The PCC Model in Online Teaching: A Framework for Effective Practice

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Abstract: Numerous online teaching models exist, each offering distinct pedagogical strengths and implementation challenges. The PCC (Preparation, Collaboration and Consolidation) model, rooted in the flipped learning approach, is a widely adopted online teaching model in higher education that promotes active learning, collaborative knowledge construction, reflective practice, self-regulated learning and peer engagement. Despite its strengths, the PCC model faces several challenges such as limited digital-pedagogical expertise among lecturers, time constraints for course design, and insufficient institutional support. Furthermore, the lack of a clearly defined implementation framework and ambiguous around stakeholder roles hinder its effectiveness and scalability. This study undertakes a comprehensive review of the PCC model alongside other established online teaching models, including flipped learning, blended learning, and MOOC-based learning, highlighting their pedagogical foundations, common challenges and evaluation gaps. Drawing on this analysis, it proposes a structured, practice-oriented actionable implementation framework designed to address current limitations. The framework introduces a four-stage lifecycle - Planning, Development, Delivery and Feedback & Refinement, supported by clearly articulated stakeholder roles, mechanism for student engagement, and specific metrics aligned with each stage of the PCC model. Comparative analysis across these models demonstrates that the proposed implementation framework advances beyond the existing approaches by offering a systematic pathway for adoption that strengthens stakeholder collaboration and student engagement, improves scalability, and enhances learning outcomes. In addition, the framework incorporates emerging innovations and techniques, including adaptive platforms, AI-driven feedback systems and collaborative technologies. These advancements are shown to increase learner interaction, foster continuous improvement and support sustainable adoption in resource-constrained contexts. By aligning pedagogical design with institutional structures and technological opportunities, this study highlights how the PCC model can contribute significantly to online teaching through systematic and structured implementation. The study contributes both theoretically and practically: it clarifies how the PCC model fits within contemporary online teaching theories and provides step-by-step guidance for educators, instructional designers and institutional leaders to implement it effectively and achieve measurable benefits.

Keywords: PCC Model, PCC Implementation Framework, Online Teaching Models, PCC Implementation Lifecycle, Flipped Learning, Active Learning

1. Introduction

Since COVID 19, the demand for online teaching has increased significantly. Nowadays, most of the training providers, particularly Higher Education (HE) institutions and a growing number of learners prefer online mode of study. Recent statistics clearly indicate that the popularity of online learning is increasing due to flexibility, adaptability, convergence and broad accessibility. Peck (2025) showed that 63% of the learners choose online learning, while NCES (2025) and Austin (2025) reported that 73% of the learners prefer online learning over in-person classes.

Online teaching benefits both learners and institutions. Learners save travel time and money, and can manage home responsibilities, and access rich digital resources at their own pace, supporting diverse learning preferences and self-directed learning (Joosten et al., 2019). For institutions, it reduces pressure on physical resources and streamline administrative processes such as automated attendance capturing and course management. However, online teaching differs from face-to-face delivery and requires specific pedagogical approaches, and teaching models, methods, techniques and tools. Lecturers who are unfamiliar with online specific strategies or unprepared for course design may compromise learning quality. Multi-country surveys show that nearly half of the university lecturers face challenges due to insufficient digital-pedagogical skills, time constraints, and minimal institutional support (Jisc, 2023), leading to poorly structured lessons, inaccessible materials, or inadequate assessment and feedback.

Choosing an appropriate teaching model for online teaching can be both a strategic and institutional decision. Successful implementation requires coordinated institutional support, along with adequate resources and facilities, to help lecturers integrate the model effectively into online lessons and achieve learning goals. The Preparation, Collaboration and Consolidation (PCC) model is one of the most popular online teaching models, building on the structure of the widely adopted flipped learning or flipped classroom approach. The model begins with learners' individual preparation, moves to collaborative work and ends with reflection. The

structured approach to online HE courses, encompassing phases of PCC model, addresses some of the limitations of the earlier models by promoting active engagement and deeper learning (Evanick, 2024).

The PCC model in online HE promotes active, collaborative learning, reflective practice, and peer engagement. It supports learners' structured progression, aligning with cognitive development and social constructivist principles, and enhances motivation and understanding (Kerimbayev et al., 2023). Benefits diminish if learners skip preparatory activities or collaborative tools are not strategically integrated.

This paper reviews established and emerging online teaching models, specially flipped learning, the PCC model, blended learning and MOOC(Massive Open Online Courses)-based learning models, to explore their role in enhancing course delivery and quality, as well as raising awareness among lecturers, learners and institutions of the requirements for effective online courses. Following the introduction, the paper is organized into five sections. Section 2 reviews literature on online teaching models and strategies, with particular attention to the flipped learning and the existing PCC model, as well as their implementation and evaluation challenges. Section 3 proposes a PCC implementation framework these challenges. Section 4 discusses emerging innovation and techniques to enhance the PCC model, Section 5 presents a comparative analysis and potential benefits, and Section 6 discusses how the proposed framework addresses gaps identified in the literature, evaluates its performance, and concludes the paper.

2. Literature Review

There is no single, universally accepted blueprint or framework for effective online teaching, though traditional face-to-face or classroom teaching is well established and supported by well-established pedagogical frameworks. As a result, online teaching may suffer from poor design and fragmented implementation. According to Rasheed et al. (2020) due to poor instructional design, inadequate technical infrastructure, or lecturers limited digital competence, learners are more likely to experience low engagement and academic achievement, and high dissatisfaction.

In the context of online teaching, teaching models, strategies, and techniques play crucial roles in shaping effective learning experiences. Teaching models—such as flipped learning, blended learning, hybrid delivery, and problem-based learning (PBL)—provide structured frameworks that guide the overall design and organisation of online courses (Bonk and Graham, 2020). Teaching strategies refer to the specific methods used within these models to facilitate learning, including gamification, asynchronous discussions, interactive multimedia, and personalised feedback (Martin & Bolliger, 2023; Huang et al., 2021). Teaching techniques are the actions or tools employed to implement teaching strategies in practice – such as using breakout rooms for groupwork and integrating quizzes for formative assessment (Killen, 2016). Each teaching model, strategy and technique brings its own set of pedagogical strengths and implementation challenges. This literature review examines the effectiveness, benefits and challenges of widely established online teaching model, PCC, and the strategies and techniques aligned with the model.

The flipped learning or flipped classroom approach is widely recognised as one of the most useful and empirically supported online teaching models. It comprises two mandatory components – Pre-Class (Asynchronous) and Live Class (Synchronous) focusing on active learning, and an optional Post-Class or extension component. A comprehensive meta-analysis of 198 tertiary-level studies reported that the model has a moderate positive effect on learner performance (Zou et al., 2020). Furthermore, a 2023 Bayesian meta-analysis of 26 HE studies reported an even larger overall positive effect on learning outcomes using pre-class video systematically with interactive in-class activities (Chen et al., 2023). However, the effectiveness of the model merely depends on meticulous content design, selection of pre-class learning materials (such as videos or readings), and the development of high quality active-learning components (Gutiérrez-González et al., 2024; Rasheed et al., 2020).

Despite its strengths, the flipped classroom model lacks a structured mechanism for post-class consolidation, which is treated as optional. This can limit opportunities for deeper reflection, revision and long-term knowledge retention, particularly in online teaching where learners may often need additional support or scaffolding approach. The PCC model is an extension of the flipped classroom model, with the addition of structured consolidation component, which addresses the weaknesses of the flipped learning model (Zainuddin and Halili, 2016). Predominantly applied within HE contexts, the PCC model aims to design fully online courses using research-based learning principles.

The PCC model is increasingly recognised for its alignment with three key educational psychology principles - Constructivism, Vygotsky’s Zone of Proximal Development (ZPD), and Bloom’s Taxonomy, and this alignment

attracts educators for effective online learning environments. The PCC model supports learners in building their knowledge and confidence through a structured process of progressive and active engagement from preparation to consolidation via collaboration components (Bruner, 1996). In the preparation stage, learners engage with the instructional content independently, building initial mental models, which are then expanded and refined in the collaboration stage through social negotiation or discussion – a core process of constructive learning (Kerimbayev, Umirzakova & Shadiev et al., 2023). The model also supports Vygotsky's Zone of Proximal Development (ZPD), particularly during collaborative activities where learners go beyond their individual capacity through scaffolding learning opportunities such as guided discussion with the help of knowledgeable peers or lecturers to narrow the ZPD gap (Mwale & Mumba, 2024; Raslan, 2024). The sequential design of the PCC model aligns with Bloom's revised Taxonomy by scaffolding learning across cognitive levels: the preparation stage facilitates lower-order cognitive skills of remembering and understanding; the collaborative stage encourages learners to apply and analyse knowledge in interactive contexts; and the consolidation stage supports higher ordering thinking through evaluation, synthesis and reflective practices (Heller, 2022).

Though three-stages of a structured approach such as PCC model are suitable for online courses, they require high instructional planning and tight coordination across all three stages, which can be resource-intensive and time-consuming for lecturers (Baig & Yadegaridehkordi, 2023). The model relies heavily on pre-class or preparation stage, which may pose consistent risks and limit its effectiveness if not adequately supported. For example, if learners fail to engage with preparation or pre-class materials before live sessions, the effectiveness of other two stages – collaboration and consolidation can be severely diminished (Peng et al., 2025). For large online cohorts, maintaining the consolidation or post-class stage through reflection or revision activities may be challenging (Suraworachet, Zhou & Cukurova, 2022). Consequently, although the PCC model demonstrates strong theoretical and practical potential, its success merely depends on learner commitment (e.g., completing pre-class activities before starting live sessions), management support and lecturer effectiveness (e.g., using productive and interactive teaching materials to engage learners and completing consolidation stage well at the end), otherwise it would be hard to apply effectively in all online courses.

One of the challenges in effectively implementing the PCC model in HE is the lack of well-defined metrics or indicators to evaluate success at each stage, which hinders the measurement and evaluation gaps (Hainz et al., 2021). The study by Geary et al. (2023) examined how institutions attempt to introduce new programs using the PCC model and how effectively those programs were implemented. The study found that institutions do not track how well lecturers and learners collaborate, which aspects or stages are effective or need improvement, and what factors may put that success at risk. Without such measures or well-defined metrics, the PCC model may sometimes be ineffective in an online teaching environment.

Implementing the three interrelated stages of the PCC model can sometimes be challenging for institutions and may pose risks. The preparation stage requires all stakeholders, including learners and management should have sufficient prior knowledge over the model. Studies reported that when learners complete their preparatory work, subsequent teamwork becomes both deeper and durable (Song et al., 2025). The model needs institutional investment in orientation resources and digital scaffolding; without strategic support and adequate funding, the process may be significantly disruptive (Bryant et al., 2023). During the collaboration stage, lecturers face the heaviest workload as they need more time for planning and content development, which accelerates tensions between teaching, research and service obligations (Demir, Czerniak & Hart, 2013). Zach and Avugos (2024) identified time pressure and uneven resource allocation as primary technical barriers to sustained collaborative practice, while Hora (2016) showed that such constraints lead lecturers to take shortcuts instead of undertaking time-consuming full redesigns. The consolidation stage is easily and often underestimated and overlooked, even though it is very crucial to achieving high potential and mastery of the subject (University of Melbourne, 2024). Across all three stages, successful implementation of the PCC model depends on a robust collaborative infrastructure. Early planning and activity-tracking mechanisms are essential to keep multiple stakeholders aligned and engaged (Svensson et al., 2021).

The rapid expansion of online and blended learning has intensified the demand for pedagogical approaches that effectively blend teaching, social and cognitive presences to enhance engagement and achievement. Established models such as flipped learning and existing PCC, offer benefits for engagement and achievement but have numerous limitations. Existing studies (e.g., Geary et al., 2023; Hainz et al., 2021; Rasheed et al., 2020) emphasize conceptual strength of these models but lack operational guidelines and fail to provide actionable, stage-specific evaluation metrics. In addition, these models highlight practical barriers—such as technological, pedagogical, and organizational constraints that hinder scalable implementation, such as limited digital resources, inadequate institutional support (Dziuban et al., 2018).

Recent studies also emphasize that most online teaching models, including flipped learning, the existing PCC, blended learning and MOOC-based approaches, face persistent challenges such as low student motivation and engagement, limited interaction, lack of immediate feedback, and unequal digital access. For example, Celik et al. (2023) highlight how the COVID-19 pandemic exposed these weaknesses in HE and argue that without management support, even established models struggle to achieve consistent outcomes. Similar concerns are reported by Mizza et al. (2025) regarding blended learning approaches, noting that inconsistent institutional support and limited digital competence among lecturers reduces effectiveness. Other popular online models, such as MOOC-based online learning, also suffer from high dropout rates and low learner commitment due to minimum interaction and inadequate scaffolding (Celik et al., 2023; Sosa-Díaz et al., 2025). These challenges clearly indicate that sustainable online teaching requires more than sound pedagogical design; it also demands clearly defined stakeholder roles, strong institutional support, and the integration of adaptive innovations.

In my recent observation within a HE context where the PCC model is implemented, I found that nearly half of the learners demonstrated limited awareness and understanding of the model itself or had not engaged in preparatory activities. They often reported their limited awareness of the PCC model due to their busyness for other commitments, lack of role models, and insufficient dialogue about the model within academic setting (Almansour & Almoayad, 2024). A recent study by Chase (2023) surveyed learners to assess their preparedness, behaviours, attitudes and expectation regarding teacher-learner collaboration and revealed that many learners lacked awareness of collaborative frameworks and focused to actively introduce and articulate such models to the learners by the lecturers. Collectively, these gaps indicate that for effective online teaching, institutions need an actionable framework that integrates stakeholder roles, implementation stages, evaluation metrics, and institutional readiness.

3. An Implementation Framework for the PCC Model

To overcome challenges and issues and address the need for a metric to evaluate the success of each stage of the PCC model, as identified in the literature review (e.g., Geary et al., 2023; Hainz et al., 2021; Rasheed et al., 2020), this paper proposes an actionable implementation framework as a strategic solution. The framework focuses on coordinated stakeholder engagement, structured implementation cycles, and stage-specific metrics to support continuous improvement and scalability, aligning and integrating teaching, social, and cognitive presences (Edumadze & Govender, 2024). The proposed framework comprises three key components, as shown in Figure 1: **Stakeholder involvement**, **Implementation lifecycle**, and **Monitoring & Evaluation**. Among these, the Implementation lifecycle is central, guiding the process through four iterative cycles—**Planning, Development, Delivery, and Review & Refinement**—that ensure continuous improvement and effective execution of the existing PCC model.

The PCC implementation framework was developed through a combination of recent literature review, reflection observation of PCC model applied in several online degree and masters courses at Regent College London, and consultations with colleagues and students. Observations of student behaviours, performance and institutional challenges helped determine the implementation guidelines for each stage of the framework, clarify the roles of management, lecturers and students and establish metrics to measure student success. During the development of the framework, an iterative development process was applied to ensure that it aligns with practical online teaching, addresses common gaps identified in several models discussed in the literature, and adapts to diverse online learning contexts.

- **Stakeholder involvement** – Learners, lecturers and management, including support and administrative staff should be working together to implement the existing PCC model.
    - **Senior management** - should formally recognize the PCC model as the default pedagogical design for online courses. They should allocate adequate resources for staff workload relief, ensure access to instructional design expertise, provide necessary digital tools, and support staff training and development structures.
    - **Learners** - must be oriented to the model through early engagement or inductions, onboarding materials and sessions, and clear expectation-setting. Low-stakes familiarization tasks can help learners build confidence, reduce anxiety and better understand the learning model. For example, learners are expected to complete preparatory activities (such as watching videos or completing quizzes) before starting live sessions, actively participate in collaborative activities and engage with consolidation activities to reinforce their understanding of the subject to be taught.

- **Lecturers** - need adequate time and access to appropriate tools to prepare content aligning with each stage of the PCC model. They are responsible for facilitating collaborative tasks and integrating meaningful consolidation activities to reinforce learning. Lecturers should be well prepared to implement the model by following proposed implementation lifecycle and playing crucial role in monitoring and evaluating learners' performance throughout the implementation process.
- **Other staff** – roles of other staffs such as support and administrative are essential in ensuring the technical, scheduling, supporting and communication infrastructure needed to successfully implement and sustain the PCC implementation lifecycle.

- **Implementation lifecycle** – The PCC implementation framework follows a four-step iterative cycle, applicable at the lesson, module and program level. The implementation lifecycle can be applied by the lecturers several times if needed across teaching weeks or adjusted based on feedback.
  1. **Planning** – Lecturers should identify module objectives and align them with the original three stages of the PCC model - Preparation, Collaboration and Consolidation.
  2. **Development** – Lecturers should design specific activities and select appropriate tools (e.g., Edpuzzle, discussion forums, Flipgrid and Breakout rooms) to develop lesson content in alignment with the original PCC model.
  3. **Delivery** – Lecturers should deliver live sessions that enable learners to engage in collaborative activities, both synchronously (during live sessions) and asynchronously (outside of live sessions). Emerging innovations and techniques – such as those discussed in Section 4 – can be applied during this cycle to enhance the delivery experience.
  4. **Feedback & Refinement** - Lecturers should analyze feedback and learn analytics to evaluate the effectiveness of the implementation lifecycle, then revise and enhance course content, activities and delivery methods to improve implementation of the PCC model.

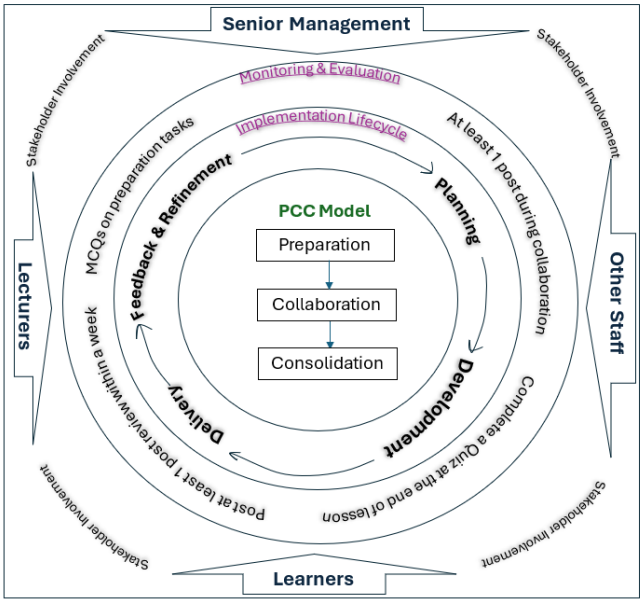

Figure 1: Implementation of PCC model – an actionable framework

5. Monitoring and evaluation – Each stage of the PCC model should include monitoring and evaluation mechanisms. Some examples are provided below. Allocating marks for informal assessment can motivate learners to actively participate, thereby supporting the effective implementation of the PCC model:

- Preparation stage: This should include a 15-minute video clip or reading, followed by 5 minutes of MCQ questions. Each learner must complete this task within 24 hours prior to the live session.
- Collaboration stage: Each learner needs to post at least once during the group task in each session.
- Consolidation stage: On the same day each learner will complete a quiz and within one week, each learner needs to submit a reflection post.

4. Emerging Innovations and Techniques That Enhance the PCC Model

Successful implementation of the PCC model requires lecturers to continuously adapt to technological advances, pedagogical teaching strategies, methods, techniques and tools, and learner needs. While platforms like Canvas, Moodle, or Blackboard provide basic infrastructure to manage preparatory content, coordinate collaboration activities, and support consolidation activities through integrated tools and plugins, recent innovations in digital learning environments, AI-driven tools and collaborative technologies offer new opportunities for senior management. These innovations enable the application of the PCC model across all online courses, enhancing implementation and contributing to better organizational outcomes. These innovations, along with other pedagogical techniques also support the proposed implementation framework of the PCC model, particularly the implementation lifecycle: Planning, Development, Delivery and Feedback & Refinement.

4.1 Adaptive Learning Platforms to Support Preparation

Adaptive learning platforms such as Smart Sparrow, Knewton, McGraw-Hill ALEKS, DreamBox Learning and Carnegie Learning help lecturers personalise learning, assess performance, and boost engagement using AI to analyse behaviour, adjust content in real-time, and provide scaffolding before collaborative tasks (Yaseen et al., 2025). These platforms support both preparation and consolidate stages of the PCC model by reducing lecturers' content design time. In preparation, learners engage in self-paced activities, such as short videos and MCQs, while adaptive features personalise learning and guide progress throughout the course.

4.2 Collaborative Technologies and Peer-teaching Enhancements

In the collaboration stage, real-time tools that allow multiple learners to work simultaneously on a shared task or document, such as Microsoft Teams, Google Workspace, Slack, Padlet/Jamboard and Miro/MURAL, are highly beneficial for facilitating structured group interactions, synchronous discussions, and co-creation of content. According to Panadero & Järvelä (2015), using structured peer learning designs such as jigsaw, gallery walk, reciprocal teaching, team-based learning, role play or snowball/think-pair-share strategies with these collaborative tools can significantly enhance learner motivation and knowledge construction. The use of virtual reality (VR) and augmented reality (AR) help learners work together in more interactive, practical ways, especially in STEM (Science, Technology, Engineering, and Mathematics) and professional education settings (Radianti et al., 2020).

4.3 AI and Learning Analytics for Consolidation

In the consolidation stage, AI-driven feedback tools such as Grammarly, Turnitin Revision assistant, Carnegie learning MATHia, Socratic by Google, Jill Watson (Georgia Tech), Otter.ai and Khan Academy with GPT integration are increasingly used to provide instant, formative feedback to thousands of learner inputs simultaneously. Learning analytics dashboards offers even more such as learners' participation patterns, performance trends and cognitive engagement. These performance related data are critical for the Feedback & Refinement stage of the proposed implementation framework for successful online course design and delivery (Ifenthaler & Yau, 2020).

4.4 Microlearning and Modular Design for Flexible Delivery

Emerging practices like microlearning, delivering content in short, focused bursts and bite-sized units, and modular design support flexible and learner-centered delivery. Modular approaches help learners manage their cognitive load, allow lecturers to adapt content based on feedback, and assessment data (Littlejohn and Hood, 2018) and enable the implementation of structured and reusable content throughout the lifecycle.

4.5 AI Assisted Teaching and Content Creation

AI-assisted teaching tools such as ChatGPT, Cognii, Gradescope (by Turnitin), Duplingo (Squirrel AI) and Quizlet AI help lecturers for creating fast prototyping of quizzes, videos, and case-based materials, and grading written and numerical answers quickly. However, they also require strategic integration to support pedagogical values, uphold academic integrity and align with the PCC model (Luckin et al., 2022).

4.6 Stakeholder Dashboards and Institutional Readiness

Institutions should increasingly invest in stakeholder-specific dashboards that offer relevant and tailored insights to all stakeholders, including senior management and lecturers, enabling real-time monitoring of key metrics

across the proposed implementation framework of the PCC model. These dashboards support data-driven decision-making, enhance transparency and facilitate effective resource allocation (Al-Fraihat et al., 2020).

5. Comparative Analysis and Anticipated Benefits

5.1 Comparative Analysis with Existing Models

The proposed PCC implementation framework addresses critical gaps across several contemporary online teaching models, including flipped learning, blended learning, MOOC-based learning and the existing PCC models by embedding structured processes such as stakeholder involvement, integration of emerging innovations and technologies, institutional readiness measurements and continuous monitoring. Table 1 presents comparative analysis across these models, showing that while each offers certain strength, they also suffer from limitations such as insufficient stakeholder engagement, lack of structured implementation cycles and inadequate integration of emerging technologies. The proposed PCC implementation framework mitigates these gaps through a comprehensive, interactive and scalable approach designed to enhance learner engagement, institutional readiness and sustainable delivery in HE contexts. Table 1 compares all these four models across six dimensions or characteristics that are crucial for the effectiveness of online teaching.

Dimensions	Existing PCC	Flipped Learning	Blended Learning	MOOC-based Learning	Proposed Framework
Stakeholder Involvement	Limited to lecturer and learner	Moderate (lecturer-driven)	Limited (institution + learner)	Minimal (platform-driven)	Comprehension: learners, lecturers, management, support staff
Structured Implementation Cycle	Absent	Partially present	Partial (course-level cycles)	Absent	Four-stage lifecycle (Planning, Development, Delivery, Feedback & Refinement)
Monitoring & Evaluation Metrics	Minimal	Limited	Moderate	Minimal	Stage-specific with feedback loops and analytics integration
Integration of Emerging Technologies	Low	Moderate	Moderate	Low	High (AI, adaptive platforms, VR/AR, dashboards)
Scalability and Adaptability	Challenging	Moderate	High	Very high	Designed for scalability across courses and contexts
Institutional Readiness Emphasis	Low	Medium	Low–Medium	Low	Strong focus on governance, resources, and training

Table 1: Comparing analysis of existing models and proposed Implementation PCC Framework

5.2 Anticipated Benefits

Considering the gaps highlighted in Section 3 - Literature review, the complexities/issues associated with four contemporary online teaching models, and insights from consultations with colleagues and students, the proposed framework is expected to offer the following benefits:

- **Improved learner engagement** – Combining three stages – Preparation, Collaboration and Consolidation with adaptive and collaborative technologies, learners are more likely to engage actively throughout the learning cycle.
- **Consistent quality across courses** – The incorporation of the structured four-stage lifecycle (Planning, Development, Delivery, Feedback & Refinement) promotes consistency and standardization, thereby reducing variability or differences in implementation across courses and lecturers.
- **Actionable monitoring and evaluation** – Stage specific metrics and dashboard integration support data driven decision-making, allowing lecturers to monitor learner performance and evaluate content effectiveness in real-time
- **Institutional readiness and scalability** – The framework focuses governance structures, training, and resource allocation, ensuring readiness for large-scale adoption across courses and lecturers.

- **Alignment with emerging innovations** – The framework accommodates emerging AI-driven tools, adaptive and collaborative technologies, and microlearning strategies, ensuring adaptability to future educational trends and technological advancements.

Based on reflection observations and the iterative development of the framework, most colleagues and students agreed that if all stakeholders clearly understand and fulfil their responsibilities, and if management including lecturers implement the framework systematically, including measuring their performance at each stage, students' learning outcomes are likely to improve significantly.

6. Discussion and Conclusions

This paper critically examines several established online teaching models, including the PCC model as a comprehensive online teaching model in HE, and highlights its pedagogical strengths such as promoting active learning, collaborative knowledge construction, reflective practice, self-regulated learning and peer engagement. However, despite the strong pedagogical strengths of these established online models, they continue to face significant implementation challenges such as the absence of well-defined evaluation metrics and ambiguity around stakeholder roles. Due to these challenges, many of these models are often ineffective and fail to deliver meaningful learning experiences for learners.

To address the issues identified, the paper proposes a structured implementation framework that incorporates stakeholder-specific responsibilities, implementation lifecycle of planning, development, delivery and feedback & refinement, along with actionable evaluation metrics. The implementation framework provides clear guidance on how to effectively implement the PCC model in HE contexts. The paper predominantly discusses the integration of emerging innovations and techniques for enhancing the scalability, effectiveness, and learner engagement of the PCC model. Through comparative analysis, the proposed implementation framework demonstrates its ability to address critical gaps observed across flipped learning, blended learning, MOOC-based learning, and the existing PCC models. These gaps include low learner engagement, limited interaction, insufficient stakeholder involvement, lack of institutional and structured evaluation mechanisms, inconsistent institutional support and inadequate scaffolding, which often lead to student disengagement and high dropout rates. By embedding systematic processes, data-driven monitoring, and technological innovation, the implementation framework offers a comprehensive and sustainable solution. Anticipated benefits include improved learner engagement, consistent quality across online courses, actionable evaluation mechanisms and sustainable implementation in diverse educational contexts.

By aligning pedagogical strategies (such as flipped learning and peer collaboration) with technological advancements (such as AI-driven feedback systems and adaptive learning platforms), and institutional readiness (including adequate resources, policies, staff training and support structures), this study bridges theory and practice. It offers a roadmap for the effective and practical implementation of the PCC model. HE institutions can implement the framework in their online courses more effectively and efficiently to enhance learning experiences.

While the proposed PCC implementation framework addresses many challenges of online teaching models, including flipped learning, blended learning, MOOC-based learning and the existing PCC, this study has some limitations. This is primarily a conceptual model, based on literature reviews, observations and reflections, and informal consultations, without formal empirical testing or large-scale implementation. Future research should explore empirical validation of the framework across diverse disciplines, institutional contexts and student populations to ensure its long-term sustainability, scalability and adoption of the PCC model in varied HE settings.

Ethics Declaration

Ethical approval was not required for this research, as it involved analysis, literature review, and framework development without the participation of human or animal subjects.

AI Declaration

AI-assisted tools were used solely to enhance language clarity, streamline content to meet the extended 6,000-word limit and ensure adherence to ICER 2025 formatting and reference guidelines. All research content, analysis, and conclusions were independently developed and verified by the authors.

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