

ORIGINAL

Digital Innovation in Higher Education: Assessing the P-OUS Open Distance Learning Model through the Integration of Science and Technology

Innovación Digital en la Educación Superior: Evaluación del Modelo de Educación a Distancia Abierta P-OUS a través de la Integración de Ciencia y Tecnología

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ABSTRACT

Introduction: the rapid growth of digital innovation has reshaped higher education, making open and distance e-learning essential for accessibility and flexibility. This study focuses on the P-OUS (Peruse, Offer, Uphold, and Sow) Open Distance Learning Model implemented at Pangasinan State University - Open University Systems, highlighting its integration of science and technology to support graduate education in diverse fields.

Objective: the purpose of this study is to assess the effectiveness of the P-OUS model by examining its relevance, resource adequacy, implementation quality, and program outcomes.

Method: guided by Stufflebeam's CIPP evaluation framework, the study utilized a structured questionnaire distributed via Google Forms to students from the Doctor of Education, Master of Arts in Education, Master of Science in Fisheries, and Master in Development Management programs. Data analysis combined descriptive statistics for demographics, technology access, and satisfaction levels with thematic analysis of qualitative feedback on perceived barriers and experiences.

Results: findings indicate that the P-OUS model effectively promotes inclusive and flexible learning. Quantitative results show that 83 % of students reported high satisfaction with course design and interaction, while 78 % expressed positive engagement in collaborative learning. The overall mean satisfaction score of 4,32/5 reflects strong approval of learning flexibility and accessibility. However, challenges remain, including technical limitations (42 %), pedagogical inconsistencies (31 %), and personal time-management constraints (27 %).

Conclusions: the study concludes that the P-OUS model enhances learner inclusion, adaptability, and engagement in graduate online education. Sustainable implementation requires optimizing workload and assessment pacing, strengthening communication and faculty presence, expanding mobile-first and offline access.

Keywords: E-Learning; Open and Distance E-Learning; Higher Education; CIPP Evaluation; Student Engagement.

RESUMEN

Introducción: el rápido crecimiento de la innovación digital ha transformado la educación superior, convirtiendo el aprendizaje abierto y a distancia en un enfoque esencial para garantizar la accesibilidad y la flexibilidad. Este estudio se centra en el modelo P-OUS (Peruse, Offer, Uphold y Sow) de educación abierta y a distancia, implementado en la Pangasinan State University - Open University Systems, destacando su papel en la integración de la ciencia y la tecnología para apoyar la educación de posgrado en diversos campos.

Objetivo: el propósito de este estudio es evaluar la eficacia del modelo P-OUS mediante el análisis de su pertinencia, suficiencia de recursos, calidad de implementación y resultados del programa.

Método: guiado por el marco de evaluación CIPP de Stufflebeam, el estudio utilizó un cuestionario estructurado distribuido a través de Google Forms a estudiantes de los programas de Doctorado en Educación, Maestría en Artes en Educación, Maestría en Ciencias de la Pesca y Maestría en Gestión del Desarrollo. El análisis de datos combinó estadísticas descriptivas para los perfiles demográficos, el acceso tecnológico y los niveles de satisfacción, con un análisis temático de los comentarios cualitativos sobre las barreras percibidas y las experiencias.

Resultados: los hallazgos indican que el modelo P-OUS promueve eficazmente un aprendizaje inclusivo y flexible. Los resultados cuantitativos muestran que el 83 % de los estudiantes expresó alta satisfacción con el diseño e interacción de los cursos, mientras que el 78 % manifestó una participación positiva en las actividades colaborativas. La puntuación media general de 4,32/5 refleja una fuerte aprobación de la flexibilidad y accesibilidad del aprendizaje. Sin embargo, persisten desafíos, incluidos limitaciones técnicas (42 %), inconsistencias pedagógicas (31 %) y restricciones personales de gestión del tiempo (27 %).

Conclusiones: el estudio concluye que el modelo P-OUS mejora la inclusión, la adaptabilidad y el compromiso del estudiante en la educación en línea de posgrado. Su implementación sostenible requiere optimizar la carga de trabajo y el ritmo de evaluación, fortalecer la comunicación y la presencia docente, ampliar el acceso móvil y sin conexión, y mejorar los sistemas de apoyo técnico y estudiantil.

Palabras clave: Educación en Línea; Educación Abierta y a Distancia; Educación Superior; Evaluación CIPP; Compromiso Estudiantil.

INTRODUCTION

Open and distance e-learning (ODeL) has become a pivotal modality in higher education, driven by the rapid expansion of digital innovation and the need for flexible access among diverse learners.⁽¹⁾ The COVID-19 pandemic further accelerated this transformation, compelling universities worldwide to adopt online and blended delivery models as essential strategies for continuity and inclusivity. In the context of Southeast Asia, and particularly in the Philippines, ODeL is positioned not only as an alternative but as a sustainable framework to democratize access to graduate education while ensuring academic quality.⁽²⁾

The Pangasinan State University, Open University Systems (PSU-OUS) responded to this challenge by developing the P-OUS Open Distance e-Learning Model. Anchored in digital innovation, the model integrates science and technology to enhance accessibility, adaptability, and learner-centeredness in graduate programs. Its framework operationalizes four interrelated components—Peruse, Offer, Uphold, and Sow—designed to cultivate reflective learning, collaborative engagement, academic integrity, and knowledge transfer. Such principles resonate with Moore’s transactional distance theory, the Community of Inquiry (CoI) framework, and Laurillard’s design perspective, positioning ODeL as both pedagogical practice and technological ecosystem.⁽³⁾

Globally, research indicates that effective online education depends on structured interaction, timely feedback, and robust digital infrastructures.⁽⁴⁾ However, challenges remain. Learners often face unequal access to connectivity, varying degrees of digital literacy, and the ergonomic limitations of prolonged online engagement. Furthermore, faculty presence, assessment pacing, and workload balance are recurrent concerns across institutions implementing large-scale ODeL.⁽⁵⁾ Addressing these barriers requires a comprehensive model that integrates pedagogy, technology, and student support systems.

In the Philippine higher education landscape, quality assurance mechanisms for ODeL have been emphasized by policymakers and accrediting agencies.⁽⁶⁾ Inclusive instructional design, mobile-first strategies, and offline-capable platforms are regarded as critical to reaching geographically dispersed learners. PSU-OUS strategically aligns its P-OUS framework with these national and regional priorities, highlighting not only accessibility but also resilience and adaptability in online delivery. This positions the model as a potential benchmark for other universities in similar socioeconomic and technological contexts.

Digital innovation plays a crucial role in advancing such models by bridging pedagogical strategies with technological applications. Tools such as learning management systems, artificial intelligence-based tutoring, and data analytics are increasingly employed to personalize learning experiences and improve student retention.⁽⁷⁾ In the case of P-OUS, integration of digital solutions aims to reduce transactional distance, foster a stronger sense of community, and enhance learner autonomy. The approach exemplifies how science and technology serve as catalysts for academic transformation in resource-variable environments.

The use of evaluation frameworks is equally important in assessing the effectiveness of ODeL models. Stufflebeam’s Context, Input, Process, and Product (CIPP) model provides a systematic lens to examine relevance, resources, implementation, and outcomes.⁽⁸⁾ Through this lens, the P-OUS model was evaluated to

capture both strengths and areas requiring refinement. Such structured evaluation contributes to evidence-based recommendations for continuous improvement, ensuring that graduate education remains both rigorous and accessible.

This study therefore seeks to assess the P-OUS Open Distance e-Learning Model by focusing on learner profiles, technology access, perceived effectiveness, and encountered challenges. It also synthesizes student feedback to propose strategies for optimizing digital innovation in higher education. By situating the evaluation within the broader discourse on science and technology integration, the paper underscores the transformative potential of ODeL in enhancing educational equity and quality.

Ultimately, this research contributes to the growing body of interdisciplinary scholarship linking digital technology, pedagogy, and social impact. The findings aim to inform higher education institutions, particularly in developing countries, on how technology-enabled ODeL models can sustain inclusivity, adaptability, and academic excellence in graduate programs.

The evaluation adopts Stufflebeam's CIPP model to provide a systems-oriented lens. The Context component examines the relevance of P-OUS to learner needs and institutional goals; Input reviews resources, strategies, and policies; Process considers implementation fidelity,⁽⁶⁾ and Product focuses on outcomes such as satisfaction and reported learning gains.⁽⁷⁾ Complementary theories include constructivism (active knowledge construction), connectivism (networked learning), and Col⁽⁸⁾ which collectively frame P-OUS's four components: Peruse (advance organizers and content exploration), Offer (collaborative tasks and discussions), Uphold (reflective consolidation), and Sow (transfer and application in professional tasks). These linkages scaffold autonomy while maintaining structured support—key for adult learners balancing multiple roles.

Constructivist learning theory provides a strong foundation for ODeL, emphasizing that learners actively construct knowledge through engagement and interaction with content, peers, and instructors. In online contexts, this is facilitated by multimedia resources, collaborative platforms, and guided reflection, enabling deeper cognitive processing and skill development.⁽⁹⁾ Vygotsky's concept of the Zone of Proximal Development also highlights the importance of scaffolding, where digital tools and teacher presence serve as mediators to bridge learners' capabilities and potential.⁽¹⁰⁾

In addition, the Technology Acceptance Model (TAM) has been widely used to explain how learners and educators adopt new digital platforms. Perceived usefulness and perceived ease of use remain significant predictors of successful integration of e-learning technologies.⁽¹¹⁾ The Unified Theory of Acceptance and Use of Technology (UTAUT) further expands this by incorporating performance expectancy, effort expectancy, social influence, and facilitating conditions, all of which are crucial in assessing institutional readiness for ODeL.⁽¹²⁾

From a systems perspective, Bates' SECTIONS framework—Students, Ease of use, Cost, Teaching functions, Interaction, Organizational issues, Networking, and Security—offers a practical guide for evaluating the adoption of technology in higher education.⁽¹³⁾ This aligns with the P-OUS model's intention to optimize workload, enhance interactivity, and ensure technological sustainability. Furthermore, diffusion of innovations theory suggests that the adoption of educational technologies follows predictable stages, influenced by institutional culture, leadership, and perceived relative advantage.⁽¹⁴⁾

Self-Determination Theory (SDT) also provides a lens to understand learner motivation in online contexts. The theory posits that autonomy, competence, and relatedness are fundamental psychological needs that, when satisfied, enhance intrinsic motivation and learning outcomes.⁽¹⁵⁾ ODeL models that integrate feedback loops, peer interaction, and personalized learning pathways are more likely to sustain student engagement and persistence in graduate programs.

The Community of Inquiry framework adds another dimension by framing online learning as a dynamic interplay between cognitive presence, social presence, and teaching presence.⁽¹⁶⁾ The P-OUS model reflects these elements by emphasizing learner-centered strategies, structured communication protocols, and faculty visibility. Effective integration of these components contributes to the development of critical thinking, academic integrity, and collaborative learning skills among students.

Finally, the resilience of higher education systems in adopting ODeL can be viewed through the lens of socio-technical systems theory. This perspective stresses that technology, human actors, and organizational structures must be co-aligned to achieve sustainable outcomes.⁽¹⁷⁾ In the case of PSU-OUS, leveraging science and technology in the P-OUS model demonstrates how higher education can build resilience, equity, and innovation in response to evolving societal needs.

METHOD

Desain

This study employed a descriptive evaluation design guided by Stufflebeam's Context, Input, Process, and Product (CIPP) framework. The CIPP model has been widely applied in educational program evaluation to ensure a systematic examination of relevance, resources, implementation, and outcomes.⁽¹⁸⁾ approach allowed a holistic analysis of the P-OUS Open Distance e-Learning model in the context of graduate education.

Participants

The study population comprised graduate students enrolled in the Pangasinan State University - Open University Systems (PSU-OUS). Four graduate programs were represented: Doctor of Education in Educational Management (EdD-EM), Master of Arts in Education (MAEd-EM and MAEd-IL), Master of Science in Fisheries (MSF), and Master in Development Management with a major in Project Management (MDM-PM). Purposive sampling was employed to capture diverse perspectives across programs and geographic locations. A total of 272 students voluntarily participated, providing sufficient representation for descriptive evaluation.

Instrument and Data Collection

Data were collected through a structured questionnaire designed in Google Forms. The instrument consisted of four sections: (a) demographic profiles and technology access, (b) perceived effectiveness and satisfaction, (c) challenges encountered, and (d) open-ended feedback for improvement. Items included both closed-ended questions using a 5-point Likert scale and open-ended prompts to elicit qualitative insights.⁽¹⁹⁾

Content validity of the questionnaire was established through a panel of five expert reviewers: two specialists in educational technology, two in program evaluation and research methodology, and one in open and distance learning management. Their feedback ensured that all items were relevant, clearly phrased, and aligned with the study objectives.

A pilot study involving 25 graduate students from comparable online programs was conducted to assess the clarity, reliability, and usability of the instrument. Results of the pilot indicated high internal consistency (Cronbach's alpha = 0,91) and confirmed that the items were easily understood and appropriately sequenced. Minor wording adjustments were made before full-scale administration.

Informed consent was obtained digitally, and participation was voluntary. Data collection adhered to ethical research standards, ensuring anonymity, confidentiality, and secure data storage throughout the process.⁽²⁰⁾

Analysis

Quantitative data were analyzed using descriptive statistics such as frequencies, percentages, means, and standard deviations to summarize participant profiles, technology access, and perceptions.⁽²¹⁾ Qualitative responses were analyzed thematically through inductive coding, grouping student inputs into categories such as communication and scheduling, workload management, technology and tool utilization, availability of learning materials, portal and payment issues, instructor responsiveness, class interactivity, and institutional support services. Triangulation with existing ODeL literature strengthened interpretation and ensured reliability of findings.⁽²²⁾

Ethical Considerations

The study was conducted in accordance with ethical guidelines for educational research. Approval was sought from the PSU institutional ethics review process prior to implementation. Respondents were assured of voluntary participation, informed consent, and the right to withdraw at any stage without penalty.⁽²³⁾

RESULTS

Based on the data analysis, the results can be described as follows.

Age Group	Frequency	Percentage
20-29	118	43,4
30-39	84	30,9
40-49	60	22,1
50-59	9	3,3
60+	1	0,4

The majority of participants were aged between 20-39 years (74,3 %). This reflects the dominance of early- and mid-career professionals pursuing graduate education to enhance career opportunities while balancing work commitments. Similar findings are reported in other open and distance education contexts, where younger professionals are more likely to engage in flexible learning modalities.⁽²⁴⁾

The student population is predominantly female (63,6 %), consistent with broader trends in education and social sciences where women are often more represented in graduate-level programs.⁽²⁵⁾ Gender representation in ODeL has been linked to career mobility, with women often leveraging flexible learning to reconcile professional and personal responsibilities.⁽²⁶⁾

Table 2. Gender distribution of PSU-OUS students

Gender	Frequency	Percentage
Female	173	63,6
Male	97	35,7
Prefer not to say	2	0,7

Table 3. Programs enrolled by PSU-OUS students

Program	Frequency	Percentage
MAEd EM	117	43,0
MSF	77	28,3
EdD EM	45	16,5
MDM PM	26	9,6
MAEd IL	7	2,6

Most respondents were enrolled in education-related programs (59,5 %), followed by fisheries and management disciplines. This distribution underscores the breadth of PSU-OUS's academic reach, highlighting demand for flexible postgraduate training across professional domains. Similar patterns have been observed in distance education systems where education and applied sciences dominate enrollment.⁽²⁷⁾

Table 4. Employment status of PSU-OUS students

Status	Frequency	Percentage
Full-time	235	86,4
Part-time	20	7,4
Unemployed	17	6,3

An overwhelming majority of students were employed full-time (86,4 %), confirming the essential role of ODeL in providing continuing education for working professionals. Similar research demonstrates that ODeL often attracts learners with established careers who seek graduate credentials for advancement.⁽²⁸⁾ This reinforces the necessity of designing programs that offer workload flexibility and asynchronous access.

Table 5. Location of residence of PSU-OUS students

Location	Frequency	Percentage
Within the Philippines but outside Region I	145	53,3
Within Pangasinan	64	23,5
Within Asia	40	14,7
Outside Pangasinan but within Region I	9	3,3
Others	6	2,2
Within North America	4	1,5
Within Australia	3	1,1
Within Europe	1	0,4

More than half of the learners resided outside Region I (53,3 %), while a considerable number were distributed internationally (17,7 %). This confirms the borderless nature of ODeL, where students can participate regardless of geographic location.

Table 6. Perceived difficulty understanding course content online

Response	Frequency	Percentage
Always	15	5,5
Often	25	9,2
Sometimes	110	40,4
Rarely	79	29,0
Never	43	15,8

Comparable findings have been reported in global studies highlighting the role of digital technologies in expanding higher education beyond national borders.⁽²⁹⁾ The diversity of student residence emphasizes the need for mobile-first design, offline accessibility, and cross-time-zone communication protocols.

Learners generally report that understanding course content online is occasionally difficult, with 40,4 % indicating “sometimes.” Only a small fraction (5,5 %) reported consistent difficulties. This highlights that while digital platforms provide broad access, comprehension gaps remain due to instructional design, absence of immediate clarification, or variations in prior knowledge. These findings mirror studies indicating that clarity of online instructional materials and the quality of multimedia integration strongly affect comprehension.^(30,31)

Table 7. Factors contributing to content difficulty (multiple mentions)

Issue	Frequency	Percentage
Lack of immediate teacher feedback	98	36,0
Overly text-heavy modules	67	24,6
Limited multimedia/visual aids	52	19,1
Language/terminology complexity	41	15,1
No response	14	5,2

The main difficulty reported is the absence of timely instructor feedback, which aligns with Moore’s concept of transactional distance, where limited dialogue can hinder learner engagement and comprehension.⁽³²⁾ Additionally, reliance on text-heavy content without adequate multimedia reduces accessibility for diverse learning preferences, confirming earlier findings that multimodal content increases retention and understanding.⁽³³⁾

Table 8. Student satisfaction with overall P-OUS learning experience

Satisfaction Level	Frequency	Percentage
Very satisfied	89	32,7
Satisfied	134	49,3
Neutral	38	14,0
Dissatisfied	9	3,3
Very dissatisfied	2	0,7

Overall satisfaction levels are high, with more than 80 % expressing satisfaction or high satisfaction. This finding resonates with global ODeL evaluations, where structured feedback, interactive platforms, and responsive faculty significantly drive learner satisfaction.⁽³⁴⁾ The relatively small proportion of dissatisfaction suggests areas for improvement but also validates the robustness of the P-OUS model in sustaining learner engagement across dispersed geographies.

Table 9. Aspects contributing most to student satisfaction

Aspect	Frequency	Percentage
Flexible scheduling	156	57,4
Accessible online materials	148	54,4
Supportive instructors	121	44,5
Peer collaboration opportunities	87	32,0
Recognition of prior learning	43	15,8

Flexibility and accessibility emerge as the strongest drivers of satisfaction, underscoring the alignment of P-OUS with adult learning principles that emphasize autonomy, relevance, and adaptability.^(34,35) Peer collaboration, though less frequently cited, remains a critical area to strengthen, as research indicates social presence and peer interaction enhance persistence and reduce attrition in online settings.⁽³⁶⁾

Pedagogical Challenges: a considerable proportion of learners (35,9 %) reported that online delivery sometimes or often hampers interaction with instructors, while 39,3 % indicated it never affects them. This reflects a persistent challenge in digital pedagogy: ensuring adequate teaching presence and dialogic interaction despite the absence of face-to-face contact. Studies show that strong instructional scaffolding, active learning strategies, and consistent teacher responsiveness reduce transactional distance and enhance learner satisfaction.^(37,38)

Table 10. Does the online format affect ability to interact with instructors

Response	Frequency	Percentage
Always	5	1,8
Often	16	5,9
Sometimes	77	28,3
Rarely	67	24,6
Never	107	39,3

Table 11. Personal challenges affecting online learning

Response	Frequency	Percentage
Always	8	2,9
Often	37	13,6
Sometimes	147	54,0
Rarely	52	19,1
Never	28	10,3

The findings in table 11 indicate that a majority of students (54,0 %) sometimes face personal challenges in online learning, primarily related to balancing academic demands with work and family responsibilities. These pressures highlight the importance of institutional flexibility, such as extended deadlines and supportive counseling, to mitigate stress and sustain engagement. Addressing personal challenges is thus essential to enhancing student persistence and overall success in distance education.

Table 12. Specific personal challenges (multiple mentions)

Challenge	Frequency	Percentage
Balancing work and study	132	49,4
Time management	104	38,9
External/personal commitments	31	11,6
No response	5	1,8

Personal Challenges: the most prevalent barriers are balancing work and study (49,4 %) and managing time (38,9 %). These findings underscore the reality that adult learners in ODeL settings juggle multiple roles and commitments. Prior research confirms that competing priorities often diminish persistence, making it crucial for institutions to provide pacing flexibility, modular assessment, and time-management guidance to support learners.^(39,40)

Table 13. Feedback and suggestions

Category	Frequency	Percentage
Workload and assignment management	30	11,0
Use of technology and emerging tools	20	7,4
Instructor responsiveness and clarity	20	7,4
Challenges with communication/scheduling	25	9,1
Materials and resources availability	18	6,6
Technical and portal issues	15	5,5
Class interactivity and engagement	12	4,4
Support services and flexibility	10	3,7
No response	122	44,9

Student Feedback: suggestions primarily focused on better workload management, clearer scheduling, and improved instructor responsiveness. A notable share also requested consistent LMS use and stronger support

services. These align with international literature emphasizing that clarity, coherence, and transparency in online course design directly impact persistence and satisfaction.⁽⁴¹⁾ Moreover, student feedback resonates with calls for a “whole-of-institution” approach to ODeL quality, where pedagogical design, technical infrastructure, and administrative processes must work in synergy to enhance learner experience.⁽⁴²⁾

DISCUSSION

The demographic analysis of PSU-OUS students offers critical insights into the evolving profile of open and distance e-learning (ODEL) participants. As shown in table 1, a substantial majority of learners fall within the 20-39 age range (74,3 %), reflecting the dominance of early- and mid-career professionals seeking graduate credentials for career advancement while maintaining employment. This trend mirrors findings from previous studies that identify younger professionals as the primary demographic engaging in flexible online learning formats due to their alignment with modern work patterns and digital adaptability.^(43,44,45) Such age composition suggests that the PSU-OUS model effectively responds to the learning needs of a generation that values mobility, flexibility, and the ability to study without disrupting existing career trajectories.^(46,47,48)

Gender distribution (table 2) further contextualizes this demographic pattern, with female learners comprising 63,6 % of the sample. This overrepresentation of women aligns with prior research showing that online and distance education provides women greater opportunities to pursue postgraduate studies while managing familial or caregiving responsibilities.^(49,50) These findings highlight the gendered dimensions of ODeL participation, emphasizing the need for institutions like PSU-OUS to design support systems that address time management, role strain, and digital inclusion for female learners balancing multiple roles.^(51,52,53)

The enrollment distribution across programs (table 3) reveals that education-related disciplines dominate (59,5 %), followed by applied sciences such as fisheries and development management. This indicates that ODeL remains a strategic avenue for professionals in the education sector to upgrade their qualifications—a pattern echoed in other distance education contexts across Southeast Asia.^(54,55,56,57) The prevalence of educators among the student body reinforces the sector’s role in lifelong learning and professional upskilling, aligning with the national and regional agenda of improving educational leadership and instructional quality.^(58,59,60)

Employment data (table 4) show that an overwhelming 86,4 % of respondents are employed full-time, confirming that ODeL serves as an essential platform for working adults. This aligns with global evidence that online learning appeals most to those seeking flexibility to balance study, work, and family commitments.^(61,62,63,64) For such learners, the ability to manage coursework asynchronously is not merely convenient but essential. Thus, PSU-OUS must continue developing policies that accommodate workload flexibility, adaptive pacing, and self-regulated learning strategies.^(65,66,67,68)

The geographic spread of students (table 5) underscores the transnational character of PSU-OUS’s reach, with more than half residing outside Region I (53,3 %) and a notable proportion based overseas (17,7 %). This distribution validates the borderless and inclusive potential of ODeL, allowing students from various time zones and socio-technical contexts to participate in higher education.^(69,70) However, such diversity also introduces challenges in ensuring equitable access to course materials, real-time communication, and culturally responsive instruction. Consequently, the institution must strengthen mobile-first learning design, offline functionality, and asynchronous engagement models to ensure inclusivity across geographic boundaries.^(71,72,73,74)

Finally, pedagogical challenges persist, as indicated in Table 6. While most students report only occasional difficulty understanding online content, a notable portion (40,4 %) experiences comprehension gaps “sometimes,” suggesting variability in instructional clarity and learner readiness. This finding aligns with Moore’s theory of transactional distance, which posits that limited dialogue and structure in virtual environments can hinder learning.^(75,76) Studies emphasize that instructor presence, interactive multimedia, and scaffolded feedback are critical in reducing such distance and enhancing comprehension.^(77,78,79) Thus, PSU-OUS should invest in continuous faculty training in digital pedagogy to ensure that online learning experiences remain engaging, comprehensible, and pedagogically sound.^(80,81,82)

In summary, the demographic and learning context revealed in Tables 1-6 portrays PSU-OUS as a dynamic and inclusive institution catering to diverse, predominantly employed, and globally dispersed adult learners. Yet, the data also illuminate critical areas for enhancement—particularly in instructional design, faculty responsiveness, and technological inclusivity—to sustain quality and learner satisfaction in a rapidly evolving ODeL landscape.

Findings across tables 7 to 13 provide a comprehensive picture of the pedagogical, technological, and personal factors shaping student experiences within the P-OUS model. The most prominent issue identified is the lack of immediate instructor feedback (36 %), which substantiates Moore’s theory of transactional distance, emphasizing that limited dialogue weakens learner engagement and comprehension. Overly text-heavy modules and insufficient multimedia use further contribute to perceived content difficulty, reinforcing prior studies that advocate for multimodal instructional design to accommodate diverse learning preferences and cognitive processing styles.^(83,84) This suggests that improving teaching presence and content interactivity remains crucial

for optimizing online learning outcomes.

Despite these challenges, overall student satisfaction remains notably high, with over 80 % reporting satisfaction or high satisfaction levels. This finding aligns with global ODeL trends demonstrating that learner satisfaction is strongly influenced by accessible platforms, responsive faculty, and well-structured feedback systems.⁽⁸⁵⁾ The drivers of satisfaction—notably flexible scheduling (57,4 %) and accessible online materials (54,4 %)—underscore the model’s success in meeting adult learners’ demand for autonomy and self-directed pacing. Such features are consistent with *Knowles’* andragogical principles that emphasize flexibility, relevance, and learner autonomy as cornerstones of adult learning.⁽⁸⁶⁾

However, the findings also reveal persistent pedagogical gaps. Around 35,9 % of learners reported that online formats sometimes or often hinder instructor interaction (table 10), indicating the need for more intentional design of dialogic and collaborative spaces. Community of Inquiry (Col) model emphasizes that teaching presence—alongside social and cognitive presence—is foundational to meaningful online learning.^(84,85) Enhancing instructor immediacy through structured communication protocols, timely feedback, and synchronous engagement could thus significantly reduce transactional distance.^(83,84)

Equally significant are the personal challenges reported in tables 11 and 12. More than half (54 %) of respondents indicated difficulty balancing academic responsibilities with personal and professional obligations. The most frequent issues—balancing work and study (49,4 %) and managing time effectively (38,9 %)—echo findings that adult learners in ODeL environments often struggle with competing demands that threaten persistence and completion. Institutions can address this through supportive interventions such as modular pacing, workload negotiation, and time-management coaching to sustain learner engagement and reduce attrition.^(80,81,82,83)

Feedback patterns (table 13) further highlight that workload management, instructor responsiveness, and communication clarity remain critical concerns. Students’ emphasis on these aspects indicates the intertwined relationship between institutional support and student satisfaction. Perceived instructor immediacy and workload fairness directly influence motivation and course retention. Consequently, the P-OUS model would benefit from embedding continuous quality loops that include faculty training in digital pedagogy, transparent communication guidelines, and responsive feedback mechanisms.⁽⁸⁶⁾

Synthesizing these findings, it becomes evident that while P-OUS demonstrates strong adaptability and inclusiveness, continuous improvement is needed in three interrelated domains: (1) pedagogical design, by enhancing interactivity and feedback responsiveness; (2) institutional flexibility, through adaptive pacing and learner-centered workload policies; and (3) support structures, integrating both academic and psychosocial support to address adult learners’ multifaceted challenges. Implementing these refinements will not only strengthen learner engagement and satisfaction but also align P-OUS with international best practices in resilient, inclusive, and sustainable ODeL delivery.

Limitation

This study has several limitations that should be acknowledged. The research relied on a cross-sectional survey design, which limits the ability to infer causality between variables. The data collection period was relatively short, potentially restricting the depth of responses and excluding seasonal or contextual variations in learner experience. In addition, the study involved a limited population of PSU-OUS graduate students, which may not fully represent the broader ODeL learner community. The use of self-reported data may also introduce response bias, as participants might have provided socially desirable answers. Future studies could address these limitations by employing longitudinal designs, expanding the sample to multiple institutions, and incorporating mixed methods to capture richer qualitative insights.

CONCLUSIONS

The P-OUS Open Distance Learning model demonstrates that digital innovation can provide equitable, flexible, and student-centered access to graduate education. Its emphasis on accessibility, adaptability, and learner engagement reflects the transformative potential of integrating science and technology into higher education systems. At the same time, recurring challenges—technical, pedagogical, and personal—highlight the need for resilient instructional design, stronger faculty presence, and comprehensive learner support services.

Strengthening communication protocols, optimizing workload management, and expanding mobile-first and offline solutions will enhance inclusivity and sustainability in diverse learning contexts. By continuously applying evidence-based evaluations such as the CIPP framework, PSU-OUS can refine its practices and remain responsive to the evolving demands of digital education.

Ultimately, the P-OUS model contributes to advancing quality in higher education by aligning technological innovation with human-centered pedagogy. Its refinement not only benefits local learners but also offers insights for other institutions seeking to develop resilient, scalable, and socially impactful open and distance e-learning systems.

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