

At minimum, faculty development should cover course design, digital communication, online facilitation, assessment, accessibility, copyright, data protection, student engagement and basic troubleshooting. Teacher educators require additional competence in modelling digital pedagogy for prospective teachers. Physical education faculty need competence in video-based demonstration, movement analysis, remote coaching, digital fitness assessment and the design of safe home-based activities.

Professional development is more effective when it is sustained and practice-oriented. One-off workshops can introduce tools but rarely change pedagogy by themselves. Faculty need opportunities to redesign an actual course, receive peer feedback, observe examples, test activities with students and revise their design. Communities of practice can help institutions create shared expertise. Instructional designers and educational technology units can further reduce the burden on individual academics.

UNESCO's 2024 AI Competency Framework for Teachers is particularly relevant to this changing role. The framework identifies 15 competencies across five dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy and AI for professional learning [5]. For South Asian teacher education, this suggests that digital professional development should move beyond "how to use the software" toward questions such as when a technology improves learning, what data it collects, how its outputs should be evaluated and how teachers retain professional judgement.

Workload is an under-discussed issue. Online courses can require substantial preparation because teachers must create materials, record or edit media, moderate discussions, provide more frequent written feedback and handle technical queries. If institutions simply add online teaching to existing workloads, faculty may experience burnout and may revert to low-interaction methods. Workload models should recognise course development, digital moderation and student support as legitimate academic work.

Faculty autonomy also matters. Standardisation can improve accessibility and quality assurance, but excessive centralisation can make courses inflexible. A useful model is to standardise minimum quality requirements while allowing disciplinary variation. For example, every course might be expected to include clear learning outcomes, accessible materials, formative assessment and a communication plan, while the actual learning activities differ between educational psychology and physical education.

For teacher education, faculty development should be linked to school-level digital transformation. Prospective teachers need to understand not only how to teach online in universities but how digital tools are changing school classrooms. This includes virtual collaboration, digital citizenship, and online safety, AI-supported lesson planning and differentiated digital instruction. Teacher educators therefore occupy a dual position: they are online instructors themselves and models of the professional practice they want future teachers to adopt.

7. Online Teacher Education: Opportunities and Persistent Challenges

Teacher education is unusually consequential because its graduates become multipliers of educational practice. If pre-service teachers experience weak online pedagogy, they may reproduce weak digital teaching in schools. Conversely, well-designed online teacher education can expand access to professional knowledge, connect student teachers with wider communities and support continuous reflection.

One major opportunity is flexibility. Students can access recorded lectures, readings, demonstrations and discussion activities at times compatible with work or family responsibilities. Online platforms can also connect teacher candidates across institutions and regions. A trainee in a rural setting can potentially interact with peers, teacher educators and school practitioners beyond the immediate campus. Digital portfolios can document lesson plans, reflective journals, micro-teaching videos and evidence of professional growth.

A second opportunity is authentic digital practice. Teacher candidates can be asked to design an online lesson, create accessible multimedia content, analyse a digital classroom scenario or evaluate an AI-generated lesson plan. Such tasks develop professional judgement rather than simple software familiarity.

However, teacher education contains elements that are difficult to move fully online. School internship and teaching practice require observation, classroom interaction, mentoring and direct engagement with pupils. Online preparation can support these activities through pre-practicum simulations, digital lesson planning, video reflection and mentor communication, but it should not automatically be treated as a substitute for authentic school experience. This distinction is especially important in programmes where professional standards require demonstrated classroom competence.

Online teacher education can also challenge traditional assumptions about learning. Students accustomed to teacher-directed instruction may initially struggle with self-regulation. Teacher educators should therefore provide explicit guidance on time management, academic reading, online discussion and independent study. Scaffolding should gradually decline as learners develop autonomy.

Assessment needs redesign as well. If online teacher education relies heavily on unsupervised written examinations, questions about authenticity become unavoidable. Better approaches include teaching portfolios, lesson-design tasks, reflective commentary, oral defence, peer feedback, case analysis and observed micro-teaching. These approaches do not eliminate academic dishonesty, but they make learning processes more visible.

Digital equity remains particularly important for teacher candidates from rural and economically disadvantaged communities. If online teacher education becomes the default without alternative access routes, it can widen the very educational inequalities teacher education is expected to address. Institutions should provide low-bandwidth alternatives, downloadable materials, campus access points and flexible participation arrangements.

The literature therefore supports a blended conception of teacher preparation in which online learning is used extensively for conceptual, reflective and collaborative work while face-to-face or school-based experiences remain central to professional formation. The aim is not to defend physical presence for its own sake, but to identify which learning outcomes genuinely require embodied social interaction. Such outcome-based decisions are more defensible than treating “online” or “offline” as inherently superior modes.

8. Online Physical Education: Why the Discipline Requires a Distinct Strategy

Physical education exposes the limits of generic online-learning models. Much of higher education can move substantial portions of content online because learning is primarily conceptual or text-based. Physical education combines conceptual knowledge with movement competence, demonstration, observation, practice, feedback, safety and social interaction. The challenge is therefore not simply how to transmit information about sport and exercise, but how to support learning through and about the body.

The distinction is recognized in India's National Education Policy 2020, which notes that certain practical subjects have limitations in online and digital environments and cautions that online education should be combined with experiential and activity-based learning to avoid excessive screen-based education [11]. This observation is highly relevant to physical education because psychomotor and affective dimensions cannot be fully captured by conventional online lectures.

The PETE literature provides important evidence. Murtagh and colleagues' mixed-studies review identified only 14 empirical studies meeting its criteria for online PETE and concluded that online instruction can support independent learning but that relationships, learner support and online competence require careful attention [3]. A later study examining online PETE during emergency remote delivery described the field as especially difficult to transition because of its embodied nature [4]. These findings suggest that physical education should not simply borrow an online model from lecture-based disciplines.

At the same time, digital technologies offer genuine opportunities. Video can allow students to record movement, review performance and receive feedback. Slow-motion analysis can make biomechanical features visible. Digital portfolios can document skill progression. Fitness applications and wearable devices can support self-monitoring, although their validity and data practices must be considered. Virtual demonstrations can provide repeated access to technical instruction, while online discussion can strengthen conceptual understanding of training principles, sports psychology, biomechanics, health and pedagogy.

A 2024 systematic review of digital media in physical education reported positive findings for some applications, including fitness technologies, video feedback, digital games and flipped learning, while also noting that the overall evidence base was frequently weak and that results were not consistently positive [12]. This caution is important. The presence of a digital tool does not guarantee improved physical activity or motor learning.

More recent research on digital-intelligent technologies in physical education suggests growing use of adaptive platforms, virtual simulation, multimodal assessment and data-driven feedback, while also identifying algorithmic accuracy, privacy and unequal access as significant barriers [13]. The opportunity is therefore substantial but should be approached critically.

The appropriate strategy is a pedagogical division of labour. Online environments are particularly effective for conceptual knowledge, observation, reflection, video analysis, planning and feedback. Face-to-face or supervised settings remain especially important for complex skill acquisition, safety-sensitive activities, interpersonal coaching and authentic practical assessment. A carefully designed blended PETE model can therefore use online technology to extend, rather than replace, embodied learning.

9. Online PETE and the Theory-Practice Challenge

The problem of online PETE is closely connected to the theory-practice relationship in teacher education. A future physical education teacher must know what to teach, why it should be taught, how to demonstrate it,

how to observe learner performance, how to modify instruction and how to maintain safety and inclusion. Online learning can contribute strongly to the first two dimensions and can partially support the others, but the translation into professional action requires practice.

One promising approach is video-based pedagogical reasoning. A teacher candidate can watch a recorded lesson, identify instructional decisions, analyse movement errors, propose feedback and redesign an activity. This creates a bridge between theoretical knowledge and professional judgement. Candidates can also record their own micro-teaching and annotate the recording to explain why they selected a particular demonstration, grouping strategy or feedback technique.

Another approach is structured peer learning. Students can work in small groups to analyse technique, develop lesson plans or design adaptations for learners with different abilities. Online peer review can be particularly valuable when criteria are explicit. However, peer assessment should not become a substitute for expert feedback. Physical education requires specialised knowledge, and inaccurate peer advice can reinforce misconceptions.

Practical assessment presents the greatest challenge. A student may submit a video demonstrating a skill, but a short recording may not reveal consistency, decision making, safety awareness or performance under authentic conditions. Video can also be edited. Institutions should therefore use triangulation: video evidence, reflective explanation, teacher observation, practical demonstration where feasible and oral questioning. Such combinations can strengthen authenticity without rejecting online tools.

Digital technologies can also broaden inclusion. A learner with a disability may benefit from adaptive activities, alternative demonstrations or technology-assisted feedback. However, universal design requires that digital tasks do not assume identical physical space, equipment or physical capacity. Teacher educators should teach candidates how to modify activities and assessment criteria without lowering meaningful learning expectations.

The social dimension of physical education also matters. Sport and physical activity frequently develop cooperation, communication, leadership and ethical behaviour. Online individual exercise tasks can support health-related outcomes but may not reproduce the relational experiences of team games or group activities. Virtual peer challenges, collaborative planning and reflective discussion can preserve some social dimensions, but institutions should remain realistic about what online environments can and cannot provide.

Thus, online PETE should be evaluated against discipline-specific learning outcomes rather than a generic checklist. If the intended outcome is knowledge of exercise physiology, online instruction may be highly suitable. If the outcome is safe and competent performance of a complex practical skill, supervised practice remains essential. This outcome-based approach provides a defensible basis for deciding which components should be online, blended or face-to-face.

10. Online Assessment, Feedback and Academic Integrity

Assessment is one of the most difficult components of online education because it simultaneously measures learning and shapes learning behaviour. If assessment remains dominated by high-stakes, time-limited online examinations, institutions may reproduce the weaknesses of traditional assessment while adding new concerns about identity verification, connectivity failure and academic misconduct.

Recent research on generative AI makes the issue more complex. A 2024 scoping review of AI and higher education assessment concluded that assessment needs to evolve toward approaches that strengthen self-regulated learning, responsible learning and academic integrity [14]. A 2025 systematic review of generative

AI applications in higher education similarly shows that AI is being integrated into instructional contexts at increasing speed, while disciplines differ considerably in adoption and pedagogical use [15].

The appropriate response is not simply surveillance. Remote proctoring can raise privacy, accessibility and equity concerns, particularly when students have limited devices or unstable connectivity. AI-detection tools also have limitations and should not be treated as definitive evidence of misconduct. More robust assessment design reduces dependence on detection by making the learning process visible.

For teacher education, process-based assessment can include lesson plans, teaching demonstrations, reflective journals, portfolios, case analysis and oral explanations. For physical education, assessment can combine practical performance, movement analysis, training-plan design, video evidence and reflective commentary. Oral follow-up is particularly useful when a submitted product has been created with digital or AI assistance because the student must demonstrate understanding of the underlying reasoning.

Formative assessment is equally important. Short quizzes, polls, discussion prompts and feedback cycles can identify misconceptions before final assessment. The goal should be feedback for learning rather than simply grading online work. Rubrics can make expectations visible and help students evaluate their own performance.

Academic integrity should also be reconceptualised in the AI era. Students need explicit instruction on acceptable AI use, citation, verification and disclosure. UNESCO's guidance on generative AI emphasises human-centred use, data protection and the need for policy development [16]. A blanket prohibition may be difficult to enforce and may not prepare students for workplaces in which AI tools are increasingly present. Conversely, unrestricted use can undermine independent learning. A more sustainable approach is assessment-specific guidance: some tasks may require unaided work, while others may permit AI for brainstorming, language support or critique, provided use is disclosed and outputs are verified.

Assessment literacy should therefore become part of both faculty development and student orientation. Institutions need clear rules, but rules should be accompanied by pedagogical redesign. The objective is not merely to catch dishonest behaviour; it is to create assessment systems in which authentic intellectual and practical engagement is difficult to outsource and worthwhile to perform.

11. Generative AI and Emerging Opportunities

Generative AI has introduced a new layer of possibility into online higher education. Large language models can explain concepts at different levels of complexity, generate examples, provide conversational practice, support translation, help teachers draft learning materials and assist with formative feedback. In teacher education, AI can be used to critique lesson plans, generate classroom scenarios, simulate learner questions and support reflective dialogue. In physical education, AI-supported systems can potentially assist with movement analysis, training-plan feedback and personalised learning resources.

Recent reviews indicate that the evidence base is expanding rapidly. A 2025 review of pedagogical applications examined research published during the first two years after ChatGPT and found growing experimentation across disciplines, while noting uneven geographic and disciplinary coverage [17]. Another 2025 review of 139 studies found that generative AI applications are concentrated in some disciplines and less developed in areas including sports sciences and interdisciplinary fields [18]. This underrepresentation is relevant to physical education because it suggests that claims about AI's effectiveness should not simply be transferred from language or engineering education.

Evidence concerning learning outcomes is also promising but mixed. A 2025 systematic review and meta-analysis reported positive effects of generative AI on several university learning outcomes, including language skills, academic achievement, affective-motivational outcomes and higher-order thinking, while finding no significant effect on metacognition [19]. Such findings should not be interpreted as proof that AI automatically improves learning. Outcomes depend on task design, learner characteristics, instructional scaffolding and the way AI is used.

The most important emerging opportunity is therefore not automated teaching but augmented teaching. AI can help educators produce alternative explanations, identify common misconceptions, generate practice questions and personalise examples, while the teacher retains responsibility for accuracy, context, ethics and judgement. This is consistent with UNESCO's AI competency framework, which places human agency and ethical use at the centre [5].

For South Asia, AI may also support multilingual and resource-constrained environments. Translation, summarisation and text-to-speech can improve accessibility; AI-based tutoring may provide additional practice where teacher time is limited. Yet these opportunities depend on language quality, connectivity and institutional governance. AI systems can reproduce cultural bias, generate inaccurate information and mishandle sensitive student data.

Teacher education should therefore include AI literacy as professional literacy. Future teachers need to understand prompting, verification, bias, privacy, intellectual property, assessment implications and appropriate disclosure. They also need to know when not to use AI. A teacher who accepts an AI-generated explanation without checking it is not demonstrating digital competence.

Physical education can develop an especially interesting AI agenda around movement analysis and personalised activity. Computer vision, wearable sensors and multimodal systems may support feedback that is difficult to provide continuously through human observation. But algorithmic assessment of bodies raises questions about accuracy, fairness, and consent and data ownership. In educational settings, students should not become passive data sources for opaque systems.

The emerging principle should therefore be “human-led, AI-supported” online education. Institutions should invest in AI literacy and governance before scaling AI-enabled learning. The most defensible opportunities are those that increase feedback, accessibility, and personalization and teacher capacity without transferring educational authority to automated systems.

12. Quality Assurance, Accessibility and Institutional Governance

Quality assurance for online education should move beyond checking whether a platform is available. It should examine whether students can achieve intended learning outcomes through a coherent, accessible and supported learning experience. This requires quality indicators at the course, programme and institutional levels.

At course level, institutions can examine alignment among outcomes, activities and assessment; clarity of navigation; accessibility; interaction; feedback; workload; academic integrity; and learner support. At programme level, they should consider progression, practical requirements, internship arrangements and graduate competencies. At institutional level, governance should cover infrastructure, cybersecurity, data protection, staff development, student services and quality monitoring.

India provides an important policy example. The University Grants Commission maintains regulations for open and distance learning and online programmes and has continued to amend the regulatory framework,

including a 2024 third amendment [20]. The National Education Policy 2020 also recognises the potential of online and digital education while explicitly identifying challenges related to digital equity, online assessment, practical subjects and teacher preparation [11]. These policy directions illustrate the movement from emergency adoption toward regulated and quality-oriented digital provision.

Quality assurance should also recognise disciplinary variation. A generic online course checklist cannot adequately evaluate PETE. Physical education programmes require criteria for practical learning, movement demonstration, safety, equipment, observation and authentic assessment. Teacher education requires criteria for practicum, mentoring, micro-teaching and professional competence. The quality system should therefore include common institutional standards plus discipline-specific standards.

Accessibility should be embedded in quality assurance. Captions, readable documents, alternative text, accessible navigation and compatibility with assistive technologies should be checked before a course begins. Students should have clear channels for reporting barriers. Accessibility also includes cognitive accessibility: predictable structure, plain instructions and manageable information density.

Data governance is increasingly important. Learning management systems, video platforms, assessment tools and AI systems generate large amounts of student data. Institutions need policies for collection, storage, retention, access and deletion. Students should know what data are being collected and why. AI-enabled systems require additional scrutiny because automated decisions can be difficult to explain.

Governance must also address platform dependency. Universities may become dependent on commercial tools whose pricing, privacy conditions or availability can change. Open standards, interoperable systems and downloadable content can increase institutional resilience.

Finally, quality assurance should use evidence rather than technology enthusiasm. Institutions should examine completion, learning outcomes, student experience, equity and graduate performance. If a new tool increases activity but not learning, it should be redesigned or discontinued. The criterion should always be educational value.

13. A Context-Responsive Framework for Online Higher Education

The evidence reviewed in this article supports a Context-Responsive Online Teaching and Learning Framework for South Asian Higher Education. The framework consists of eight interacting dimensions rather than a linear technology-adoption sequence.

- *First is Infrastructure Readiness.* Institutions need reliable connectivity, appropriate devices, platform stability, technical support and contingency arrangements. Low-bandwidth alternatives should be treated as part of quality design rather than as inferior substitutes.
- *Second is Pedagogical Alignment.* Learning outcomes should determine activities, technologies and assessment. Course designers should deliberately balance synchronous and asynchronous learning, individual and collaborative work, explanation and application.
- *Third is Faculty Digital Competence.* Teachers require competence in online pedagogy, assessment, accessibility, data protection and AI. Professional development should be continuous and embedded in real course redesign.
- *Fourth is Learner Readiness and Support.* Students need orientation to online learning, digital literacy, self-regulation and academic integrity. Counselling and technical support should be accessible.

- *Fifth is Inclusive Access.* Equity must include connectivity, affordability, language, disability and geographical context. Institutions should monitor participation and outcomes across student groups rather than relying on average indicators.
- *Sixth is Authentic Assessment.* Assessment should make learning visible and should use varied evidence, particularly when AI can generate conventional written products. Oral defence, portfolios, projects, practical demonstrations and reflective explanations can strengthen authenticity.
- *Seventh is Discipline-Sensitive Design.* Teacher education and physical education should not be evaluated by the same assumptions as purely theoretical programmes. Teacher education requires practicum and mentoring; physical education requires embodied learning, safe practice and practical assessment. Online technologies should complement these experiences.
- *Eighth is Responsible Innovation and Governance.* AI, analytics, wearable devices and other emerging technologies require ethical review, privacy safeguards, transparency and human oversight. Innovation should be evaluated against learning outcomes and equity rather than novelty.

These dimensions are mutually dependent. Strong infrastructure without pedagogy produces efficient delivery of weak instruction. Excellent pedagogy without access produces exclusion. AI without governance produces risk. Online teacher education without practicum weakens professional formation. Online physical education without embodied practice cannot fully achieve psychomotor outcomes.

The framework therefore proposes a simple institutional question: “What educational problem is this technology solving, for which learners, under which conditions, and with what evidence?” This question shifts decision making from technology-first adoption to evidence-based educational design.

For implementation, institutions can begin with a diagnostic audit, followed by faculty development, course redesign, pilot delivery and evaluation. Pilots should include diverse learners and should measure learning outcomes, engagement, satisfaction, equity and workload. Successful practices can then be scaled, while ineffective practices should be revised rather than institutionalised.

14. Discussion

The central finding of this review is that online teaching and learning in South Asian higher education has moved into a more demanding phase. The emergency question—how to keep teaching going during disruption—has been replaced by the quality question—how to design online learning that is equitable, academically rigorous and appropriate to disciplinary outcomes. This transition requires institutions to learn from pandemic experience without reproducing its emergency assumptions.

Three tensions are particularly visible. The first is access versus quality. Online learning can widen access, but access without reliable infrastructure, support and sound pedagogy may create a nominal rather than meaningful opportunity. The second is flexibility versus structure. Students’ value asynchronous flexibility, but excessive openness can increase uncertainty and disengagement. The third is automation versus human agency. AI and analytics can extend teacher capacity, but educational judgement remains essential.

The South Asian context intensifies these tensions because the region contains wide differences in resources and learner conditions. A single digital strategy is unlikely to work equally well across institutions. This is why contextual design should replace universal technology prescriptions. UNESCO’s regional evidence of uneven digital transformation supports this conclusion [1].

Teacher education occupies a strategic position because it determines the digital practices that future teachers carry into schools. Its online transformation should therefore be evaluated not only by whether teacher candidates pass their courses but by whether they can design inclusive, ethical and pedagogically sound digital learning for their future pupils. This requires explicit integration of digital pedagogy into teacher preparation.

Physical education makes the argument even stronger. It demonstrates that not all learning outcomes are equally transferable to online environments. The discipline requires an integration of knowledge, movement, perception, feedback and social interaction. Online tools can improve several components, but they cannot eliminate the need for embodied practice. Recent PETE research and digital-PE reviews support a complementary rather than replacement model [3], [4], [12], [13].

The role of AI should similarly be framed as augmentation. Current research suggests substantial promise but also uneven evidence, disciplinary variation and unresolved questions about metacognition, assessment and responsible use [15], [17]–[19]. Teacher education should therefore prepare educators to evaluate AI rather than simply use it.

Overall, online education should be understood as an educational ecology. Infrastructure, people, pedagogy, assessment, policy and technology interact. Interventions focused on one component alone are unlikely to produce durable improvement. South Asian higher education can gain substantially from online learning, but only when digital transformation is treated as a process of educational redesign rather than technological substitution.

15. Future Research Directions

Future research should move beyond broad surveys of attitudes toward online learning and investigate how particular designs affect particular outcomes.

First, longitudinal studies are needed to determine whether the digital practices adopted during the pandemic have produced sustained changes in teaching quality, student learning and faculty workload.

Second, comparative South Asian research should examine differences among urban and rural institutions, public and private universities, high- and low-resource settings, and different language environments. Such studies can reveal whether apparently successful models depend on conditions that are not widely available.

Third, teacher education research should investigate the relationship between online teacher preparation and later classroom practice. Studies could examine whether teacher candidates who receive systematic digital-pedagogy preparation are more confident and effective in designing technology-supported school learning.

Fourth, online PETE requires a dedicated research agenda. Studies should examine video-based feedback, virtual simulations, wearable technologies, remote coaching, practical assessment and blended practicum models. Research should distinguish between theoretical learning outcomes, motor learning, pedagogical competence and professional identity.

Fifth, AI research should investigate not only adoption but learning mechanisms. Questions of metacognition, critical thinking, over-reliance, feedback quality, bias and long-term retention are more important than counts of how frequently students use ChatGPT or other tools. The recent meta-analytic evidence showing variation across outcomes illustrates the need for nuanced investigation [19].

Sixth, equity research should examine meaningful participation rather than simple internet access. Researchers should measure device type, data affordability, connectivity stability, accessibility, language, learning space and digital competence. These variables may explain why two students with nominal internet access experience very different educational outcomes.

Seventh, assessment research should test alternatives to conventional online examinations, including portfolios, oral assessment, projects and practical evidence. Finally, institutional research should examine cost and sustainability so that digital investment is linked to educational value rather than technological complexity.

16. Conclusion

Online teaching and learning has become a permanent component of the higher education landscape, but permanence should not be confused with maturity. South Asian universities have made significant progress in adopting digital platforms and expanding online provision, yet the region continues to face uneven infrastructure, digital inequality, faculty-development needs, assessment challenges and policy gaps. The next stage of development must therefore focus on quality, equity and pedagogical coherence.

The review shows that online education is most effective when it is designed around learning outcomes and supported by appropriate infrastructure, faculty competence, learner preparation, meaningful interaction and authentic assessment. Teacher education requires particular attention because future teachers need to experience and critically analyse digital pedagogy as part of their professional formation. Physical education requires an even more specialised approach because embodied, psychomotor and social learning cannot be fully replicated by conventional online delivery.

For South Asian higher education, the most defensible model is therefore context-responsive and often blended. Online environments should extend access, flexibility, reflection, collaboration and feedback, while face-to-face and supervised experiences should be retained where they are educationally necessary. Institutions should evaluate technology by the learning problem it solves, the students it serves and the evidence that it improves outcomes.

The proposed Context-Responsive Online Teaching and Learning Framework emphasises infrastructure readiness, pedagogical alignment, faculty competence, learner support, inclusive access, authentic assessment, discipline-sensitive design and responsible innovation. Its central principle is simple: technology should remain subordinate to educational purpose. If South Asian higher education can maintain that principle while investing in digital capacity and regional collaboration, online learning can become more than a legacy of the pandemic. It can become a means of creating a more flexible, inclusive, connected and professionally relevant higher education system.

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AI Usage Disclosure

Generative AI was used as an AI-assisted drafting and language-support tool during preparation of this manuscript. The author is responsible for the Final Manuscript, its interpretation, source selection, verification, and submission decisions. No AI system is listed as an Author.

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