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Martha Cleveland-Innes, Editor-in-Chief

Welcome to Volume 51, Issue 1 Canadian Journal of Learning and Technology (CJLT).

CJLT is a peer-reviewed, bilingual journal that publishes research on technology and learning. It is freely accessible online, indexed in multiple databases, and available in accessible formats. There are no fees for article submission or publication. This issue includes a Notes discussion article and five research articles.

Navigating the evolving landscape of education innovation is the overarching theme in this issue. As global education systems grapple with rapid technological change, shifting learner expectations, and the imperative for lifelong learning, a diverse body of research is emerging to illuminate the path forward. The six essays in this issue offer a compelling cross-section of current education innovations, spanning micro-credentials, artificial intelligence, emotional intelligence, privacy, online learning policy, and strategic EdTech integration.

There is an underlying emphasis on systemic thinking—whether through policy frameworks, theoretical models, or stakeholder collaboration. The study on micro-credentials in the Caribbean underscores the promise of flexible, skills-based learning but also reveals persistent barriers such as technological inequity and institutional inertia. Similarly, the Vietnamese benchmarking study highlights the limitations of piecemeal ICT adoption in higher education, advocating for comprehensive, context-sensitive policy development. In parallel, the Ethiopian study on EdTech strategies offers a grounded theoretical framework that moves beyond adoption determinants to propose actionable, stakeholder-informed strategies. This shift from "why" to "how" is critical as institutions seek sustainable models for technology integration.

In keeping with CJLT history, the role of emerging technologies continues to be explored in the bibliometric analysis of AI in university education, which maps the global research landscape and identifies key themes such as motivation and feedback. While the study reveals growing international collaboration, it also calls for deeper qualitative inquiry to understand the pedagogical implications of AI. Equally important are the human dimensions of technology adoption, as seen in the study from Kazakhstan, which examines how emotional intelligence and privacy orientation shape mobile learning attitudes. This research reminds us that technological innovation must be attuned to cultural and psychological contexts, especially in transitional economies.

Finally, the analysis of student evaluations of teaching offers a refreshing perspective: despite concerns about bias, the emotional tone of student feedback appears largely neutral. This finding may help alleviate faculty apprehension and encourage more constructive engagement with student voices.

Together, these studies reflect a global, interdisciplinary effort to reimagine education for the 21st century. They challenge us to think beyond tools and platforms, urging a deeper consideration of policy, pedagogy, equity, and emotion. As we move forward, the integration of technology in education must be not only innovative but also inclusive, intentional, and informed by diverse perspectives.

Article titles, authors, and abstracts are listed in presentation order below. Enjoy!

Perspectives on Implementing Micro-credentials in the Commonwealth Caribbean: A Survey of Stakeholders

Perspectives sur l'implantation des micro-crédits dans les Caraïbes du Commonwealth : une enquête auprès des parties prenantes

Rory McGreal, *Athabasca University, Canada*

Abstract

Micro-credentials (MCs) have emerged as a transformative tool in education and workforce development, offering flexible, targeted learning opportunities that align with the principles of lifelong learning. This paper presents the findings of a survey conducted among stakeholders in the Commonwealth Caribbean in a baseline study to gauge their awareness, experiences, and attitudes toward MCs. The study reveals that while a majority of respondents are familiar with MCs, significant barriers such as lack of awareness, resistance to change, and limited access to technology hinder their widespread adoption. The paper highlights the potential of MCs to address regional flexible learning and skills gaps, support workforce development, and promote social inclusion, while also emphasizing the need for clear policies, quality assurance frameworks, and stakeholder collaboration. By applying the Lifelong Learning Paradigm, the paper provides a comprehensive framework for understanding the role of MCs in supporting continuous learning, skill development and adaptability. The findings underscore the importance of aligning MCs with industry needs, leveraging technology, and fostering a supportive ecosystem to ensure their successful implementation in the Caribbean. The paper concludes with actionable recommendations for policymakers, educators, and employers to integrate MCs into the region's lifelong learning landscape.

Keywords: Caribbean, labour force, micro-credentials, policies, sustainable development

Résumé

Les micro-crédits (MC) sont apparus comme un outil de transformation dans l'éducation et le développement de la main-d'œuvre, offrant des possibilités d'apprentissage flexibles et ciblées qui s'alignent sur les principes de l'apprentissage tout au long de la vie. Ce document présente les résultats d'une enquête menée auprès des parties prenantes dans les Caraïbes du Commonwealth dans le cadre d'une étude de référence visant à évaluer leur connaissance, leurs expériences et leurs attitudes à l'égard des microcrédits. L'étude révèle que bien que la majorité des personnes interrogées soit familiarisée avec les MC, des obstacles importants tels que le manque de connaissance, la résistance au changement et l'accès limité à la technologie empêchent leur adoption à grande échelle. Le document met en évidence le potentiel des MC pour combler les lacunes régionales en matière d'apprentissage flexible et de compétences, soutenir le développement de la main-d'œuvre et promouvoir l'inclusion sociale, tout en soulignant la nécessité de politiques claires, de cadres d'assurance qualité et d'une collaboration entre les parties prenantes. En appliquant le paradigme de l'apprentissage tout au long de la vie, ce document fournit un cadre complet pour comprendre le rôle des MC dans le soutien à l'apprentissage continu, au développement des compétences et à l'adaptabilité. Les résultats soulignent l'importance d'aligner les MC avec les besoins de l'industrie, de tirer parti de la technologie et d'encourager un écosystème favorable pour garantir leur mise en œuvre réussie dans les Caraïbes. Le document se termine par des recommandations concrètes à l'intention des décideurs politiques, des formateurs et des employeurs afin d'intégrer les MC dans le paysage de l'apprentissage tout au long de la vie de la région.

Mots-clés: Caraïbes, main-d'œuvre, micro-crédits, politiques, développement durable

Intelligence artificielle et formation universitaire : analyse bibliométrique des tendances et perspectives de recherche

Artificial Intelligence and University Education: Bibliometric Analysis of Research Trends and Perspectives

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Résumé

Cette étude examine les tendances et les développements des publications ainsi que la dynamique de collaboration scientifique entre auteurs, pays, organismes et sources récentes liés à l'utilisation de l'intelligence artificielle (IA) dans la formation et l'apprentissage universitaires. Une analyse bibliométrique de 285 articles publiés depuis 2014 jusqu'au 26 mars 2024, issus de la base de données *Web of Science* a révélé une forte association entre l'IA et des thèmes tels que l'éducation, la motivation des étudiants, le « feedback » et l'autocontrôle. La Chine et les États-Unis sont les pays les plus influents dans ce domaine de recherche, avec une collaboration croissante d'autres pays, comme le

Afrique du Sud, Brésil, Canada, Israël, Pologne, Singapour, Vietnam depuis 2023. Les premières publications remontent à 2022 dans des revues spécialisées comme *International Journal of Educational Technology in Higher Education* et *Educational Technology & Society*. Bien que l'analyse présente certaines limites, telles qu'une compréhension réduite des tendances, une couverture partielle des publications et une faible représentativité des données, elle offre des *insights* précieux pour de futurs projets de collaboration interdisciplinaires et de recherches qualitatives visant à mieux comprendre la dynamique de l'intégration de l'IA dans l'enseignement supérieur.

Mots-clés : analyse bibliométrique, apprentissage, formation universitaire, intelligence artificielle, tendances de recherche

Abstract

This study examines the trends and developments in publications, as well as the dynamics of scientific collaboration among authors, countries, organizations, and recent sources related to the use of artificial intelligence (AI) in university education and learning. A bibliometric analysis of 285 articles published since 2014 until March 26, 2024, drawn from the *Web of Science* database, revealed a strong association between AI and themes such as education, student motivation, feedback, and self-control. China and the United States are the most influential countries in this research field, with increasing collaboration from other countries such as Brazil, Canada, Israel, Poland, Singapore, South Africa, and Vietnam since 2023. The earliest publications date back to 2022 in specialized journals such as *International Journal of Educational Technology in Higher Education* and *Educational Technology & Society*. Although the analysis has limitations, such as a limited understanding of trends, partial coverage of publications, and low representativeness of data, it provides valuable insights for future interdisciplinary collaboration projects and qualitative research aimed at better understanding the dynamics of AI integration in higher education.

Keywords: artificial intelligence, bibliometric analysis, learning, research trends, university education

Privacy and Emotional Intelligence in Technology-Based Learning

Confidentialité et Intelligence émotionnelle dans l'apprentissage basé sur la technologie

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Abstract

This study explores the influence of emotional intelligence and privacy orientation on attitudes and intentions to learn with mobile technologies. Data were collected from 272 respondents in Kazakhstan, a country with a transitioning economy. The findings reveal that both emotional intelligence and privacy orientation positively affect attitudes and intentions, except for the dimension of

concern about one's own informational privacy. Additionally, a model incorporating both emotional intelligence and privacy orientation explains variations in attitudes and intentions more effectively than models with either factor alone. This research contributes to the understanding of the multidimensional constructs of mobile learning, privacy, and emotional intelligence in non-Western contexts, providing valuable insights for technology adoption in transitional economies.

Keywords: emotional intelligence, Kazakhstan, mobile technologies, privacy orientation, technology adoption

Résumé

Cette étude explore l'influence de l'intelligence émotionnelle et de l'orientation vers la vie privée sur les attitudes et les intentions d'apprendre avec les technologies mobiles. Des données ont été recueillies auprès de 272 répondants au Kazakhstan, un pays dont l'économie est en transition. Les résultats révèlent que l'intelligence émotionnelle et l'orientation vers la vie privée affectent positivement les attitudes et les intentions, sauf pour la dimension relative à la protection de la vie privée personnelle. De plus, un modèle intégrant l'intelligence émotionnelle et l'orientation vers la vie privée explique mieux les variations dans les attitudes et les intentions que les modèles les considérant séparément. Cette recherche contribue à la compréhension des construits multidimensionnels de l'apprentissage mobile, de la vie privée et de l'intelligence émotionnelle dans des contextes non occidentaux, offrant des perspectives pertinentes pour l'adoption technologique dans des économies en transition.

Mots - clés: adoption technologique, intelligence émotionnelle, Kazakhstan, orientation vers la vie privée, technologies mobiles

Évaluation comparative des formations en ligne relativement à la perception des étudiants vietnamiens aux études supérieures

Benchmarking Online Training in Higher Education: Vietnamese Students' Perceptions

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Nguyen Tan Dai, *Université de Strasbourg, LISEC (UR 2310), France*

Nguyen Huu Binh, *Université de Langues Étrangères, Université de Danang, Vietnam*

Ngo Ba Hung, *Université de Can Tho, Vietnam*

Vo Viet Minh Nhat, *Université de Hué, Vietnam*

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Dinh Thi Hai, *Université de Hanoi, Vietnam*

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Résumé

Le Vietnam est considéré comme étant avancé dans l'adoption et l'usage des technologies de l'information et de la communication (TIC) en éducation, suivant les critères définis par l'UNESCO. Cependant, la plupart des établissements d'enseignement supérieur vietnamiens ne se limitent qu'à investir dans du matériel et des équipements technologiques pour encourager les initiatives individuelles d'enseignement en ligne chez les enseignants universitaires, sans disposer de véritable politique institutionnelle de formation en ligne ni de toutes les dimensions nécessaires à l'intégration systématique des TIC. Cela les empêche d'atteindre un niveau d'efficacité suffisant et une cohérence d'ensemble. Cet article vise à présenter les résultats de l'étude des modèles de développement du cyberapprentissage dans les établissements d'enseignement supérieur du monde entier, en particulier celui de l'Association européenne des universités d'enseignement à distance (EADTU), en vue de construire un modèle d'évaluation comparative de la politique institutionnelle de l'apprentissage en ligne en fonction de la perception des étudiants. Ce modèle a fait l'objet d'une enquête auprès de 460 étudiants de quatre établissements d'enseignement supérieur vietnamiens, dont les résultats d'analyse factorielle permettent de valider une version adaptée de l'enquête au contexte local.

Mots-clés : Association européenne des universités d'enseignement à distance, enseignement supérieur, évaluation comparative, formation en ligne, perception des étudiants, Vietnam

Abstract

Vietnam is ranked at the advanced stages in the adoption and use of information and communication technologies (ICTs) in education, according to the criteria defined by UNESCO. However, most Vietnamese higher education institutions are limited to investing in technological equipment and materials to encourage individual initiatives in online teaching among lecturers, without having a comprehensive institutional policy for online training, including all the dimensions necessary for the systemic integration of ICTs. This prevents them from achieving a sufficient level of efficiency and overall coherence. This article is a study of models for the overall development of e-learning in higher education institutions, in particular that of the European Association of Distance Teaching Universities (EADTU), for building a benchmarking model for e-learning institutional policy under students' perception. This model was subject to a survey involving 460 students from four Vietnamese higher education institutions, with the result of factor analysis validating an adapted version that fits to the local context.

Keywords: benchmarking, European Association of Distance Teaching Universities, higher education, online training, students' perception, Vietnam

Examining the Emotional Tone of Student Evaluations of Teaching

Analyse du ton émotionnelle des évaluations de l'enseignement par les personnes étudiantes

Derek Newman, *Cambrian College, Canada*

Abstract

Student-written evaluation ($N = 600$) of professors was examined to determine the emotional tone of the words used to evaluate faculty. Using the revised Dictionary of Affect (DOA; Whissell, 2009), evaluation words ($N = 26,764$) uploaded to the *Rate My Professors* website between 2018 and October of 2023 were measured for their pleasantness, activation, and imagery. Overall, the emotional tone of the students' written evaluation was very close to the DOA's definition of everyday English ($M = 50$) for all three categories: pleasantness ($M = 51.1$, $SD = 6.3$), activation ($M = 52.2$, $SD = 4.8$), and imagery ($M = 50.2$, $SD = 7.4$). The results indicated that the written evaluations were uniform in expression and emotional tone: neither very pleasant/unpleasant, active/passive, or imagery/abstract.

While significant relationships were found with professor quality and difficulty ratings, the number of words in the evaluation, and the instructor's gender, all associations had small correlational strengths and weak effect sizes, indicating that the variables might not be strong predictors of the emotional tone of student evaluations. If student written evaluations are not emotionally charged, then there is an opportunity to reduce any negative feelings faculty members have attached to the process.

Keywords: academia, emotional tone, student evaluation of teaching, student evaluations

Résumé

L'évaluation écrite des professeures et professeurs réalisée par les personnes étudiantes ($N = 600$) a été examinée pour déterminer le ton émotionnel des mots utilisés pour les évaluer. À l'aide du dictionnaire *Dictionary of Affect* (DOA ; Whissell, 2009), les mots d'évaluation ($N = 26,764$) téléversés sur le site web *Rate My Professors* entre 2018 et octobre 2023 ont été mesurés pour leur caractère agréable, leur activation et leur imagerie. Dans l'ensemble, le ton émotionnel de l'évaluation écrite réalisée par les personnes étudiantes était très proche de la définition de l'anglais courant du DOA ($M = 50$) pour les trois catégories : caractère agréable ($M = 51,1$, $SD = 6,3$), activation ($M = 52,2$, $SD = 4,8$) et imagerie ($M = 50,2$, $SD = 7,4$). Les résultats indiquent que les évaluations écrites étaient uniformes en termes d'expression et du ton émotionnel : ni très agréables/désagréables, ni actives/passives, ni imagées/abstraites.

Bien que des relations significatives aient été trouvées avec la qualité de la personne enseignante et les notes de difficulté, le nombre de mots dans l'évaluation et le genre de la personne enseignante, toutes les associations avaient des forces de corrélation faibles et des tailles d'effet faibles, ce qui

indique que les variables pourraient ne pas être des prédicteurs forts du ton émotionnel des évaluations réalisées par les personnes étudiantes. Si les évaluations écrites réalisées par les personnes étudiantes ne sont pas chargées d'émotion, il est possible de réduire les sentiments négatifs que les personnes enseignantes attachent au processus.

Mots-clés: académie, ton émotionnel, évaluation de l'enseignement par les personnes étudiantes, évaluations par les personnes étudiantes

Educational Technology Integration Strategies in Colleges of Teacher Education in Ethiopia

Stratégies d'intégration des technologies éducatives dans les établissements de formation des personnes enseignantes en Éthiopie

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Abstract

Research on educational technology (EdTech) integration has extensively explored determinants; however, strategies remain underexamined. Existing models predominantly focus on identifying the determinants of technology adoption yet fail to offer systemic frameworks for sustainable EdTech integration. This study bridges that gap by investigating strategies proposed by stakeholders in a college of teacher education, culminating in a theoretical framework. The research was conducted across four Ethiopian colleges of teacher education by employing a constructivist grounded theory. Data were collected through semi-structured interviews and document analysis, involving 23 participants selected through purposive and theoretical sampling. Data analysis was performed using MAXQDA (Version 2020) software. The results revealed six key strategies categorized into teacher-related, institution-related, and organization-related. A co-constructed theoretical framework illustrates the roles of various stakeholders in EdTech integration, underpinned by ecological systems theory, diffusion of innovations, and the unified theory of acceptance and use of technology. Credibility was ensured through a member-checking survey. The study advocates for further quantitative research to evaluate the correlation between strategies and educational technology integration outcomes, with replication across diverse contexts and stakeholders.

Keywords: Ethiopia, constructivist grounded theory, educational technology, teacher education, strategies

Résumé

La recherche sur l'intégration des technologies éducatives (EdTech) a largement exploré les déterminants, mais les stratégies restent sous-examinées. Les modèles existants se concentrent principalement sur l'identification des déterminants de l'adoption des technologies, mais ne parviennent pas à proposer des cadres de référence systémiques pour une intégration durable des EdTech. Cette étude comble cette lacune en examinant les stratégies proposées par les parties prenantes dans les établissements de formation des personnes enseignantes, pour aboutir à un cadre théorique. La recherche a été menée dans quatre établissements éthiopiens de formation des personnes enseignantes en utilisant une théorie constructiviste ancrée. Les données ont été collectées par le biais d'entretiens semi-structurés et d'une analyse de documents, impliquant 23 personnes participantes sélectionnées par le biais d'un échantillonnage raisonné et théorique. L'analyse des données a été réalisée à l'aide du logiciel MAXQDA (version 2020). Les résultats ont révélé six stratégies clés classées en trois catégories : liées à l'enseignant, liées à l'institution et liées à l'organisation. Un cadre théorique coconstruit illustre les rôles des différentes parties prenantes dans l'intégration des EdTech, étayé par la théorie des systèmes écologiques, la diffusion des innovations et la théorie unifiée de l'acceptation et de l'utilisation de la technologie. La crédibilité a été assurée par un sondage de vérification auprès des membres. L'étude préconise la poursuite des recherches quantitatives pour évaluer la corrélation entre les stratégies et les résultats de l'intégration des technologies éducatives, avec une reproduction dans divers contextes et auprès de diverses parties prenantes.

Mots-clés : Éthiopie, théorie constructiviste ancrée, technologie éducative, formation des personnes enseignantes, stratégies

Author

Martha Cleveland-Innes is Professor of Open, Digital, and Distance Education at Athabasca University in Canada and Editor-in-Chief of the bilingual *Canadian Journal of Learning and Technology.* She is the co-author of open source publications The Guide to Blended Learning (2018), Participant Experience in an Inquiry-Based Massive Open Online Course (2022), and Principles of Blended Learning (2024). The Design of Digital Learning Environments: Online and Blended Applications of the Community of Inquiry was recently co-edited by Dr. Cleveland-Innes (Taylor& Francis, 2024). Her research interest areas include 1) online and blended learning, 2) artificial intelligence and online communities of inquiry, 3) higher education reform and lifelong learning, and 4) leadership in education. She is currently Visiting Professor of Pedagogy at Mid-Sweden University (2018-present). For more information, see her Athabasca faculty profile.

Perspectives on Implementing Micro-credentials in the Commonwealth Caribbean: A Survey of Stakeholders

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Rory McGreal, *Athabasca University, Canada*

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Keywords: Caribbean, labour force, micro-credentials, policies, sustainable development

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Les micro-crédits (MC) sont apparus comme un outil de transformation dans l'éducation et le développement de la main-d'œuvre, offrant des possibilités d'apprentissage flexibles et ciblées qui s'alignent sur les principes de l'apprentissage tout au long de la vie. Ce document présente les résultats d'une enquête menée auprès des parties prenantes dans les Caraïbes du Commonwealth dans le cadre

d'une étude de référence visant à évaluer leur connaissance, leurs expériences et leurs attitudes à l'égard des microcrédits. L'étude révèle que bien que la majorité des personnes interrogées soit familiarisée avec les MC, des obstacles importants tels que le manque de connaissance, la résistance au changement et l'accès limité à la technologie empêchent leur adoption à grande échelle. Le document met en évidence le potentiel des MC pour combler les lacunes régionales en matière d'apprentissage flexible et de compétences, soutenir le développement de la main-d'œuvre et promouvoir l'inclusion sociale, tout en soulignant la nécessité de politiques claires, de cadres d'assurance qualité et d'une collaboration entre les parties prenantes. En appliquant le paradigme de l'apprentissage tout au long de la vie, ce document fournit un cadre complet pour comprendre le rôle des MC dans le soutien à l'apprentissage continu, au développement des compétences et à l'adaptabilité. Les résultats soulignent l'importance d'aligner les MC avec les besoins de l'industrie, de tirer parti de la technologie et d'encourager un écosystème favorable pour garantir leur mise en œuvre réussie dans les Caraïbes. Le document se termine par des recommandations concrètes à l'intention des décideurs politiques, des formateurs et des employeurs afin d'intégrer les MC dans le paysage de l'apprentissage tout au long de la vie de la région.

Mots-clés: Caraïbes, main-d'œuvre, micro-crédits, politiques, développement durable

Introduction

In an era of rapid technological advancement and evolving labour market demands, the need for flexile and continuous learning and skill development has never been more critical. Traditional education systems, while foundational, often struggle to keep pace with the dynamic developmental needs of industries and individuals. Micro-credentials (MCs) have emerged as a promising solution, offering flexible, targeted learning opportunities that enable individuals to acquire new skills and knowledge throughout their lives. Rooted in the principles of lifelong learning, MCs provide a pathway for upskilling, reskilling, and personal development, making them particularly relevant in the context of the Commonwealth Caribbean, where economic diversification and workforce readiness are pressing priorities (OECD Development Centre, & Inter-American Development Bank, 2024).

The Commonwealth Caribbean comprises 12 of the 20 small island developing countries in the Anglophone Caribbean Community (CARICOM) region. The Caribbean Examinations Council (CXC®), the Commonwealth of Learning (COL), and other organizations have recognized the importance of MCs (Commonwealth of Learning, 2024). With the desire to impact educational transformation in CARICOM as a whole, CXC® and COL structured an intervention to explore policy, application, and capacity development of MCs in all levels of education and training in the Commonwealth Caribbean region (Ali, 2023a; Commonwealth of Learning, 2024). Micro-credentials are generally defined as attestations of educational interventions lasting one semester or less, typically less than 45 hours, with some consisting of one or a few lessons of short duration (Ali, 2024). Micro-credentials are typically used to assess specific competencies or outcomes, providing successful learners with accreditation.

The Commonwealth Caribbean has distinct socio-economic, environmental, and educational challenges which it must address through educational transformations and so stands to benefit significantly from the adoption of MCs (CARICOM, 2017). However, the region's readiness to embrace this innovative approach to learning needs to be explored. This paper seeks to address this gap by presenting the findings of a survey conducted among key stakeholders, including educational administrators, faculty, and government officials, to assess their awareness, experiences, and attitudes toward MCs. The study aims to provide a comprehensive understanding of the current state of MCs in the region, identify barriers to their adoption, and propose strategies for their effective implementation.

The Lifelong Learning Paradigm serves as the conceptual framework for this study, emphasizing the continuous, flexible, and inclusive nature of learning. By framing MCs within this paradigm, the paper highlights their potential to support personal development, social inclusion, economic competitiveness, and active citizenship.

Conceptual Framework: Lifelong Learning Paradigm

The Lifelong Learning Paradigm is a comprehensive framework that supports accessibility and the flexible and inclusive nature of learning during the entirety of the learner's life (Kodhandaraman et al., 2011; Terziev, 2019). This provides a strong theoretical foundation for interpreting the survey data and for making evidence-based recommendations. This conceptual framework includes learning in various contexts and formats. UNESCO has defined lifelong learning as being for all levels of education, all age groups, all modalities, and all spheres and spaces. It is considered to be an investment in human capital contributing to economic growth and social development. This framework provides a rationale that is particularly appropriate for MCs, which enable people to acquire new knowledge and valuable skills throughout their lives. Micro-credentials can serve as an essential factor in addressing the region's skills gaps, supporting workforce development, and promoting accessibility and inclusion. This framework undoubtedly enhances the relevance and impact of MCs, within a policy setting, while supporting the learning and workforce needs of the Caribbean (UNESCO, 2020).

Methodology

A hybrid response survey instrument for collecting responses on the attitudes of critical educational stakeholders (education policy architects, education professionals, and others) towards MCs was created by the author and circulated by both the CXC® and the COL to regional education stakeholders. The survey comprising closed- and open-ended items underwent revisions based on feedback received from these two organizations. The survey was administered by COL via its website and by CXC® where approximately 300 Commonwealth Caribbean stakeholders identified were emailed for participation in the survey. Ultimately, a survey response rate of 52% was obtained, there being 157 responses, of which only 112 contained partial or complete data. The purpose of this survey was to gauge stakeholders' awareness and interest in, as well as their knowledge of and potential experience with, micro-courses, including their expressed concerns.

This paper consists of a survey, which formed one section of a report[1] to CXC® and COL. The comments from respondents, which have been categorized and summarized for clarity, provide the most valuable insights.

Findings

Demographics (Q1)

The survey primarily gathered responses from educational administrators and managers, who formed the majority of participants, followed by faculty and instructors. Most respondents were affiliated with governmental ministries, organizations, and tertiary education institutions. A significant portion of the respondents were veteran employees with over 10 years of experience in the education sector, with a female majority reflecting regional employment trends in education. Notably, the response rate did not align with the population sizes of the countries in the region. For instance, Saint Lucia, despite being much smaller than Jamaica, had more respondents, while Guyana garnered substantially more responses than other countries. This highlights the need for tailored strategies for the different countries in the region.

Figure 1

Respondents by Organization (N=112)

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[1]Available at https://oasis.col.org/items/b757b9e4-58d1-4bcc-b408-1ef5fddaf995/full
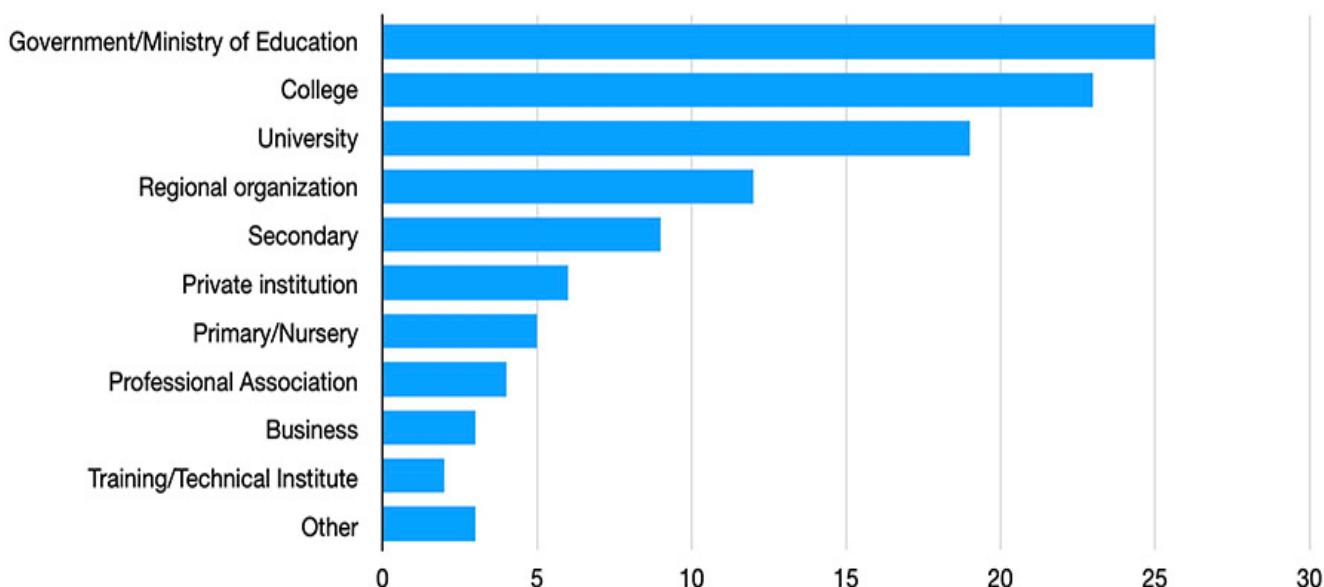
Figure 2

*Years of Experience in the Organization (N=112)*
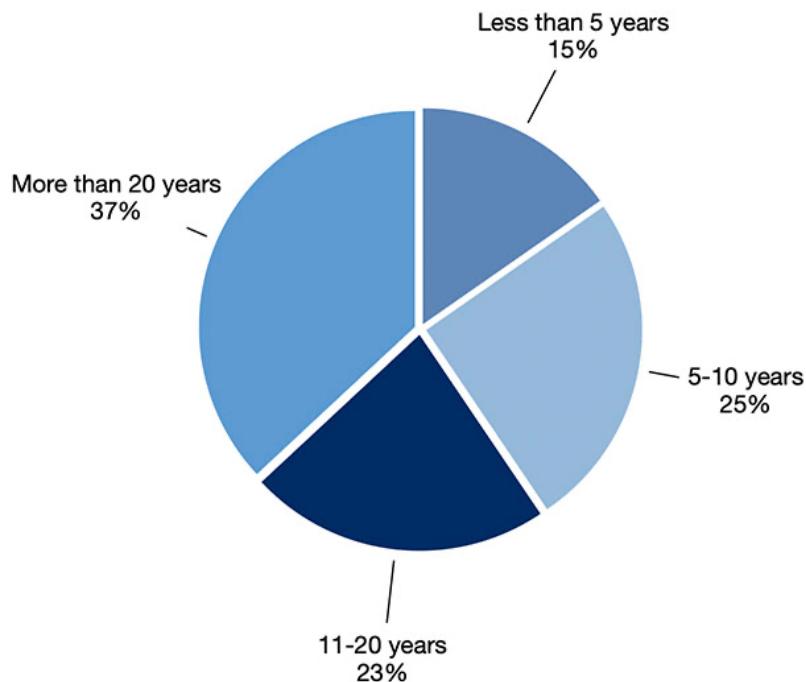
**Figure 3**

Respondents by Gender (N=112)
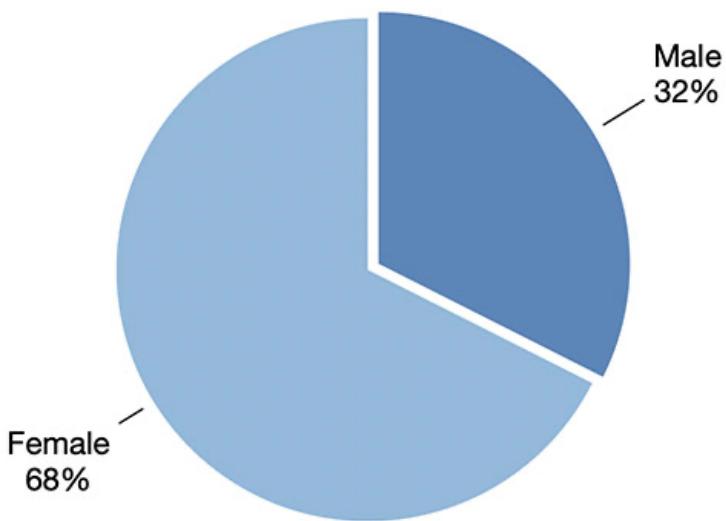
Figure 4

Country of Residence (N=112)
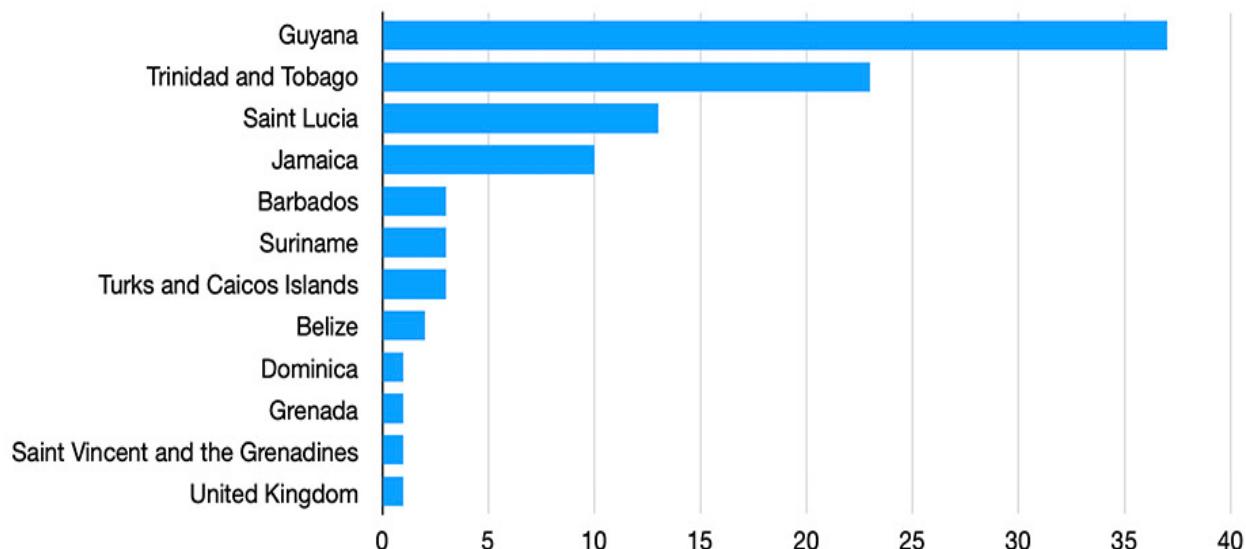
Awareness of Micro-credentials (Q2-Q4)

The majority of respondents were aware of MCs even though this term is not commonly used to describe the credentials offered for short courses in the region (Q2).

Figure 5

Response to Q2. Have you heard of micro-credentials before taking this survey? (N=112)
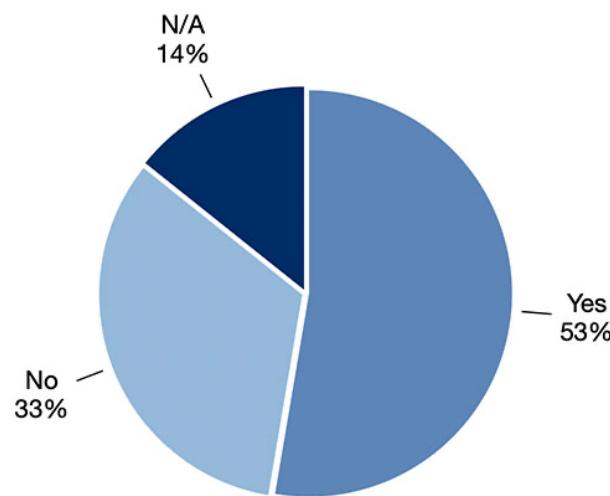
Most respondents (66%) had some familiarity with MCs, but the greater number of these were only somewhat or moderately familiar. At least a third noted that they had no awareness of MCs (Q3).

Figure 6

Response to Q3. How would you rate your familiarity with micro-credentials? (N=112)
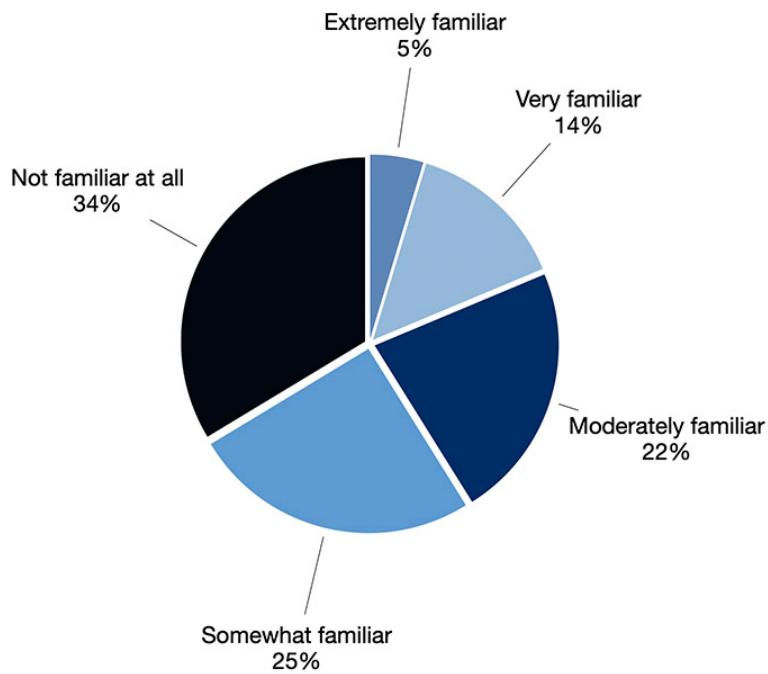

No country stood out as being more or less familiar (Q4). Unsurprisingly, the respondents indicated that they primarily learn about MCs through social networking. Professional associations and institutional websites are also important sources of information.

Figure 7

Response to Q4. What sources do you use to learn about new educational opportunities? (Check all that apply) (N=112)
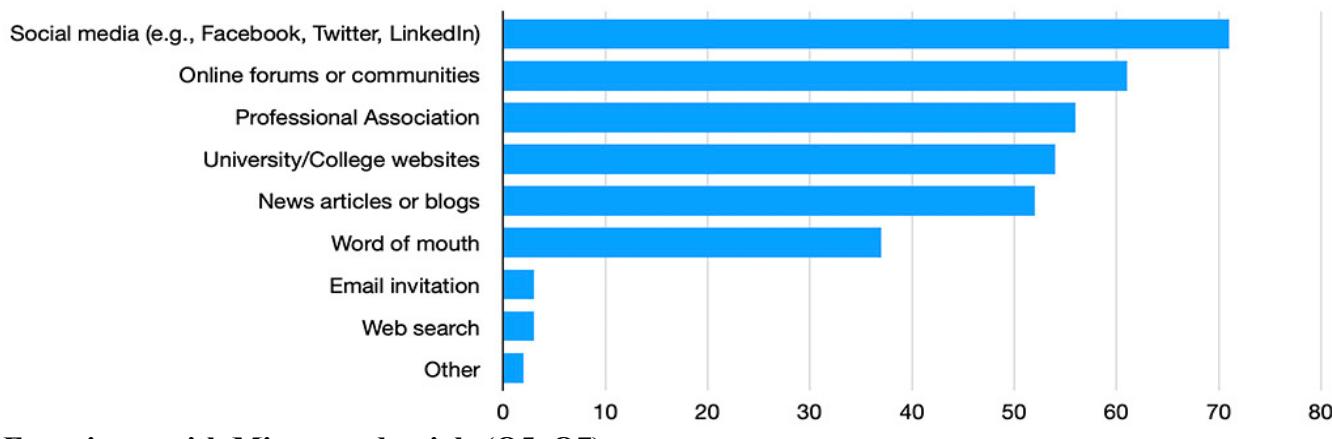
Experience with Micro-credentials (Q5–Q7)

Short courses in the Caribbean have been available for many years, predating the term "micro-credential," which has become familiar to educators. Half of the respondents reported having more than 10 years of experience in this regard (Q5).

Figure 8

Response to Q5. What is your experience with micro-credentials? (N=112)
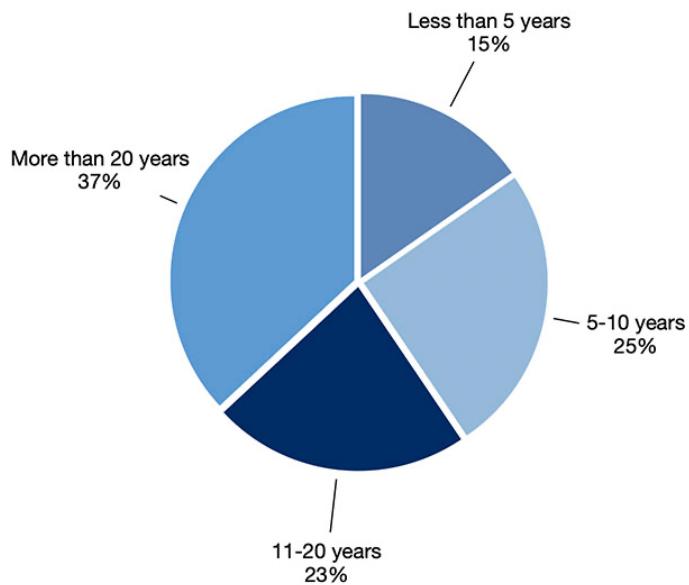
While 32 respondents stated that they had never been involved in developing or delivering short courses or programs, a large majority (80) had this experience, some going back many years (Q6[2]). Unsurprisingly, the motivation for creating short courses was primarily top-down from the administration in order to meet industry demands and/or generate new revenues. Personal interest was also an important factor (Q7).

Figure 9

Response to Q7. If yes, what motivated you to develop a short course or programme? (Check all that apply). (N=112)
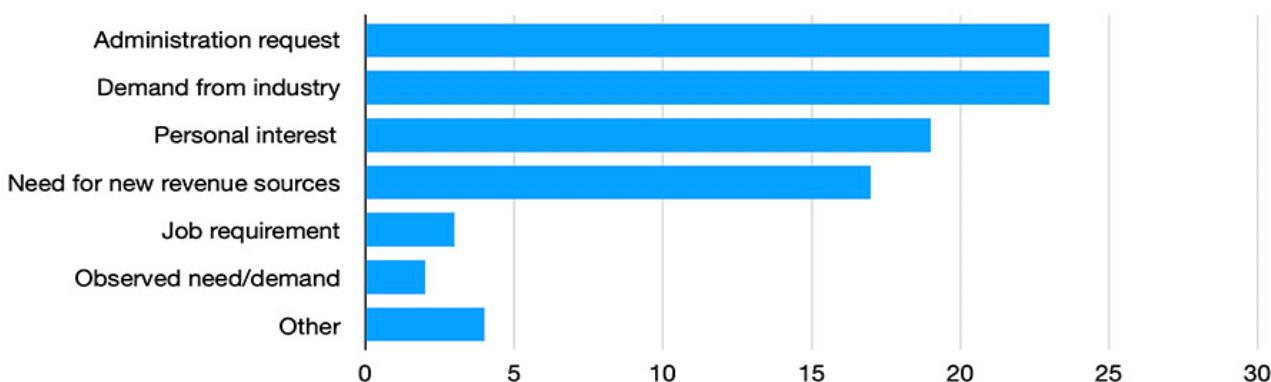
Note. The validation of this information from industry was not part of this exercise.

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[2] Q6. Have you ever been involved in developing or delivering a short course? Or programme leading to a certificate? (If NO. skip to #10)

Summary of Comments (Q7)

In response to participants struggling to complete a 12-hour course, the material was restructured into smaller, more manageable mini-courses, each ranging from 5 to 15 minutes. The experience in developing standards and guidelines for the quality assurance of MC learning products informed this decision. Mini courses were designed to address specific skills that are occasionally required on the job, such as learning new procedures or technologies, ultimately enhancing productivity.

Overwhelmingly, the experience of practitioners has been positive (Q8).

Figure 10

Response to Q8. If yes, what was your overall experience with the short course? (N=32; Yes=80)
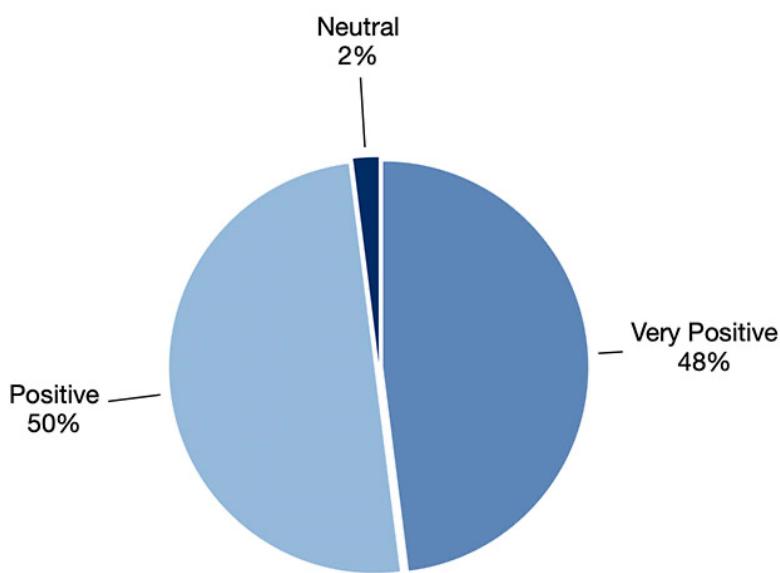
Summary of Comments (Q9)

Designing Micro-Courses

Q9. *Describe your experience and the impact on your work*. According to respondents, engaging in the design and development of MCs has provided significant professional growth and enhanced skill sets (80=YES). Creating digital media courses tailored to specific age groups has allowed for curricula that can be both age-appropriate and relevant to immediate educational needs. Through this process, at least one respondent learned to quickly build knowledge on administrative and personal interests, making micro-courses particularly pertinent and practical. From an organizational perspective, this experience has deepened an instructor's understanding of industry needs and strategies, fostering networking and improving the ability to identify and bridge skill gaps.

Other respondents incorporated MCs into a thesis; proposed learning pathways for lecturers to acquire skills in virtual reality (VR); and facilitated the transition of college lecturers to VR, enhancing

their teaching methods and improving student engagement. The practical aspects of VR area were thoroughly covered, including hands-on training that was both extensive and highly focused.

Facilitating Continuous Professional Development (CPD) programmes for the Ministry of Education in Guyana has also been a transformative experience. These five-day programmes, spanning 20 to 30 hours, were highly effective in addressing the day-to-day challenges faced by teachers. The training sessions were structured to provide practical solutions, ensuring that teachers could immediately apply what they learned to improve their teaching efficacy. This experience has reinforced the value of targeted, short-term professional development programs leading to MCs.

Learning in a Micro-Course

Taking MCs has been a boon for acquiring new skills and knowledge quickly and efficiently. These courses are designed to be short and to the point, providing immediate, actionable insights that can be implemented. They have also equipped instructors with skills applicable to both job-related tasks and external pursuits such as research and consulting. The best MCs employ flexible delivery modes, robust assessment and evaluation methods, and are directly relevant to contemporary industry needs. They condense quality learning objectives into manageable, bite-size pieces, offering certification within a short period. This approach not only meets the needs of adult learners but also ensures immediate upskilling and improved output quality.

Impact on Work

Micro-credentials have provided just-in-time new skills that are essential for productivity and efficiency. When faced with the challenge of low completion rates for a 12-hour course, it was broken down into smaller 5 to 15-minute mini-courses, which significantly improved completion rates. The bite-sized nature of these courses made them easier to integrate into daily routines. Access to ongoing professional development and curriculum content through flexible delivery and assessment provisions has been immensely beneficial. These MCs offered helpful, short-term training opportunities that increased productivity by addressing specific job-related needs, such as new technologies or procedures.

Developing a short course in Electrical Installation to upskill Electrical and Electronic Technology Teachers for the Revised curriculum in 2015 was another impactful initiative. From an organizational standpoint, this initiative helped in understanding the organization's needs, facilitating networking, and enhancing the ability to identify and address skill gaps. As both a beneficiary and benefactor, micro-credentialing has enabled the leveraging of the core competencies of various institutions on local, regional, and international levels.

Certification

Certification through MCs has played a critical role in professional development and mobility. This college offers customized training in areas such as pumps, valves, and home care nursing, benchmarked to international standards where possible. While these courses are certified by the college, there is a growing demand for international certification and foreign accreditation, underscoring the

value of recognized credentials. Such certifications ensure that the skills and knowledge acquired are validated, enhancing their worth in the job market and contributing to professional advancement.

Implementation

Standards and guidelines for MC learning products accepted across the Jamaican education sector have informed the development of various types of MCs, whether for upskilling, reskilling, or as components of full qualifications (University Council of Jamaica, n. d.). They aim to increase flexibility in integrating MCs into existing programme portfolios, expanding capacity to meet industry needs. Additionally, the guidelines advance competency-based practices, ensuring that learning outcomes are met. This well-articulated framework for the design, development, and delivery of MCs ensures they meet established standards, enhancing their credibility and effectiveness in professional development.

Neutral or Negative Experiences

Despite the many benefits of MCs, not everyone has engaged with them. Some individuals have never enrolled in or used MCs, opting instead for other types of courses to enhance their knowledge. Others are not familiar with the term or have not researched it prior to completing surveys. This indicates a need for greater awareness and education about the advantages of MCs. Despite these gaps, those who have utilized MCs overwhelmingly report positive experiences.

Challenges and Considerations

Micro-credentials can be seen as targeting a different market than the traditional one. This can present significant challenges. Intensive research and trials are required, which may not always be feasible with existing staff. This highlights the need for dedicated resources and strategic planning to effectively explore new market opportunities. Balancing the demands of current operations with the pursuit of new market segments necessitates careful consideration and often additional support to ensure successful implementation and outcomes.

Even with no experience, respondents showed a willingness to work with micro-credentials (Q10).

Figure 11

Response to Q10. If no, then would you be willing to work with micro-credentials in your field? (N=32)
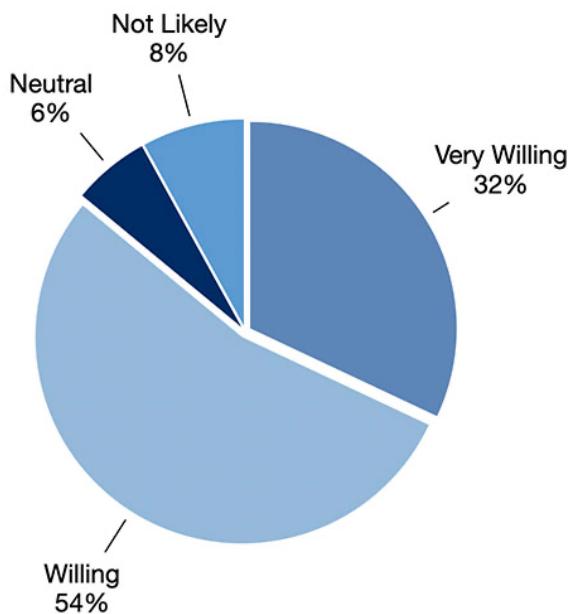
Among the respondents a large majority agreed or strongly agreed that MCs could strongly enhance the quality of education (Q11).

Figure 12

Response to Q11. To what extent do you believe micro-credentials can be implemented to enhance the quality of educational content and curricula? (N=112)
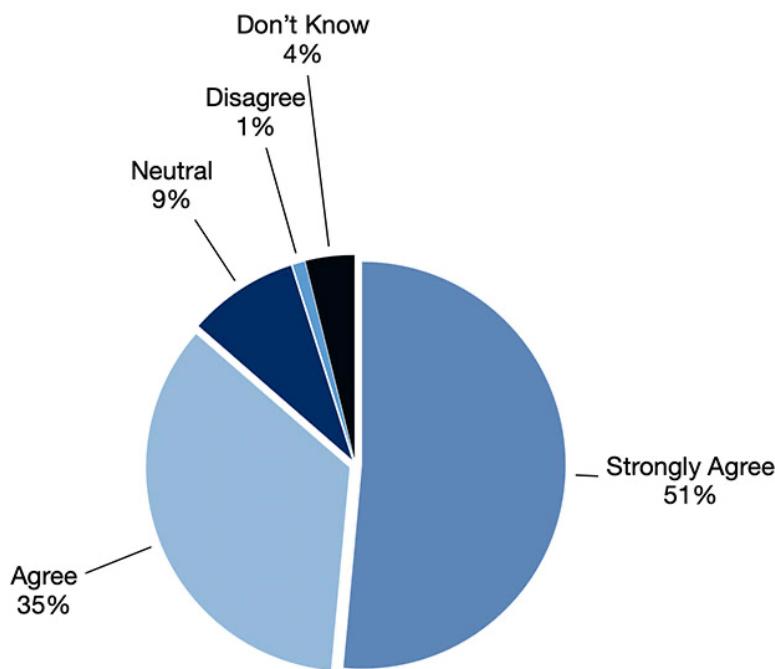
The principal advantages of micro-credentials were recognized by a majority of the respondents, with the greatest agreement on course customisation and accessibility to learning materials (Q12).

Figure 13

Response to Q12. In your opinion, what are the main advantages of incorporating micro-credentials in your educational environment? (Choose up to 3) (N=112)
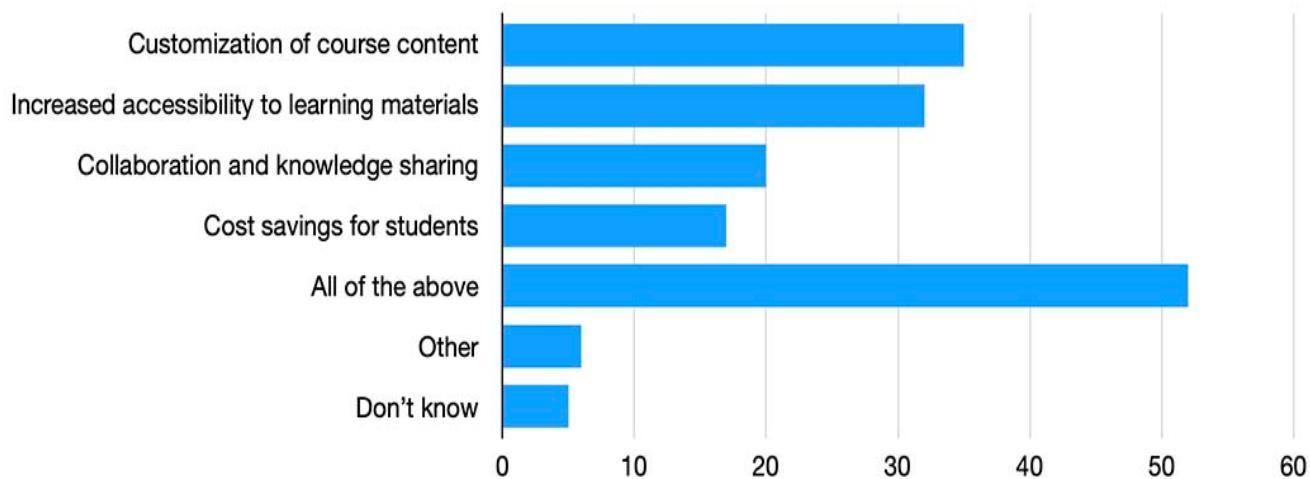
Respondents chose lack of awareness more than credential acceptance and resistance to change at their institutions as principal challenges. Quality concerns were also considered important. Alignment with goals was not considered to be as important; and concerns about the quality of the MCs, as well as their alignment with organizational goals were less commonly expressed challenges (Q13).

Figure 14

Response to Q13. What challenges do you foresee in the adoption of micro-credentials within your institution? (N=112)
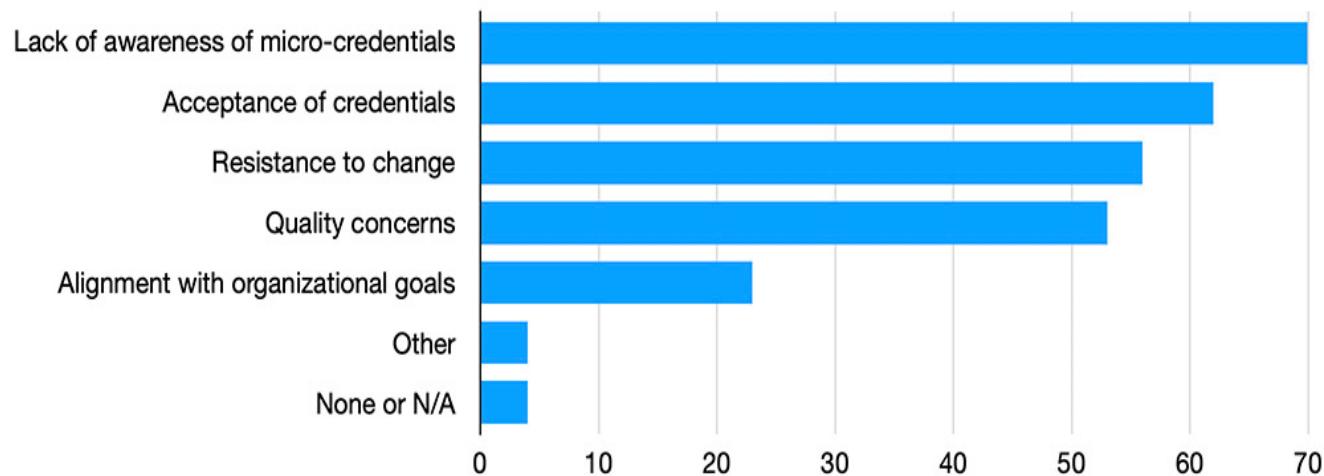
Micro-Credential Policies

Not surprisingly, because few institutions had policies or guidelines, so respondents were not aware of any (Q14).

Figure 15

Response to Q14. Are you aware of any existing policy, guidelines or initiatives regarding the use of micro-credentials at your (or another) organization? (N=112)
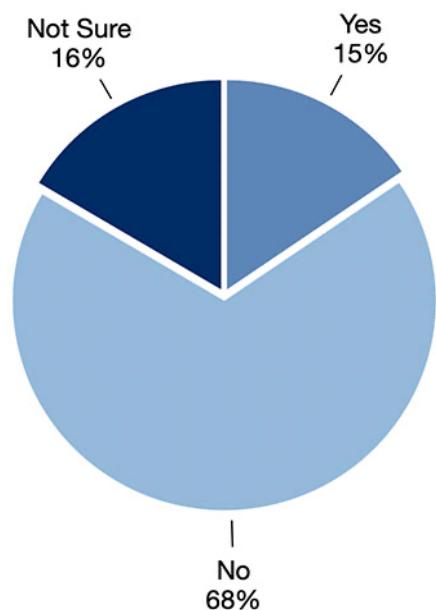
Summary of Comments (Q14)

Currently, a committee is collaborating with a training agency on micro-credentialing initiatives. While some organizations do not enforce micro-credentialing, others do. Micro-credentials have been present since the introduction of CXC® exams. Although policies exist for developing programs, including short courses, the term "micro-credential" is not explicitly mentioned. There is an approved procedure for certified special and short courses. The COL, in collaboration with national instructors developed an education leadership program, which included three short courses delivered over nine weeks, equivalent to approximately 3.5 undergraduate academic credits. Additionally, UNESCO and its specialized institute, UNESCO IIEP, have published policy guides on micro-credentials, offering blueprints for policy development and action.

The majority of respondents (72%) felt that MCs could be effective, with only one respondent finding that they were ineffective (Q15).

Figure 16

Response to Q15. If yes, how would you rate its effectiveness in promoting the use of micro-credentials? (N=112)
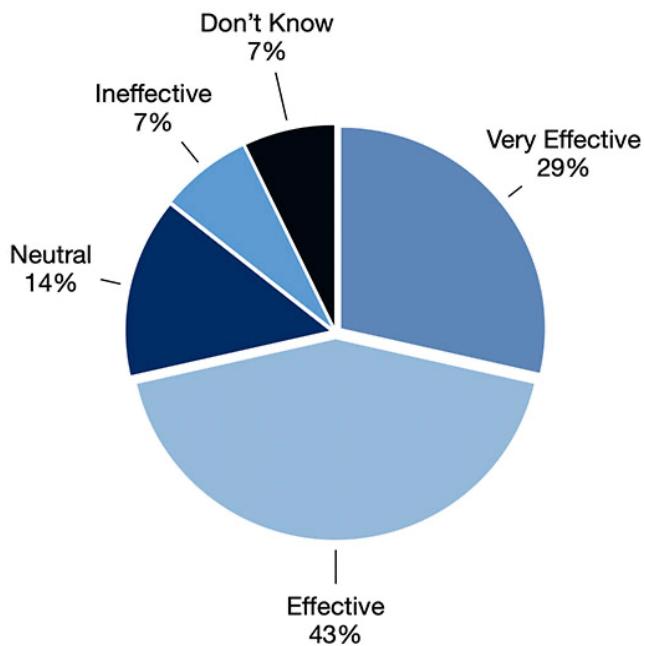
Summary of Comments Q16

Q16. *Opinions on expanding the use of micro-credentials in your institution or organization.*

Awareness and Promotion

      Raising awareness about the value and importance of MCs is crucial. Currently, the focus should be on initiating efforts rather than expanding existing ones. It is essential to begin sensitizing educators about the benefits of MC programs, combining awareness initiatives with pilot programs, and staggered rollouts for optimal impact. Government involvement is necessary to promote micro-credentialing, emphasizing its validity, application, and acceptance both locally and internationally across all programs, including the visual and performing arts. Enhancing communication with stakeholders about the quality, relevance, and practical benefits of MCs is also vital. Ensuring greater awareness and access to these programs is essential for their success.

      Efforts should be directed towards improving public awareness through social media, schools, and stakeholders, utilizing forums, seminars, workshops, and brochures. It is important to educate employees and management about MCs, highlighting their value for professional development and career growth. Increasing communication with potential clients can create demand, justifying the expansion of these courses, especially in private sector colleges.

Incentives and Support

Providing a robust support system and incentives for individuals pursuing MCs is essential. This includes allocating time for teachers to complete courses, balancing institutional responsibilities. Implementing a reward system for completing MCs, such as a point system for recognized certifications, can motivate individuals. Linking MCs to opportunities for advancement, recognition, or benefits like sabbaticals and sponsored trips can further encourage participation. Institutions could also offer employees the opportunity to do short online courses.

Training and Implementation

Integrating MCs within existing programs is crucial for their success. Incentives like time-off for face-to-face events and workshops on the benefits of MCs can motivate participation. Establishing committees to design courses and a dedicated unit for producing MCs is necessary. Training faculty, staff, and administrators on the development and implementation of MCs is essential. Aligning MCs with specific industry skills and offering them to local and regional business employees can enhance their relevance. Promoting MCs early and ensuring their quick acceptance is important for their widespread adoption.

Policy. Developing clear public and organisational policies for the development and quality assurance of MCs within existing guidelines is essential. Establishing policies for the acceptance of MCs in promotions and career advancements can encourage their uptake. These policies should outline the rules and guidelines for micro-credentialing, ensuring their integration into the broader educational framework.

Access to Learning. Improving accessibility and awareness of programs, content, and qualified coaches is called for. Addressing barriers to accessing these programs, especially for top management, by demonstrating financial feasibility and cross-border benefits, can increase participation.

Cost. Acknowledging the high costs of hiring external coaches is important, as it can make programs less attainable for most individuals. Demonstrating the financial feasibility of these programs, especially to top management, can help in securing necessary resources.

Other Comments. Creating an organization to provide MC workers on a stipend, like internship programs, can ensure competency and facilitate job placements. Significant effort is required to implement these programs, including orientation workshops for better understanding. Institutions could consider leveraging past models and splitting syllabi into parts to offer continual certification opportunities. Ensuring MCs are recognized in appointments and promotions by providing credits for additional points can encourage participation. Including MCs as part of the criteria for job evaluations and promotions can further validate their importance.

Respondents, by a wide margin, agreed that their institutional leaders are very supportive of micro-credentials (Q17).

Figure 17

Response to Q17. How supportive do you believe your organization's leadership is regarding the implementation of micro-credentials? (N=112)

Don't Know
13%

Not Very Supportive
2%

Neutral
12%

Very Supportive
42%

Somewhat Supportive
31%
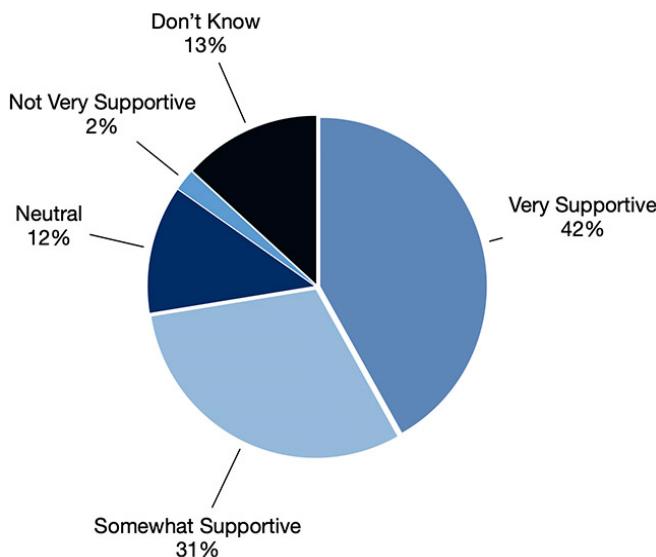
In contrast to the belief in the support that institutional leadership has for MCs, few institutions have provided training. Unsurprisingly, the countries with the most respondents also show the most respondents who have received training in MCs (Q18).

Figure 18

Response to Q18. Have you received any training or support related to micro-credentials from your institution? (N=112)

Not applicable
10%

Yes
15%

No
74%

Guyana 6

Trinidad & Tobago 4

St. Lucia 2

Jamaica 2

Suriname 1
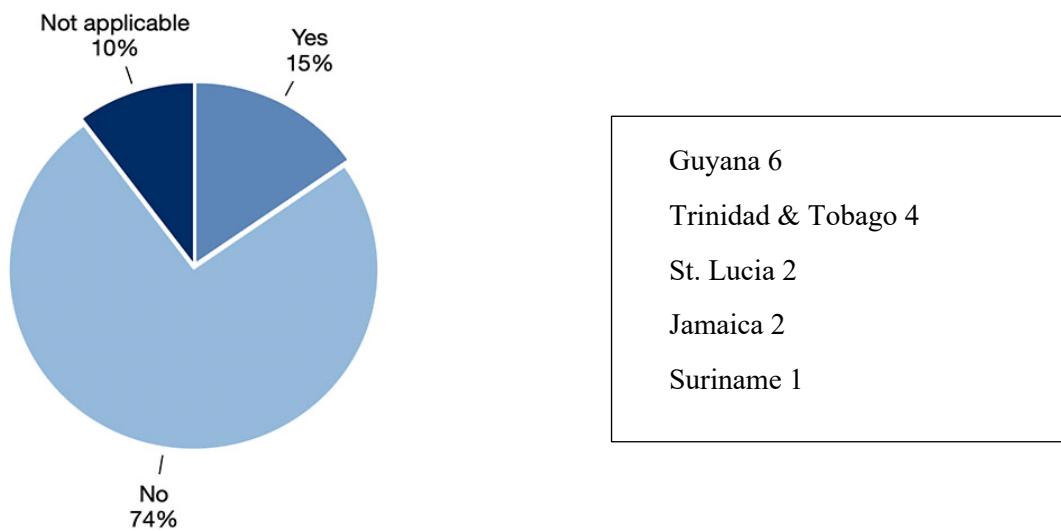
Of the 15 respondents who received training, 80% found it effective, with only one person believing that their training was ineffective (Q19).

Figure 19

Response to Q19. If yes, how would you rate the effectiveness of the training or support provided? (N=15)
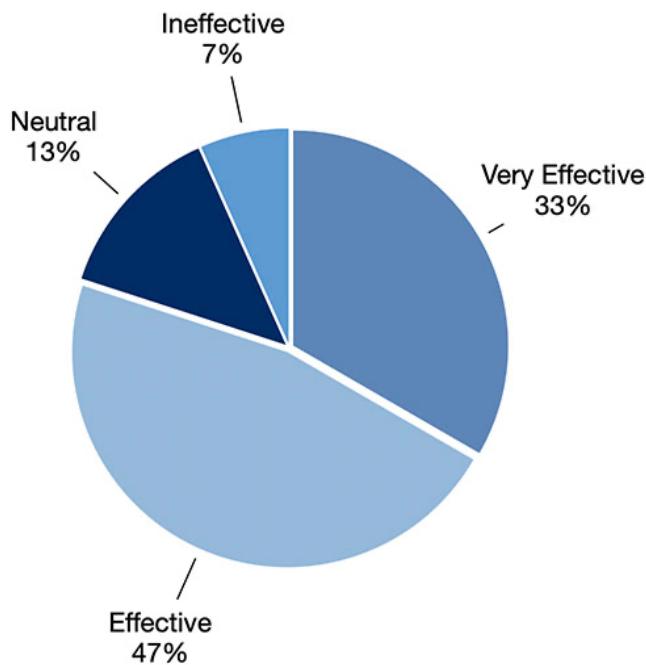
Suggestions and Feedback from Respondents

Survey of Comments Q20

Micro-credentials offer significant benefits for the Caribbean region by providing targeted, specific skill sets that improve employee productivity. These certifications enable workers to quickly gain relevant skills without the need for extensive in-house training, thereby offering an economic advantage to businesses. Companies can save on training costs while ensuring their employees current with the latest industry standards and practices. Promoting MCs as a cost-effective solution can help businesses recognize their value in maintaining a competitive edge in the market.

Awareness Campaign. A regional awareness campaign could highlight the value and utility of MCs. By leveraging marketing strategies, information sessions, and success stories, such a campaign can underscore the advantages of MCs for career advancement and lifelong learning. Sharing real-life examples of individuals who have benefited from these certifications could be used to inspire others to pursue similar pathways, ultimately creating a more skilled and adaptable workforce.

Increased Publicity of Its Credentials. Enhancing the publicity of MCs involves strategic efforts to make their value widely recognized throughout the region. This can include publishing articles in industry journals, presenting at conferences, and partnering with professional associations. By increasing visibility, these credentials can become mainstream, leading to greater acceptance and integration within various industries.

Advertisements and Marketing. Utilizing regional advertisements and marketing, particularly through influencers and social media, can also be used to significantly boost the reach and appeal of MCs. Influencers can share their positive experiences and success stories, while targeted ads can reach potential learners. Social media platforms provide an interactive space to engage with audiences, answer questions, and build a community around micro-credentialing.

Student Engagement and Feedback Sessions. Engaging students through feedback sessions is essential for understanding their needs and improving the micro-credentialing process in participating countries. These sessions can provide insights into what students find valuable and what areas need enhancement. By involving students in the development and refinement of these programs, educational institutions can ensure that the offerings remain relevant and effective.

Stakeholder Collaboration. Engaging key stakeholders, including educational institutions, employers, and government bodies, is critical to ensure that MCs meet regional labour market needs and are recognized as valid qualifications. Collaboration can help align these programs with industry standards and ensure that they are valued by employers. Stakeholders can work together to create a supportive standards-based ecosystem that promotes the adoption and success of MCs enabling regional labour mobility.

Need for Upskilling and Reskilling. Given the rapid pace of change in the modern workforce, there is an even greater need for upskilling and reskilling. Micro-skilling offers new avenues for individuals and organizations to adapt and develop resilience in the face of change. These flexible learning opportunities enable workers to stay current with emerging trends and technologies, ensuring they remain competitive and capable in their roles.

Educate, Train, and Promote. Education and training are fundamental to promoting the benefits of MCs. Conducting region-wide public education initiatives, such as webinars and professional development sessions, can spread awareness and understanding. Training sessions with regional bodies and institutions can help implement these programs effectively. Change management initiatives can ensure that new elements are integrated into existing systems, encouraging participants to apply what they have learned.

Public Education and Training. Webinars, professional development sessions, and other strategies with key educational personnel can play a pivotal role in public education and training. These platforms provide a space for detailed discussions on the benefits of MCs, best practices for implementation, and success stories. Sharing this knowledge can drive interest and participation in MC programs.

Online Course Availability. Increasing the availability of online courses can make MCs more regionally accessible to a broader audience. Online platforms offer flexibility for learners to study at their own pace and from any location. This accessibility is especially important for those balancing work, family, and other commitments, making it easier for them to pursue further education and skill development.

Strategic Communication. Strategic communication of related concepts and stakeholder feedback via social media and websites can enhance the promotion of MCs. By maintaining a consistent and informative online presence, educational institutions and organizations can keep potential learners informed and engaged. Feedback mechanisms can also help continuously improve the offerings and address concerns or suggestions from stakeholders.

Alignment with Compensation. Aligning MCs with compensation rates involves establishing a framework that recognizes and rewards the successful completion of these certifications at a regional level. Awareness campaigns and marketing strategies are essential to communicate the value of MCs in terms of financial and career growth. This alignment can incentivize workers to pursue these qualifications, knowing that their efforts will be financially acknowledged.

Financial Incentives. Offering financial incentives, such as scholarships, grants, or reduced tuition fees, can encourage enrollment in micro-courses, particularly among underrepresented groups. These incentives make education more accessible and attractive, helping to bridge the gap between skilled labor demands and the available workforce.

Integration with Traditional Degrees. Creating regionally accredited learning pathways that allow MCs to ladder towards traditional degrees can enhance the appeal of MCs. Such regional integration provides a clear and progressive educational trajectory for students, making it easier for them to pursue higher qualifications while gaining practical skills along the way.

Promotion and Endorsement by Institutions. Leading regional institutions need to endorse and promote MCs to build confidence among employers and training institutions. Greater sensitization and forums involving post-secondary and Technical and Vocational Education and Training (TVET) institutions can foster broader acceptance. Partnerships with renowned regional and international institutions can further legitimize these certifications, making public buy-in more achievable.

Linkages with Renowned Institutions. Forming linkages with renowned regional and international institutions can accelerate the acceptance of MCs. If local institutions offer these programs in collaboration with prestigious partners, it lends credibility and increases their perceived value. This approach can also facilitate the transfer of best practices and standards, enhancing the overall quality of the offerings.

Foundation for Other Courses. Making MCs a foundation for programmes and offering credits for them at regional universities and colleges can encourage enrolment. This strategy can not only add value to the credentials themselves but also could create a seamless educational pathway for students to advance their knowledge and careers.

Employer Acceptance. There is little understanding of MCs among regional employers, so improving the acceptance of MCs among them is crucial. If employers recognize and value these certifications in their hiring and employee development processes, it will drive greater interest and participation. Demonstrating the practical benefits of MCs in real-world job performance can help achieve this acceptance.

Role of Accreditation Bodies. Regional and national quality assurance and accreditation bodies should play a more active role in recognizing and incorporating MCs into the academic stream. Learning from successful models in Europe and North America can provide valuable insights. Standardizing these credentials across the region can ensure their portability and acceptance, facilitating the mobility of learners.

Regional Policy and Market Strategy. Developing a regional policy document and market strategy for MCs can provide a clear framework for implementation. Training stakeholders on these policies and promoting them widely can help ensure consistent standards and practices across institutions and employers.

Quality Assurance Structures. Establishing robust quality assurance structures, recognition agreements, and trust networks is essential for the credibility and acceptance of MCs. These mechanisms ensure that the credentials are respected and valued across different sectors and regions, promoting learner mobility and confidence in the qualifications.

Resource and Accessibility Considerations. Ensuring access to the Internet and suitable devices is critical for the successful completion of MC courses. Investments in regional infrastructure and resources can bridge the digital divide, making these learning opportunities accessible to a wider audience. Providing training on navigating learning resources and applications can also support learners in their educational journey.

Budgeting for Promotion. Increased budgeting for the promotion and advancement of MCs is necessary. Allocating funds for marketing, outreach, and resource development can enhance awareness and participation. Making these programs affordable and accessible to a diverse population ensures that more people can benefit from them.

Affordability and Accessibility. Providing affordable and accessible modes of acquiring MCs can meet the needs of a wide spectrum of people across the region. Offering flexible payment options, subsidies, or sliding scale fees can remove financial barriers, allowing more individuals to pursue these valuable qualifications.

Multi-Stakeholder Approach. A multi-stakeholder approach to public education and awareness is essential for the effective design and delivery of MC content in the participating countries. Engaging various levels of the educational ecosystem, from policymakers to industry partners, ensures that programs fill existing and future knowledge gaps. Collaboration with industry and educational institutions can create flexible learning pathways and meet competency requirements, making the experience rewarding for all parties involved.

Stakeholder Buy-In. Ensuring that key stakeholders buy in and accept their roles is crucial for a smooth transition to the use of MCs. This collaborative effort can align goals, resources, and expectations, fostering a supportive environment for learners and enhancing the overall success of these programs.

Key Observations

This investigation demonstrated the importance of a multifaceted approach. The findings emphasize the need for targeted educational efforts, clear communication, and ongoing support. The participatory nature of the process, from the survey, ensured that any resulting MC initiative will be well-informed, more widely accepted, and aligned with the unique needs and challenges not only of CXC®, but of the Commonwealth Caribbean educational ministries. Continuous evaluation and adaptation will be crucial for the successful acceptance, implementation, and sustained impact from the introduction of a micro-credential system in the region.

Stakeholders should consider supporting the recommendations of Dr. Eduardo Ali of CXC® and Dr. Sanjaya Mishra of the COL for a micro-credential framework, a federated registry of micro-credentials, and local capacities, a micro-credentialing system as an educational subsystem within the CXC® as a Qualifications Management Framework (QMF) (See Ali, 2023b; Mishra, 2022). The CARICOM Qualifications Framework (CQF) could include a micro-credential framework aligned to it for the region's benefit, including a clear strategic roadmap for ensuring that there is a coordinated strategy for education ministries to invest in, develop, and regulate MCs.

There are defined pathways for capacity building in education, training, and employment sectors. They can be linked to the other phases of the project for the Micro-credential Framework of the Caribbean designed by CXC® and COL. The objective is to ensure that educational and training institutions can competently design and offer MCs that are regulated. In addition, employers' requirements for occupations/jobs skills can be addressed by institutions with MCs to engage learners in just-in-time upskilling, retooling, and training for both employees and potential employees.

Recommendations

1. Because the lack of awareness of MCs has been identified as a major obstacle to their implementation, targeted awareness campaigns to educated stakeholder on the benefits of MCs could hasten acceptance. The benefits of MCs in supporting regional economic growth, workplace upskilling and reskilling as well as social inclusion must be more widely known.

2. Institutional inertia has also been identified as a significant obstacle to MC implementations. A cultural shift to lifelong learning using technology would be one means of overcoming this.

3. The adoption of clear public and organizational policies and guidelines by governments, key educational institutions, assessment entities, quality assurance bodies, businesses, and other organizations could play a major role in supporting MC implementation.

4. Robust quality assurance mechanisms to ensure the credibility and portability of MCs should be implemented by educational institutions and accrediting agencies.

5. Collaboration and partnerships among educational institutions, employers, and governments is essential for ensuring the success of MCs across the region.

6. The barriers of limited Internet connectivity and computer access as well as the lack of digital literacy, especially in underserved areas must be surmounted.

7. Micro-credentials must be linked to schools, vocational training, and higher education. MCs should be designed as stackable credentials so that learners can accumulate credits towards higher qualifications.

8. Micro-credentials that are delivered through online and blended learning formats can make education more accessible and more affordable.

9. Open Educational Resources (OER), combined with Artificial Intelligence (AI) can significantly reduce the cost and time to produce MCs. Training programs on taking advantage of these OER and AI will enhance the value proposition in creating quality MCs.

10. Micro-credentials can conform to some of the standards proposed or endorsed by national QA bodies such as the University Council of Jamaica and the Accreditation Council of Trinidad and Tobago.

11. CXC® has also developed its own standards and practices for micro-credentialing in teacher training courses and secondary education qualifications. The organization is progressing along a continuum to introduce MCs as an innovative flexible approach to education for sustainability and lifelong learning involving educators, children, and youth.

Closing

Caribbean Examinations Council (CXC®), in collaboration with the Commonwealth of Learning (COL), has concluded a comprehensive investigation into understanding the state of the art in micro-credential (MC) practice within the region and the possible affordances and challenges of MC implementation. This report outlines the journey from the initial stages, involving document examination and online survey that has shed light on the need for a MC system with standards acceptable by the different states in the region.

The methodology employed, including the review of existing MC documents, government strategic plans, data on short courses, and an online survey revealed a comprehensive understanding of the current MC landscape in the Commonwealth Caribbean region. The investigation, through various stages of the process, facilitated the identification of affordances and challenges, which can be used for the collaborative shaping of regional MC initiatives, based on common standards and credit acceptance enabling student and worker mobility throughout the region.

Support from COL exemplifies the commitment of this international organization to the promotion of MCs for quality teaching and learning. The collaboration between COL and CXC® as detailed in this report, can serve as a model for institutions seeking to implement MC credentials internationally.

Applying the Lifelong Learning Paradigm framework has provided a strong theoretical foundation for interpreting the findings and making recommendations. Micro-credentials, when framed as a tool for lifelong learning, addresses barriers, links them to broader goals, and proposes a lifelong

learning environment highlighting the role of technology. This provides a roadmap and offers a more comprehensive and integrated approach to MC implementation in the Caribbean, increasing MC relevance and impact, both for policymakers and practitioners. The findings reveal that while many stakeholders are familiar with the concept of MCs, significant challenges such as lack of awareness, resistance to change, and limited access to technology must be addressed to unlock their full potential.

In conclusion, this investigation not only supports agreement on a commitment to MC expansion but also provides valuable insights and a potential model for institutions and policymakers worldwide aiming to embrace the principles of student and workforce mobility, affordability, and innovation in education. This paper can contribute to the global discourse on shaping effective MC interventions.

Acknowledgements

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Intelligence artificielle et formation universitaire : analyse bibliométrique des tendances et perspectives de recherche

Artificial Intelligence and University Education: Bibliometric Analysis of Research Trends and Perspectives

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Résumé

Cette étude examine les tendances et les développements des publications ainsi que la dynamique de collaboration scientifique entre auteurs, pays, organismes et sources récentes liés à l'utilisation de l'intelligence artificielle (IA) dans la formation et l'apprentissage universitaires. Une analyse bibliométrique de 285 articles publiés depuis 2014 jusqu'au 26 mars 2024, issus de la base de données *Web of Science* a révélé une forte association entre l'IA et des thèmes tels que l'éducation, la motivation des étudiants, le « feedback » et l'autocontrôle. La Chine et les États-Unis sont les pays les plus influents dans ce domaine de recherche, avec une collaboration croissante d'autres pays, comme le Afrique du Sud, Brésil, Canada, Israël, Pologne, Singapour, Vietnam depuis 2023. Les premières publications remontent à 2022 dans des revues spécialisées comme *International Journal of Educational Technology in Higher Education* et *Educational Technology & Society*. Bien que l'analyse présente certaines limites, telles qu'une compréhension réduite des tendances, une couverture partielle des publications et une faible représentativité des données, elle offre des *insights* précieux pour de futurs projets de collaboration interdisciplinaires et de recherches qualitatives visant à mieux comprendre la dynamique de l'intégration de l'IA dans l'enseignement supérieur.

Mots-clés : analyse bibliométrique, apprentissage, formation universitaire, intelligence artificielle, tendances de recherche

Abstract

This study examines the trends and developments in publications, as well as the dynamics of scientific collaboration among authors, countries, organizations, and recent sources related to the use of artificial intelligence (AI) in university education and learning. A bibliometric analysis of 285 articles

published since 2014 until March 26, 2024, drawn from the *Web of Science* database, revealed a strong association between AI and themes such as education*,* student motivation, feedback, and self-control. China and the United States are the most influential countries in this research field, with increasing collaboration from other countries such as Brazil, Canada, Israel, Poland, Singapore, South Africa, and Vietnam since 2023. The earliest publications date back to 2022 in specialized journals such as *International Journal of Educational Technology in Higher Education* and *Educational Technology & Society*. Although the analysis has limitations, such as a limited understanding of trends, partial coverage of publications, and low representativeness of data, it provides valuable insights for future interdisciplinary collaboration projects and qualitative research aimed at better understanding the dynamics of AI integration in higher education.

Keywords: artificial intelligence, bibliometric analysis, learning, research trends, university education

Introduction

L'IA révolutionne la formation et l'apprentissage universitaires en offrant de nouvelles perspectives pour améliorer l'expérience d'apprentissage et optimiser les stratégies pédagogiques (Chiu et al., 2023). Elle offre de nombreuses applications à l'enseignement supérieur, telles que les *chat bots* [agents conversationnels] pour un soutien personnalisé aux étudiants et l'analyse de données pour identifier les lacunes d'apprentissage et proposer des stratégies d'enseignement adaptatives (Chen et al., 2022). Cependant, son utilisation dans l'enseignement supérieur étant récente et en constante évolution, il est difficile d'en mesurer l'influence réelle sur l'apprentissage et l'enseignement. Une analyse bibliométrique peut aider à comprendre les tendances et les développements récents dans ce domaine en dégageant les thématiques les plus répondues, les collaborations entre chercheurs et institutions et l'évolution temporelle de la recherche sur l'IA en enseignement supérieur (Zawacki-Richter et al., 2019).

Plusieurs analyses bibliométriques ont révélé une croissance exponentielle des publications sur l'IA dans l'éducation, y compris dans l'enseignement supérieur entre 2018 et 2023, avec une augmentation de 135 à 901 articles (Ivanova et al., 2024). Les revues en éducation étaient les plus représentées, avec l'apprentissage automatique, le système de tutorat, l'analyse des données et la personnalisation de l'apprentissage comme thématiques les plus courantes (Zawacki-Richter et al., 2019). Les défis et opportunités identifiés comprennent la nécessité de développer des systèmes d'IA plus transparents et éthiques, ainsi que la formation des enseignants à l'utilisation de ces technologies (Ivanov, 2023).

C'est dans la continuité de ces travaux de recherche que s'inscrit notre analyse bibliométrique de la littérature sur l'IA dans l'enseignement supérieur. Cette analyse vise à déterminer les tendances, les résultats clés et les lacunes. Nous présenterons les applications et défis de l'IA dans ce contexte, ainsi que notre méthodologie d'analyse. Les résultats de cette étude offrent des perspectives prometteuses pour guider la recherche future et orienter les pratiques pédagogiques dans ce contexte en pleine transformation. Dans la discussion, nous synthétiserons les résultats, discuterons des implications

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pratiques et théoriques, présenterons les limites de notre étude et proposerons des perspectives pour les futurs chercheurs.

L'IA dans l'enseignement supérieur : tendances, applications et défis éthiques

L'IA est un domaine interdisciplinaire qui vise à développer des machines capables d'effectuer des tâches nécessitant habituellement une intervention humaine, par exemple la compréhension du langage naturel, la reconnaissance d'images, la prise de décision et la résolution de problèmes (Hutter, 2005). L'IA se divise en deux catégories, chacune ayant ses propres objectifs, méthodes et applications. L'IA faible est conçue pour des tâches spécifiques, comme la reconnaissance vocale ou d'images (Szeliski, 2021). L'IA forte ou générale vise à créer des machines capables d'effectuer des tâches intellectuelles humaines et de s'adapter à des tâches variées (Lake et al., 2017).

L'apprentissage automatique utilise des algorithmes pour permettre aux machines d'apprendre à partir de données. Le traitement du langage naturel se concentre sur la compréhension et la génération de langage humain par des machines, tandis que la vision par ordinateur traite de la reconnaissance et de l'interprétation d'images et de vidéos par les machines. Ces technologies sont utilisées dans des applications, telles que la traduction automatique, la reconnaissance faciale et la conduite autonome. L'importance de cette technologie prometteuse et utilisée dans divers domaines, tels que la santé, la finance, le transport et l'éducation (Vemuri, 2014) provient de sa capacité à traiter et à analyser de grandes quantités d'informations, ce qui aide les entreprises à prendre des décisions efficaces. Ce traitement d'information se fait grâce à des algorithmes d'apprentissage automatique qui prédisent les résultats et permettent des mesures proactives (Marr, 2019). De plus en plus utilisée dans l'éducation et dans l'enseignement supérieur, l'IA permet d'améliorer l'expérience d'apprentissage, de personnaliser et d'adapter l'enseignement en analysant les données des étudiants (Castellano et al., 2024). Elle aide les enseignants à améliorer leurs stratégies d'enseignement, à repérer les lacunes et à optimiser les conditions d'apprentissage (Tang, 2024). Elle permet par ailleurs aux enseignants de développer leurs compétences professionnelles en les faisant s'interroger sur leurs interventions (Moura & Carvalho, 2024).

Sur le plan des défis éthiques, l'intégration de l'IA dans l'enseignement supérieur soulève de nombreuses questions fondamentales qui nécessitent une attention particulière. La protection des données personnelles des étudiants constitue une préoccupation majeure, car les systèmes d'IA collectent et analysent d'importantes quantités d'informations sur les comportements d'apprentissage, les performances et les caractéristiques individuelles (Williams, 2024). Cette situation pose des questions cruciales concernant le consentement éclairé, la confidentialité et la sécurité des données. Par ailleurs, l'utilisation de systèmes de surveillance basés sur l'IA pour suivre la participation et les performances des étudiants risque de créer un environnement de surveillance excessive qui pourrait compromettre l'autonomie des apprenants et altérer la relation pédagogique fondée sur la confiance (Lee & Fanguy, 2022). Le recours aux algorithmes prédictifs pour évaluer les performances ou orienter les parcours académiques soulève également des interrogations quant aux biais potentiels qui pourraient perpétuer ou amplifier des discriminations existantes basées sur le genre, l'origine ethnique ou le statut

socioéconomique (Gorgun & Yildirim-Erbasli, 2024). La transparence des systèmes d'IA utilisés dans l'éducation représente un autre défi éthique majeur. La nature « *boîte noire* » de certains algorithmes complexes rend difficile la compréhension de leur fonctionnement par les enseignants et les étudiants, ce qui compromet la possibilité de contester ou de remettre en question les décisions automatisées (Liu et al., 2024). Une telle opacité soulève des questions relatives à la responsabilité et à l'imputabilité en cas d'erreurs ou de préjudices causés par ces systèmes.

Bien que l'IA offre des avantages pour l'apprentissage universitaire, son utilisation excessive peut réduire les interactions humaines et affecter négativement la motivation et l'engagement des apprenants (Altinay et al., 2024). De plus, la personnalisation de l'apprentissage à l'aide des données suscite des préoccupations quant à la confidentialité et la protection des données.

Face à la dichotomie entre les avantages éducatifs et les dilemmes sociétaux et éthiques que présente l'IA dans le domaine de l'enseignement supérieur, il est essentiel d'entreprendre une analyse bibliométrique pour examiner la progression de la littérature savante et ces dimensions multidimensionnelles. Cet examen revêt une importance scientifique considérable, vu que ce domaine de recherche est principalement marqué par une augmentation exponentielle du nombre de publications, qui nécessite une synthèse et une organisation des connaissances, et que son caractère interdisciplinaire (situé au confluent de l'informatique, des sciences de l'éducation, de la psychologie cognitive et des sciences de l'information) engendre une fragmentation des connaissances que l'analyse bibliométrique peut aider à réduire en établissant des liens conceptuels entre ces disciplines (Holmes et al., 2022). De plus, les progrès rapides des technologies de l'IA et de leurs applications dans le domaine éducatif entraînent une obsolescence rapide des connaissances, ce qui nécessite des évaluations rigoureuses de l'état actuel de l'art. C'est pourquoi cette recherche facilite l'identification des frontières de recherche émergentes et des domaines de controverse théorique, en particulier, entre les approches techno-centriques et les méthodologies pédagogiques. Il aide à élucider les méthodologies prédominantes dans ce domaine et les limites qui y sont liées, favorisant ainsi l'avancement de modèles de recherche plus rigoureux. En fait, la cartographie des réseaux de collaboration scientifique permettra d'élucider la dynamique de la production de connaissances, les écoles de pensée dominantes et les disparités géographiques potentielles en matière de production scientifique liée à l'IA et à l'enseignement supérieur. Par conséquent, une telle méta-analyse contribue à la formulation de cadres théoriques intégratifs mieux adaptés à la complexité inhérente à l'objet de l'étude. Sur le plan social, cette étude espère répondre à des enjeux majeurs au profit des institutions d'enseignement supérieur, des décideurs politiques et de la société dans son ensemble.

Au confluent de ces considérations scientifiques et sociétales, et face à l'évolution rapide de ce domaine de recherche, il apparaît fondamental de délimiter le cadre temporel et les objectifs de notre investigation bibliométrique. L'objectif de notre recherche est donc de répondre à la question cruciale suivante : de quelle manière la production scientifique concernant l'IA dans l'enseignement supérieur s'est-elle développée entre 2014 et 2024? Quelles sont les tendances naissantes dans ce domaine interdisciplinaire? Et comment se présente la cartographie de collaboration entre auteurs et pays?

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Méthodologie

Cadre épistémologique et méthodologique

Notre recherche s'inscrit dans la continuité des analyses bibliométriques récentes (Hwang & Tu, 2021) qui examinent le développement de l'IA dans l'enseignement supérieur.

Le postpositivisme constitue le fondement épistémologique de notre analyse bibliométrique, et il offre un cadre philosophique cohérent avec notre démarche méthodologique. Ce paradigme reconnaît l'existence d'une réalité objective, bien que son appréhension reste partielle et provisoire, tout en valorisant la rigueur scientifique dans la quête de connaissance (Guba & Lincoln, 1994).

Notre méthodologie, ancrée dans cette perspective, privilégie une approche quantitative rigoureuse des productions scientifiques relatives à l'IA dans l'enseignement supérieur. La distanciation épistémologique par rapport aux publications analysées est essentielle pour garantir la validité des résultats. Cela correspond à l'aspiration à l'objectivité inhérente au postpositivisme. Cette objectivation méthodologique se traduit par l'application systématique d'indicateurs bibliométriques standardisés et reproductibles, tels que l'analyse des métriques de publication, l'identification des réseaux terminologiques par analyse d'occurrences lexicales, la cartographie des relations conceptuelles *via* l'étude des cooccurrences et l'examen des structures relationnelles de citations et de co-citations.

La multiplicité des indicateurs utilisés (citation, co-citation, occurrences, cooccurrences, couplage bibliographique) illustre la reconnaissance postpositiviste selon laquelle aucune mesure isolée n'est suffisante pour saisir toute la complexité du phénomène étudié. Cette approche multidimensionnelle permet une appréhension holistique, bien que nécessairement imparfaite, des dynamiques scientifiques dans le domaine.

La quantification systématique de la production scientifique concernant l'IA dans l'enseignement supérieur permet de catégoriser avec précision les paradigmes dominants et l'évolution chronologique des concepts structurants du domaine. Cette dimension diachronique de l'analyse bibliométrique correspond au principe postpositiviste selon lequel toute connaissance reste falsifiable et contextuellement située, ce qui nécessite un examen continu de son évolution temporelle. En révélant les dynamiques collaboratives entre chercheurs, institutions académiques et pays (Chen et al., 2022), notre méthodologie reconnaît également l'influence du contexte social sur la production des connaissances scientifiques, un principe fondamental du paradigme postpositiviste.

Méthodologie d'analyse bibliométrique

Nous avons adopté une démarche méthodologique rigoureuse structurée en trois phases principales. Notre protocole a débuté par une extraction systématique des métadonnées bibliographiques au sein de la base de données *Web of Science*, reconnue pour sa rigueur de l'indexation des articles et la qualité de ses références (Ivanova et al., 2024). La stratégie d'interrogation repose sur l'élaboration d'équations de recherche combinant avec précision les descripteurs relatifs à l'IA et à l'enseignement supérieur à partir de termes génériques (*AI*, *education*, *higher education*, *university training*) ainsi que des descripteurs spécifiques liés aux limites et défis de l'IA (*ethical challenges*, *negative impacts*,

responsibility, *negative impacts of AI in education/training/higher education*, *privacy, and AI in education*). L'utilisation d'opérateurs booléens a permis d'affiner la pertinence des résultats obtenus. Notre protocole inclut également une délimitation temporelle précise, couvrant les dix dernières années, avec une sélection axée sur des études publiées en anglais dans des revues à comité de lecture. Cela garantit la qualité scientifique du corpus constitué. À l'issue de cette phase, nous avons établi une liste de 285 articles qui constituent le corpus de données utilisé pour l'analyse bibliométrique.

Dans la deuxième phase, nous avons fait appel à un ensemble d'analyses quantitatives complémentaires, d'abord à l'évaluation de la pertinence et de la qualité des articles sélectionnés à travers l'analyse systématique des résumés, des mots-clés et des références bibliographiques, complétée par une évaluation de l'impact des publications. L'analyse thématique a été réalisée à travers l'examen des cooccurrences de termes révélant les associations conceptuelles dominantes, tandis que l'analyse des co-citations a permis d'identifier les fondements intellectuels partagés. Le couplage bibliographique, quant à lui, a mis en évidence les proximités thématiques entre les différentes publications.

La dernière phase consiste en une visualisation cartographique des résultats à l'aide du logiciel VOSviewer. Cela permet de transformer les données quantitatives complexes en représentations visuelles intelligibles. La visualisation de réseaux collaboratifs a permis d'explorer les relations entre les différents éléments de la littérature. L'analyse de densité a révélé les domaines de recherche les plus actifs et importants tandis que l'analyse de tendances a fourni une perspective diachronique sur l'évolution du domaine et a permis de mettre au jour les développements récents et les trajectoires émergentes dans le champ de recherche sur l'IA en formation et en apprentissage universitaires.

Présentation des résultats

Les résultats de l'analyse bibliométrique se focalisent sur la structure et l'évolution de la recherche, la dynamique de collaboration entre chercheurs, pays et organismes, et sur l'impact des sources dont les revues, en particulier. Pour améliorer la clarté et la cohérence des résultats de notre étude sur l'IA et l'enseignement supérieur, nous utilisons une double approche méthodologique. Celle-ci associe des visualisations générées par VOSviewer (cartes réseau, temporelles et de densité) et des tableaux quantitatifs. Les tableaux présentent plusieurs indicateurs bibliométriques clés : occurrences (fréquence des termes dans le corpus sur l'IA éducative), cooccurrences (force des associations entre concepts), nombre d'articles publiés, citations et co-citations d'auteurs.

Les cartes réseau traduisent graphiquement les données bibliométriques. Elles représentent par des cercles les entités analysées (mots-clés, auteurs, pays, institutions ou sources de publication). Le diamètre de chaque cercle est proportionnel à la fréquence d'apparition de l'entité dans le corpus. Les connexions entre cercles sont représentées par des lignes. Le nombre de lignes partant d'un cercle indique la quantité de ses connexions avec d'autres entités. L'épaisseur de chaque ligne reflète l'intensité de l'association entre deux entités dans les publications étudiées. Par conséquent, l'association des cartes aux tableaux offre une complémentarité méthodologique essentielle, combinant

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perception intuitive des structures et précision quantitative pour une compréhension globale de l'IA dans l'enseignement supérieur

Structure et évolution de la recherche sur l'IA en formation et apprentissage universitaires

L'étude, qui a utilisé un corpus de 314 mots-clés, a permis de générer un groupe vert de 285 articles, puis de filtrer un total de 72 occurrences avec une fréquence minimale de deux. Les données ont été traitées et visualisées à l'aide de VOSviewer, générant des graphes en réseau, des graphes d'analyse temporelle et des cartes thermiques pour identifier les occurrences, cooccurrences, regroupements en clusters et l'évolution des réseaux de mots-clés au fil du temps et les mots-clés ayant le plus de relations ainsi que les regroupements les plus denses.

Analyse du réseau de mots-clés

Le tableau 1 illustre les occurrences et les cooccurrences (*total link strength*) des mots. Seuls les mots-clés mentionnés au moins deux fois ont été pris en compte. Parmi les 314 mots-clés extraits des auteurs et ajoutés par *Web of Science*, 72 ont été retenus (au moins deux occurrences chacun). La fréquence totale de liaison entre ces mots est de 491. Le tableau ci-dessous présente les mots-clés faisant l'objet des analyses bibliométriques développées dans les sections suivantes.

Tableau 1

Occurrences et cooccurrences de mots-clés

Selected	Keyword	Occurrences	Total link strength
✓	Artificial intelligence	33	133
✓	Motivation	8	54
✓	Self-regulated learning	5	41
✓	Education	7	38
✓	Performance	5	35
✓	Acceptance	4	32
✓	Feedback	5	30
✓	Self-efficacy	4	30
✓	Technologies	4	29
✓	Students	5	28
✓	Cognitive-style	2	17
✓	Competence	2	17
✓	Foreign-language	3	17
✓	Impact	3	17

Selected	Keyword	Occurrences	Total link strength
✓	Perspective	2	17
✓	Teachers	4	17
✓	Variables	2	17
✓	Achievement	2	16
✓	Autonomy	2	16
✓	Experiences	2	15

La figure 1 ci-dessous offre une visualisation des cooccurrences entre les mots-clés des auteurs et ceux ajoutés par *Web of Science*.

Figure 1

Cooccurrences des mots-clés
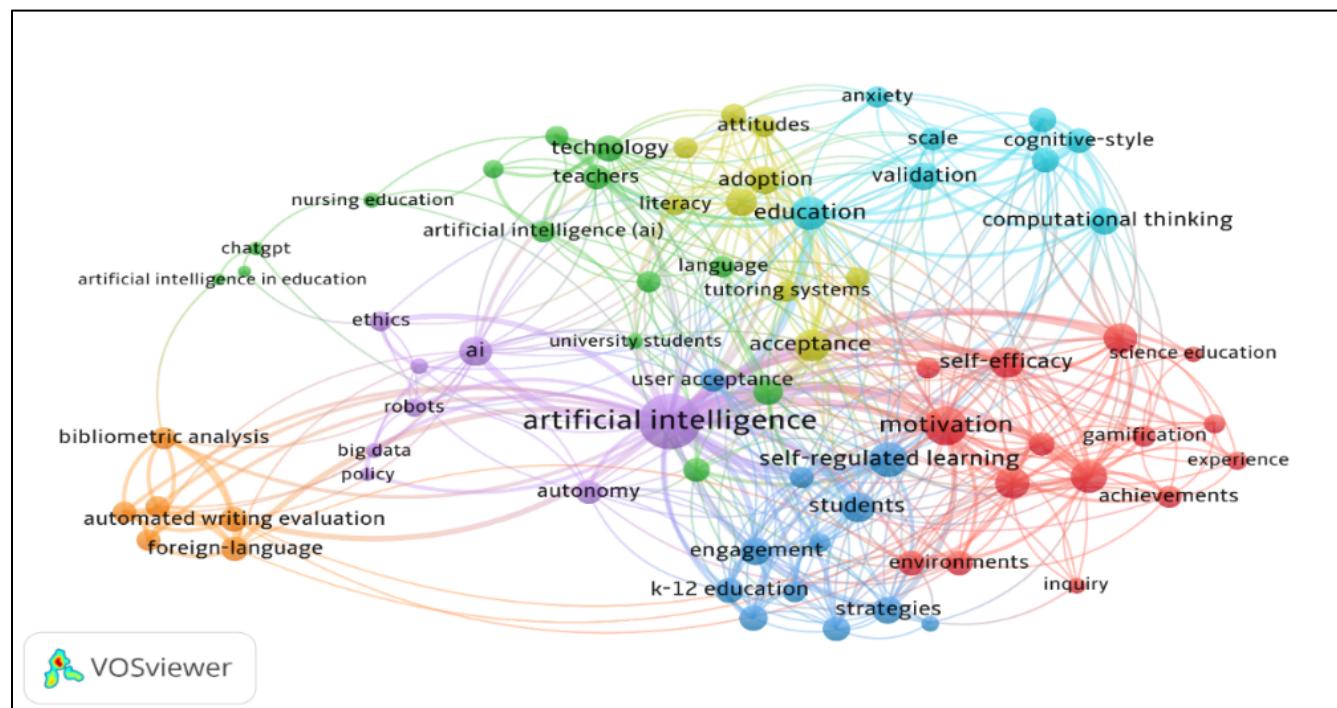
L'analyse bibliométrique d'un corpus de 285 articles a révélé que le mot-clé *intelligence artificielle* est plus cité, avec 33 occurrences (Tableau 1). Les mots-clés *motivation*, *éducation, étudiants*, *feedback*, *performance* et *autorégulation d'apprentissage* sont également fréquents (au moins trois citations). En revanche, *enseignement supérieur*, *système d'apprentissage* ou *style cognitif* sont moins utilisés (deux citations maximum). La visualisation des cooccurrences (Figure 2) révèle des regroupements de mots-clés étroitement liés, représentés par des groupes colorés. Cette cartographie permet d'établir la force des liens entre les mots-clés et de dégager les tendances et thématiques dominantes dans la littérature sur l'IA en enseignement supérieur.

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La visualisation en réseau révèle six groupes distincts. Le premier groupe (violet) est centré sur le mot-clé *intelligence artificielle* et est le plus dense. Ce mot apparaît 63 fois avec les autres mots-clés de ce groupe, représentant 12 % du total des liaisons (491) (Tableau 1). Sa fréquence de cooccurrence est de 133, indiquant des apparitions multiples dans les mêmes articles. Ce mot-clé est lié aux cinq autres groupes. Cette redondance montre que l'IA est un domaine en constante évolution et qu'il a un impact significatif sur divers secteurs, y compris l'enseignement supérieur. Par exemple, le couplage de l'IA avec l'expression *prédire la performance académique* (*academic performance prediction*) fait référence à l'utilisation de modèles prédictifs d'IA pour anticiper les performances académiques des étudiants. Le terme *adaptabilité* (*adaptability*) se réfère à la capacité de l'IA à s'adapter aux besoins des apprenants. Les mots-clés « *intelligence artificielle et éducation* » et « *IA et cours* » (*AI Course*) font référence à l'enseignement de l'IA en tant que matière académique. « *AI et connaissance* » (*IA knowledge*) se réfèrent à la compréhension et à la connaissance de l'IA par les étudiants et les enseignants. La combinaison de l'expression *AI-chatbots* (*AI-chat bot*) et *chabot* font référence à l'utilisation de robots conversationnels d'IA pour fournir un soutien aux apprenants. Le cluster vert inclut des mots tels que *intelligence artificielle, technologie, enseignant, science, étudiant universitaire* et *perception*. Le terme *technologie* est souvent associé à l'IA. Ils sont apparus ensemble quatre fois dans les articles. Le groupe rouge comporte 14 mots, tels *motivation, préférence, expérience, apprentissage profond, efficacité personnelle* et *apprentissage de langue.* Le mot-clé *motivation* a le plus de liaisons (39) et une fréquence de cooccurrence de 54 (Tableau 1). Ce mot-clé est fréquemment associé à l'IA, avec une fréquence de cooccurrence de cinq. Cependant, sa fréquence de cooccurrence avec les autres termes ne dépasse pas trois.

Le groupe bleu foncé montre quelques liaisons entre 12 mots-clés comme *stratégies, engagement, étudiants, autorégulation d'apprentissage, support d'autonomie*. Le mot *étudiants* compte la plus grande fréquence de cooccurrence (22) et une fréquence d'interaction importante (deux) avec l'IA (Tableau 1). Cela s'explique par le fait que les études en IA portent essentiellement sur l'apprentissage des étudiants. Le mot-clé *enseignement supérieur* n'apparaît qu'une seule fois, avec un total de six interactions avec des mots-clés comme *compétence, étudiants, performance, perception* et *intelligence artificielle*. Ce mot-clé a une faible interaction avec l'IA dans les publications depuis 2014.

Le groupe bleu clair inclut huit mots-clés comme *style cognitif, pensée compétitive, anxiété, éducation* et *validation*. Le mot-clé *éducation* a le plus grand nombre de liaisons dans ce groupement (27) et une fréquence de cooccurrence de 38 (Tableau 1). Il apparaît souvent avec l'IA, avec cinq occurrences dans le même article. Le groupement orangé comporte neuf mots-clés, notamment : *adoption, attitude, système de tutorat, intention comportementale* et *collège et acceptation*. Ce dernier a le plus grand nombre de liaisons avec d'autres groupements (lié à quatre regroupements) et apparaît quatre fois avec l'IA dans le même article.

L'examen des groupes révèle une forte dominance du mot-clé *intelligence artificielle* qui est présent dans toutes les publications. Le groupement violet centré sur ce mot-clé présente de nombreuses liaisons formant une étoile d'araignée dense. Ce terme est souvent associé à *éducation, apprentissage, enseignement, motivation, engagement* et *autonomie*.

Figure 2

Cooccurrences et forces de liaisons entre mots-clés de chaque groupe
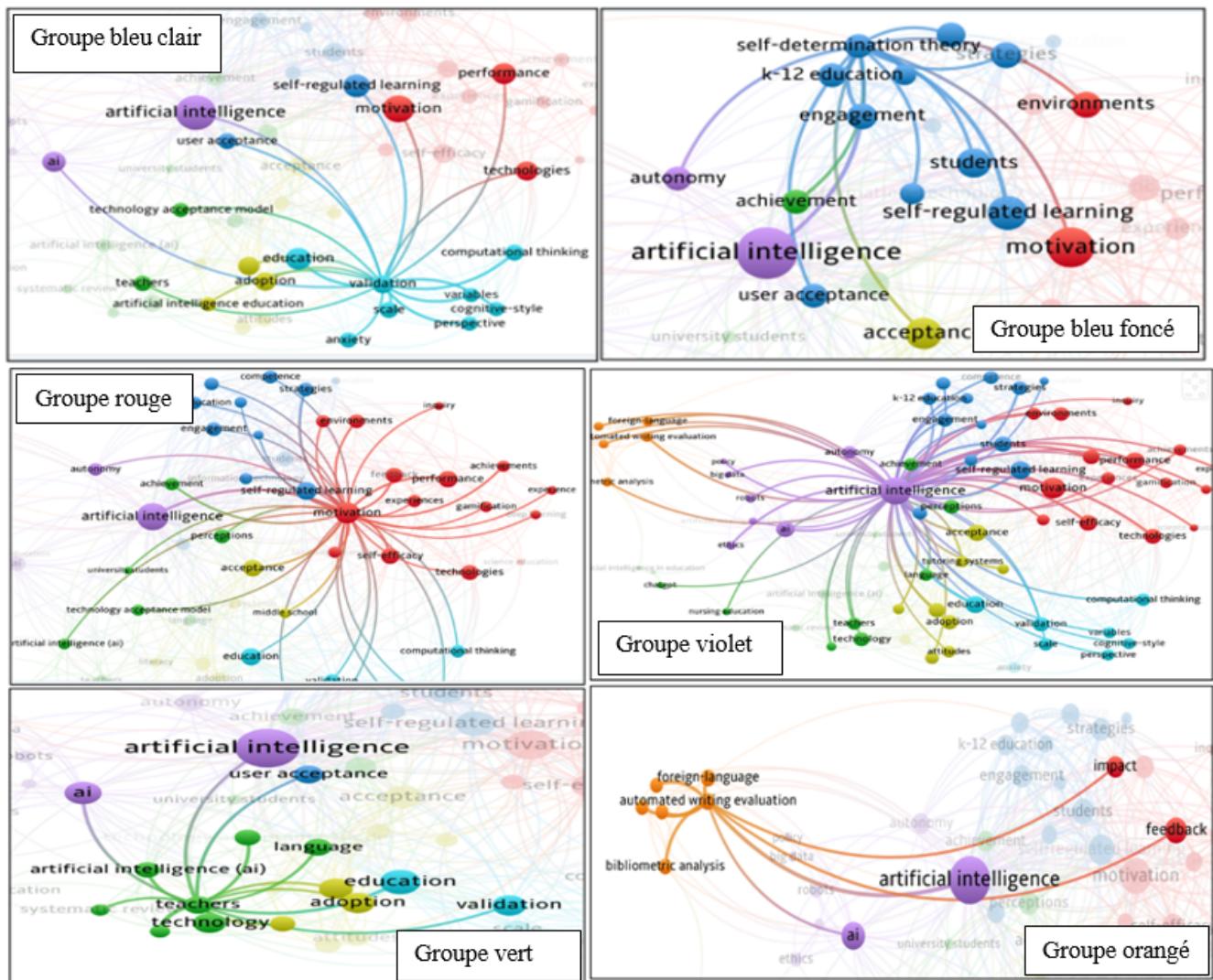
Nous remarquons également des liens significatifs entre des mots-clés comme *technologie* et des termes comme *intelligence artificielle*, *langage*, *feedback des étudiants*. Sur les six groupes, nous remarquons une condensation des liaisons et de la fréquence de cooccurrences entre cinq d'entre eux (violet, rouge, vert, bleu foncé et bleu clair). Cependant, le groupe orange, composé de quelques mots-clés ayant de faibles liaisons avec les autres mots-clés, se trouve isolé. En effet, les domaines de recherche des sciences de l'éducation, des technologies éducatives, de la didactique des langues, des études interculturelles, de la traduction et interprétation, du traitement automatique du langage naturel, de la littérature anglaise, de l'évaluation de la recherche, de la politique de la recherche, etc., auxquels se rattachent les mots-clés de ce regroupement contribuent peu à la valorisation de l'IA et de ses applications.

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Analyse temporelle des mots-clés

Nous avons suivi l'évolution des mots-clés entre 2020 et 2024 en utilisant une échelle de couleurs, divisée en deux périodes : 2020-2022 et 2023-2024. Cela nous a permis de déterminer les tendances temporelles et les changements de thèmes de recherche. Les figures 3 et 4 illustrent l'évolution des mots-clés durant chaque période.

Figure 3

Évolution des cooccurrences des mots-clés (2020-2022)
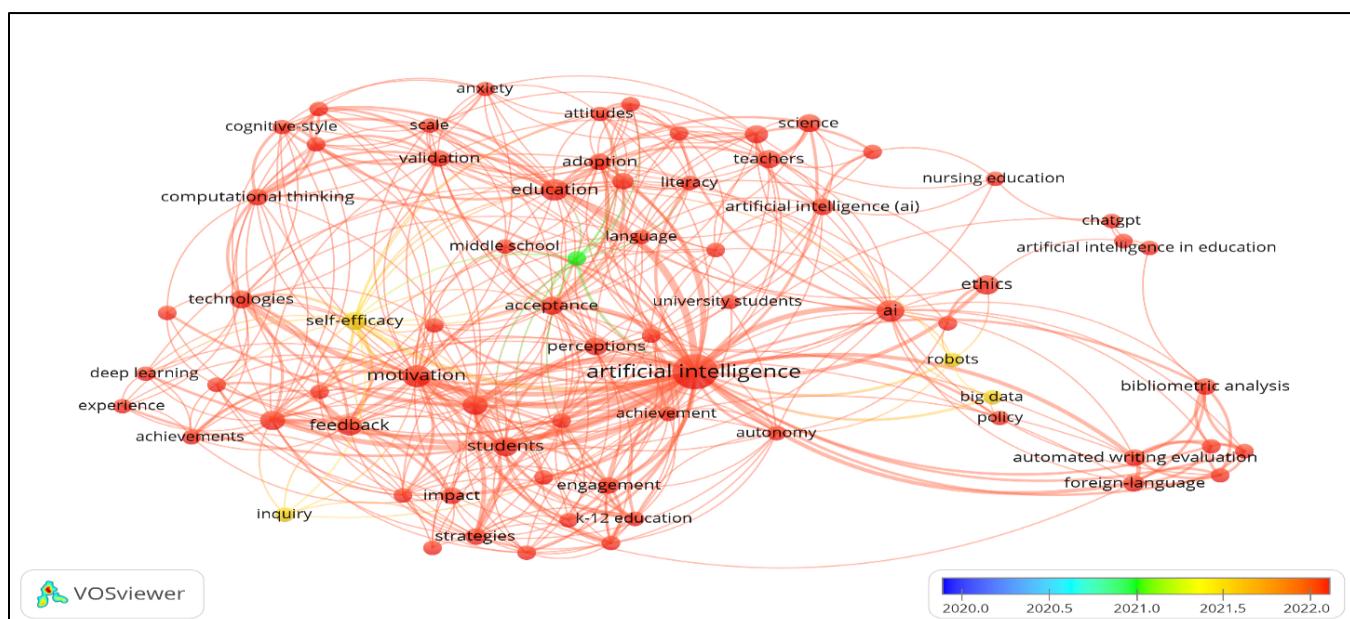
Au cours de cette période, la carte révèle que 67 des 72 mots-clés sont en rouge, ce qui correspond à l'année 2022 sur l'échelle de couleurs. Cette prédominance du rouge indique que les études sur l'IA étaient très peu fréquentes entre 2020 et 2022, mais ont gagné en visibilité. En fait, il s'agit d'un phénomène récent qui a émergé en 2022.

En 2023, 90 % des mots-clés apparaissent en violet, ce qui témoigne d'une croissance exponentielle des publications sur l'IA cette année-là. La densité des cooccurrences entre le mot-clé central (IA) et les autres termes montre que divers domaines de recherche tels que *technologie éducative*, *robotique*, *psychologie*, *enseignement supérieur*, *apprentissage automatique*, commencent à recourir à l'IA pour les avantages qu'elle offre dans la diffusion des travaux de recherche.

De nouveaux mots-clés comme *langage*, *anglais* et *langue étrangère* émergent également en 2023 Certains domaines linguistiques comme la *didactique des langues*, les *études culturelles* et *interculturelles* commencent à intégrer l'IA. C'est en fin de 2023 que certains concepts comme *science de l'éducation*, *impact*, *nursing éducation*, *système d'apprentissage*, *style cognitif* et *anxiété* apparaissent. Ces concepts définissent divers domaines notamment les sciences de l'éducation, les technologies éducatives et la psychologie de l'éducation qui commencent à intégrer l'IA. De plus, le

mot-clé *revue systématique* (*systematic review*) en jaune est apparu dans les écrits récents sur l'IA au début de l'année 2024. Ce mot-clé renvoie à des études qui examinent la littérature scientifique de manière systématique.

Figure 4

Évolution des cooccurrences des mots-clés (2020-2022)
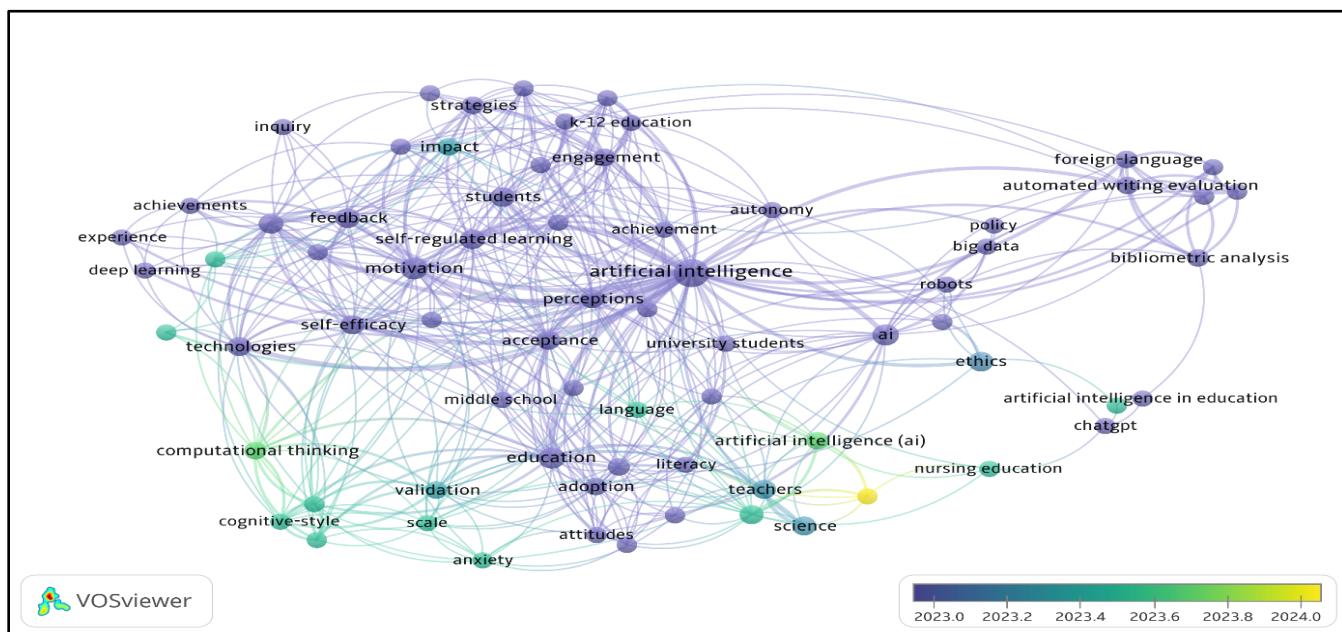
Analyse de la densité des mots-clés

L'analyse de la carte thermique de densité (Figure 5) révèle les mots-clés les plus fréquemment utilisés et leur relation avec d'autres mots-clés, ainsi que les tendances et modèles dans la publication scientifique sur l'IA en formation et en enseignement supérieur.

L'analyse de la carte des mots-clés révèle que *intelligence artificielle* est le terme le plus fréquent et dense dans les 285 articles examinés. D'autres mots-clés tels *éducation*, *motivation des étudiants*, *feedback* et *autocontrôle* sont moins présents. Des termes tels que *validation*, *adaptation*, *stratégie*, *système d'apprentissage* et *style cognitif* apparaissent rarement.

La carte révèle trois regroupements denses autour des termes *intelligence artificielle*, *éducation* et *motivation*, indiquant une forte interaction entre ces domaines dans la recherche sur l'IA. Une forte liaison entre l'enseignement, l'éducation et l'IA explique la raison pour laquelle la majorité des études se concentrent sur l'enseignement et l'éducation. Cependant, cinq zones isolées émergent, comprenant des mots-clés comme *perspective*, *style cognitif*, *compréhension informatique*, *formation en soins infirmiers*, *réussite scolaire*, *apprentissage profond*, *autonomie* et *évaluation automatique de la rédaction*. Ces zones représentent des domaines émergents avec peu de liens, notamment, *l'évaluation de la rédaction scientifique via des logiciels* (évaluation automatique de la rédaction), *la formation en soins infirmiers* (nursing éducation*), la programmation de solutions via l'IA* (pensée informatique) et *le*

traitement du langage naturel et la conduite autonome (apprentissage profond), et *l'évaluation de la recherche et de l'innovation* (analyse bibliométrique).

Figure 5

Carte de la densité des mots-clés
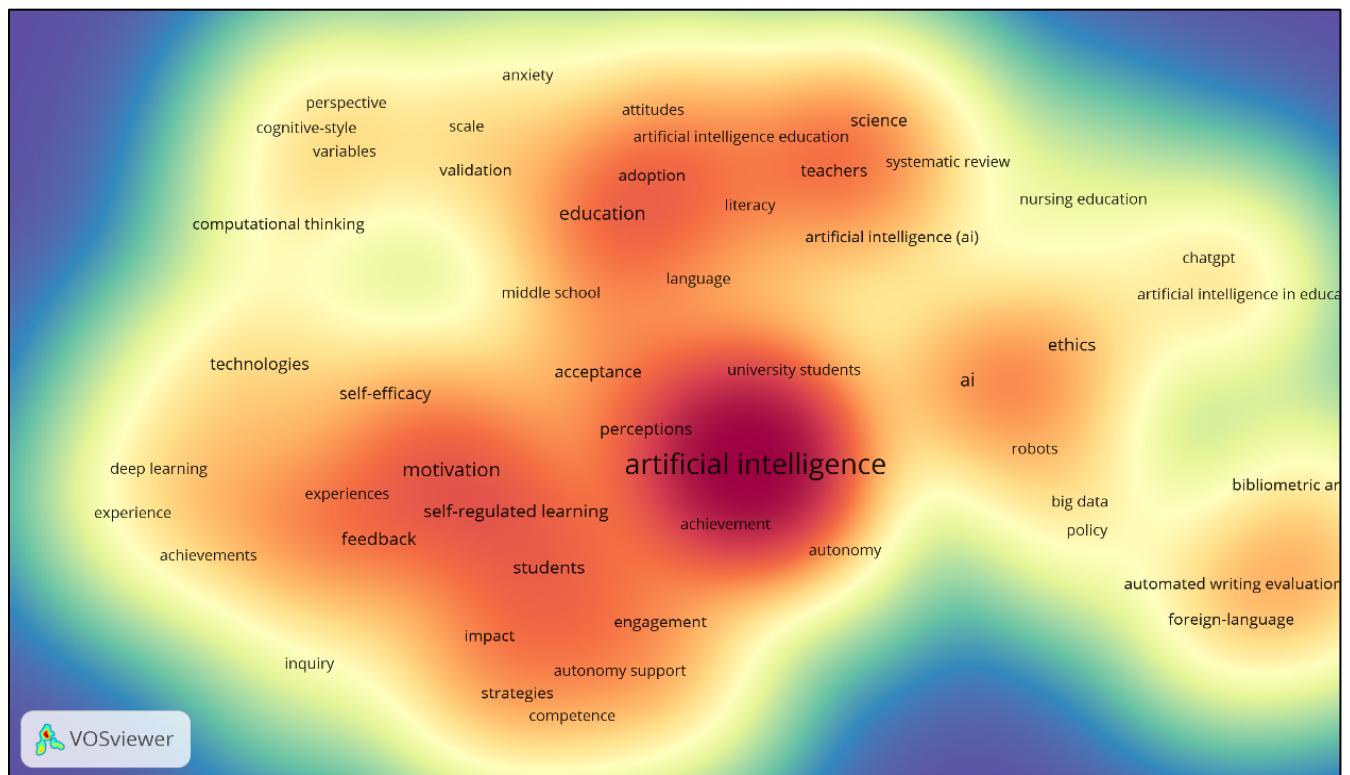
La dynamique de collaboration

Dans cette partie, nous allons analyser les collaborations entre chercheurs, pays, sources de publication et organismes pour identifier les réseaux et la dynamique interactionnelle dans le domaine de l'IA en formation et en enseignement supérieur.

Structure et dynamique de la recherche collaborative entre auteurs

En biométrie, la collaboration entre auteurs désigne les relations de co-autorat où plusieurs chercheurs contribuent à une même publication scientifique. Cette collaboration, formalisée par la signature conjointe d'articles ou autres productions académiques, crée des liens scientifiques mesurables. Elle permet d'analyser les structures sociales de production des connaissances et de révéler les communautés épistémiques et les dynamiques d'échanges intellectuels dans un domaine de l'IA et l'enseignement supérieur. Des indicateurs quantitatifs, tels que l'indice de collaboration et la densité du réseau collaboratif, aident à repérer les communautés influentes et les dynamiques sociales de la production scientifique.

Analyse du réseau d'auteurs. L'analyse du réseau d'auteurs se base sur le nombre de publications et de citations limité à un article et de citations par auteur. Sur 176 auteurs (qui ont publié les 285 articles du corpus), 140 ont publié au moins un article et ont été cités une seule fois. Dans le tableau 2, nous avons choisi de ne présenter que les auteurs les plus influents et qui ont construit les réseaux de collaboration les plus importants.

Sur 176 auteurs, 140 ont publié au moins un article et ont été cités une seule fois. Seulement 50 ont corédigé au moins un article. Ils sont répartis en trois groupements principaux : le groupement Chai, Ching Sing, le groupement Chiu, Thomas K.F, et le groupement Dai, Yun. Cependant, 90 auteurs n'ont pas de collaboration bien que certains parmi eux aient publié plusieurs articles comme Hwang, Gow-jean qui ont publié cinq documents (Tableau 2). La figure 7 décrit la collaboration entre les 50 auteurs les plus influents.

Tableau 2

Citations, co-citations d'auteurs

Selected	Author	Documents	Citations	Total link strength
✓	Chiu, Thomas K. F.	7	113	25
✓	Chai, Ching Sing	7	75	23
✓	Hwang, Gwo-Jen	5	36	19
✓	Dai, Yun	4	53	15
✓	Zhou, Wentao	2	27	14
✓	Zhou, Ying	3	15	13
✓	Chen, Xieling	3	93	12
✓	Cheng, Gary	3	93	12
✓	Xie, Haoran	4	93	12
✓	Zou, Di	4	93	12
✓	Chai, Ching-Sing	2	44	11
✓	Jong, Morris Siu-Yung	2	46	11
✓	Qin, Jianjun	2	46	11

Selected	Author	Documents	Citations	Total link strength
✓	An, Xin	2	13	10
✓	King, Irwin	2	52	10
✓	Li, Yushun	2	13	10
✓	Lin, Ziyan	2	7	10
✓	Liu, Ang	2	7	10

Figure 6

Réseau de collaboration entre auteurs
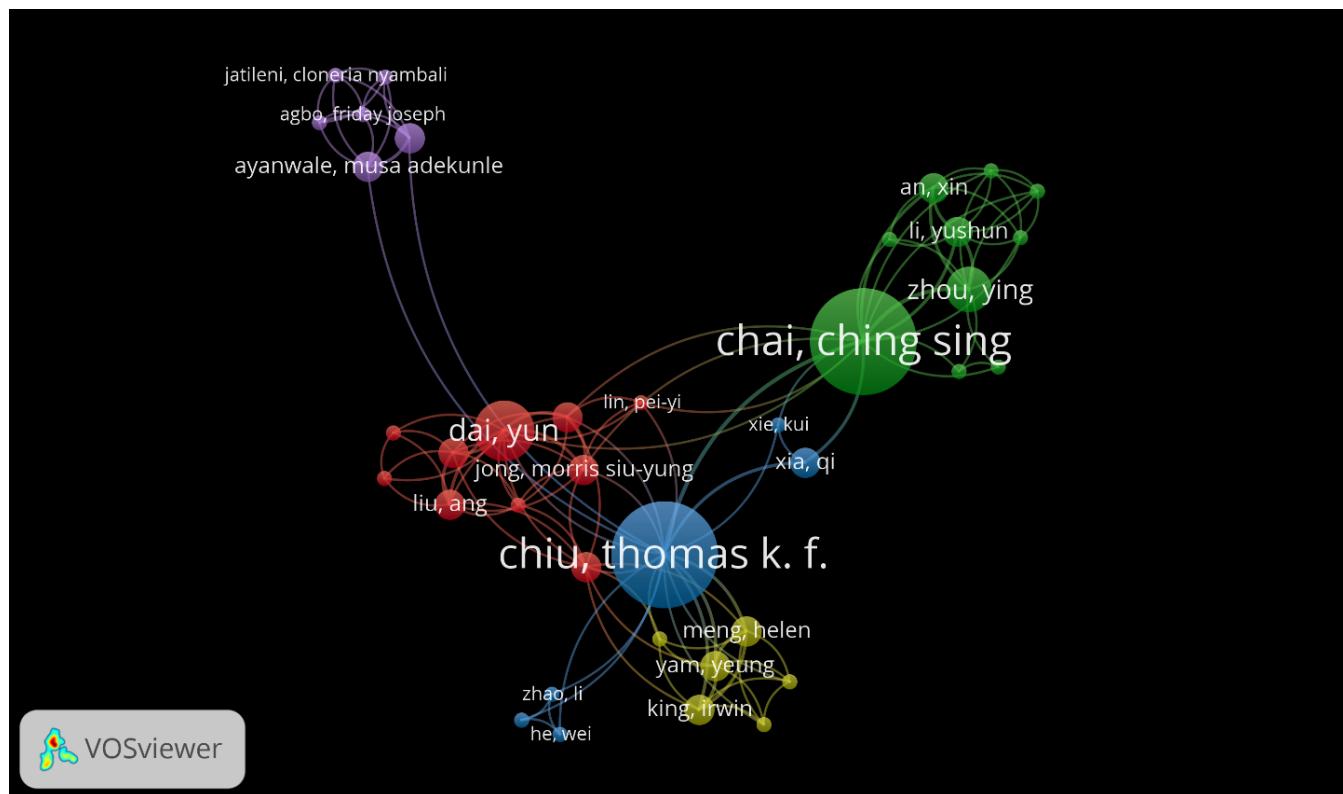
Parmi les 50 auteurs ayant publié ensemble (*co-authorship*) au moins un article, Chai et Chiu ont le nombre le plus important de publications (sept articles par auteur). Xie, Zou et Dai,Yun ont publié moins (quatre articles par personne). Deux auteurs seulement (Zhou & Cheng) ont publié trois articles. Les autres auteurs n'ont pas dépassé deux publications. Chiu est coauteur de 45 articles et est cité 88 fois dans le corpus, avec un total de 113 citations, ce qui signifie une influence notable (Tableau 2). Chai, coauteur de 31 articles, est cité 87 fois dans les 285 articles analysés, avec 75 citations au total (Tableau 2). Ces deux auteurs sont les plus reconnus et influents dans le domaine de l'IA et de

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l'éducation, y compris dans l'enseignement supérieur. Les travaux de Chiu couvrent diverses problématiques, notamment le développement de l'intention d'apprendre grâce à l'IA chez les élèves du primaire, (Chai et al., 2021) les attitudes positives des élèves du secondaire grâce à un programme d'enseignement *via* l'IA (Chiu et al., 2022), l'impact de l'IA sur la motivation des élèves de l'enseignement secondaire (Chiu et al., 2023) et des suggestions pour des pratiques éducatives axées sur l'IA (Chiu, 2023).

Figure 7

Carte des auteurs les plus influents
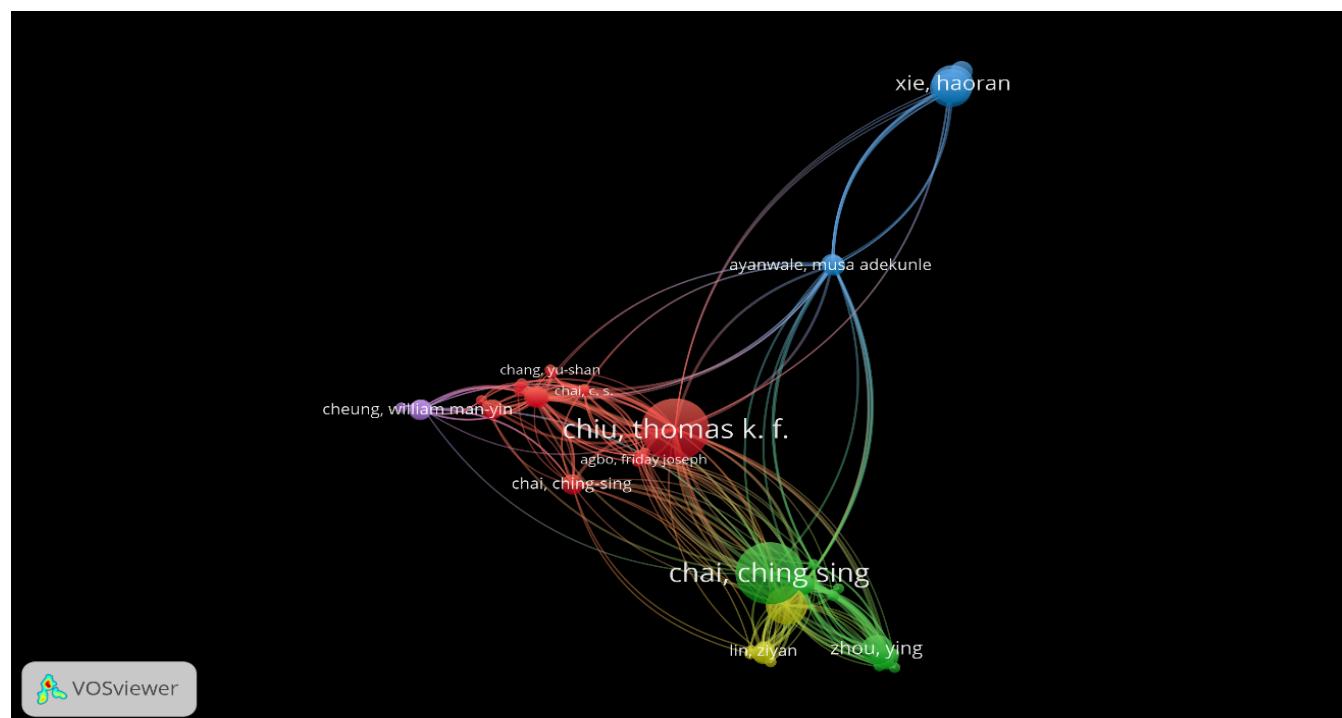
Collaboration et formation de groupes de chercheurs. Pour déterminer les collaborations et les groupes de recherche, nous avons regroupé les auteurs en fonction de la similarité de leurs références bibliographiques, en utilisant le couplage bibliographique. Ce dernier est calculé en divisant le nombre de références communes par le nombre total de références dans leurs travaux respectifs. Un nombre élevé de références communes indique un couplage fort entre les auteurs. La carte réseau (Figure 8) illustre le couplage entre les auteurs ayant au moins deux références communes et deux articles chacun.

L'analyse de la carte montre cinq regroupements d'auteurs, chacun présentant une fréquence de couplage distincte. Le premier groupement en violet est constitué de Chiu, Ming, Chai, King, Wong et Yam. Le second groupe en verte clair comporte Chai, Xia, Zhou, An et Li. Le troisième groupe en rouge est constitué de Chai, Lin, Jong, Dai, Liu et Qin. Le quatrième groupe en vert foncé est constitué de Hwang, Roll, Zhou, Tu, Seo. Le dernier groupe en bleue est constitué de Xia, Zou, Cheng, Chen, Huang. Nous observons que Chiu est l'auteur le plus influent, étant relié à 49 autres auteurs dans ce réseau. La carte ci-dessous (Figure 9) illustre les relations de Chiu avec ses collègues.

Figure 8

Couplage bibliographique entre auteurs
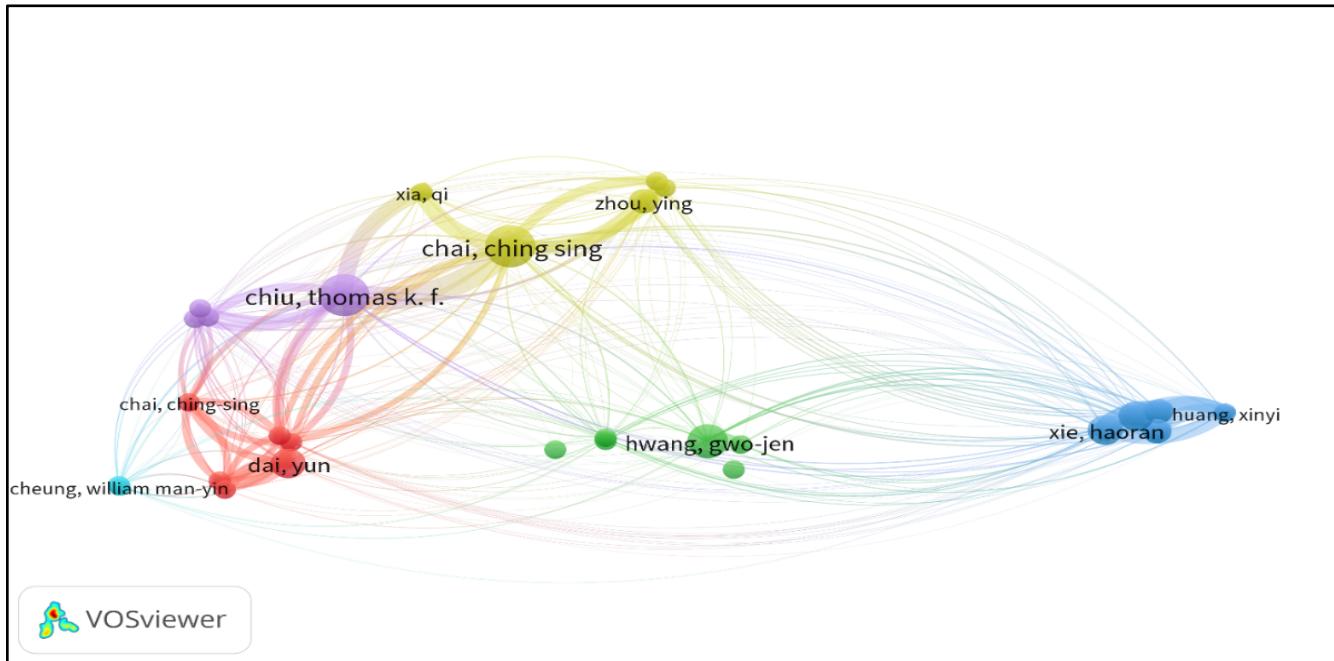
Figure 9

Collaboration de Chiu avec les membres du réseau de chercheurs
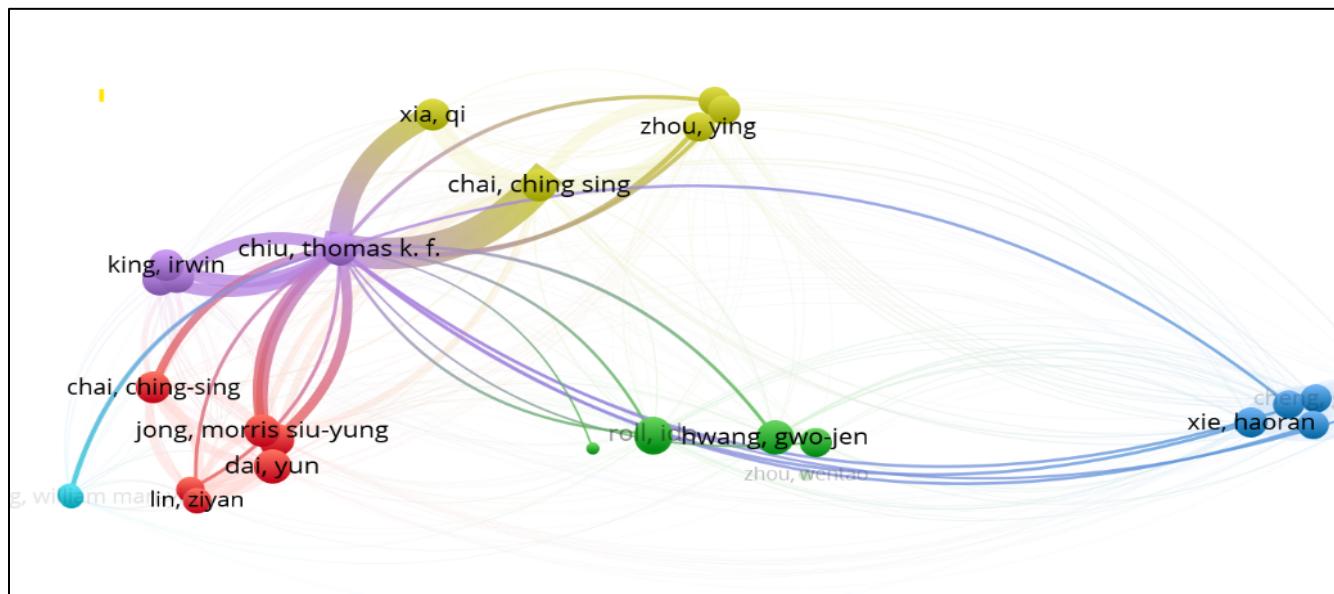
Chiu présente la fréquence de couplage la plus élevée (8,78). Il collabore fréquemment avec Chai (force de liaison la plus importante : 391) et également avec Xia (force de liaison : 247). Chai est le deuxième auteur le plus influent. La carte ci-dessous illustre ses collaborations.

Figure 10

Collaboration de Chai avec les membres du réseau de chercheurs
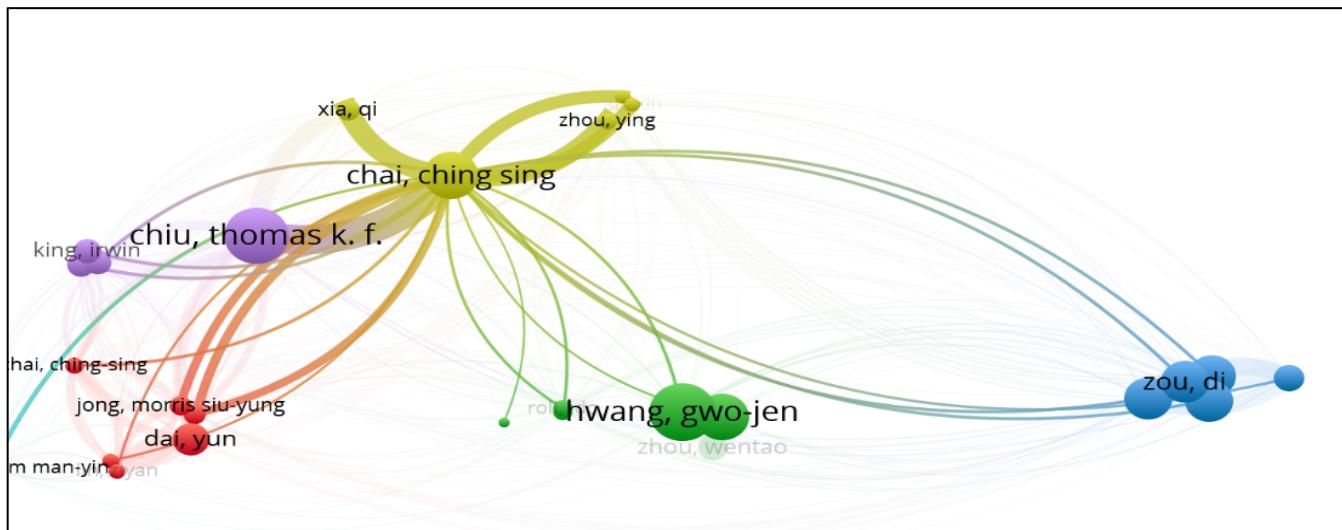
Chai présente la fréquence de couplage la plus élevée (7,36). Il collabore fréquemment avec Chiu (391), Xia (247), Zhou (233) et Li (153). Hwang est l'auteur qui cite le plus souvent les autres, avec la fréquence de couplage la plus élevée dans ses articles (9,05). Cependant, il est très peu cité (36 fois). Un examen approfondi du groupe en bleu révèle une forte collaboration entre Cheng, Zou, Chen et Huang. La carte ci-dessous illustre cette dynamique collaborative.

Figure 11

Collaboration entre Cheng, Zou, Chen et Huang
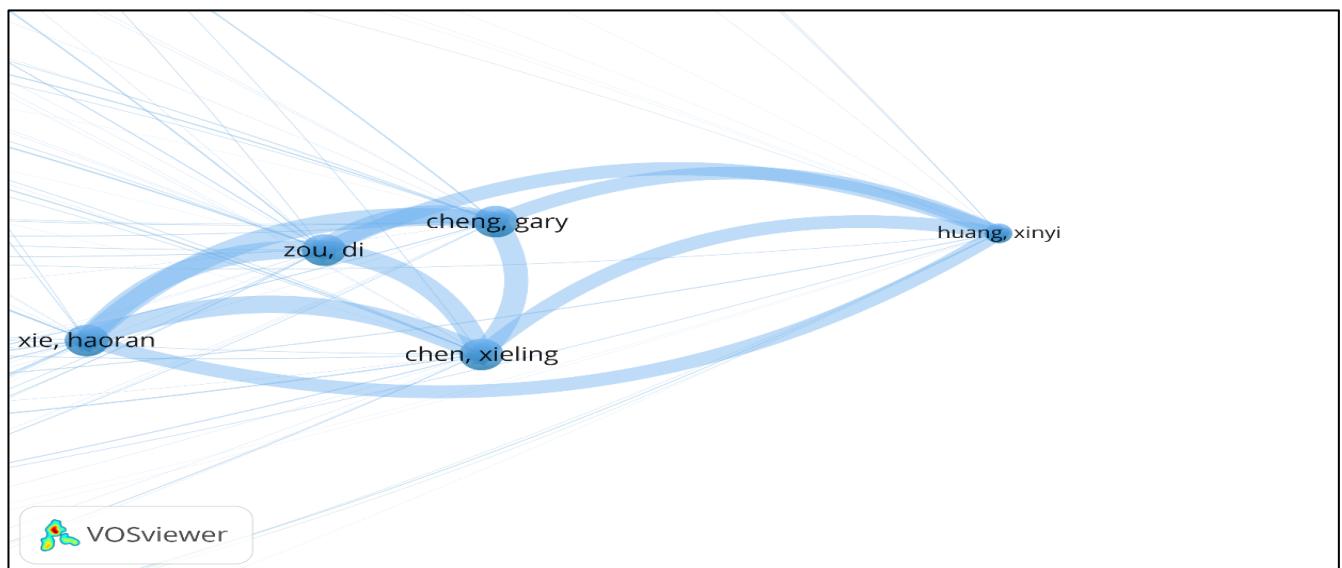
Ces quatre auteurs qui collaborent présentent des totaux de force de liaison totale (*link strength)* et proche (Xia 1342; Zou, 1350; Chen 1316; Chen, 1319). Leurs fréquences de couplage sont également

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proches (Xia : 6.44; Zou : 6.44; Chen : 6.44; Huang : 6,02). Du fait de partager leurs références bibliographiques, ils forment une équipe de recherche cohérente. Dans le but de voir l'évolution de ces collaborations dans le temps, nous avons analysé la carte temporelle des couplages bibliographiques entre 2014 et 2024. La carte ci-dessous illustre cette évolution sur la période 2014–2020.

Figure 12

Évolution de la collaboration pendant la période (2014–2020)
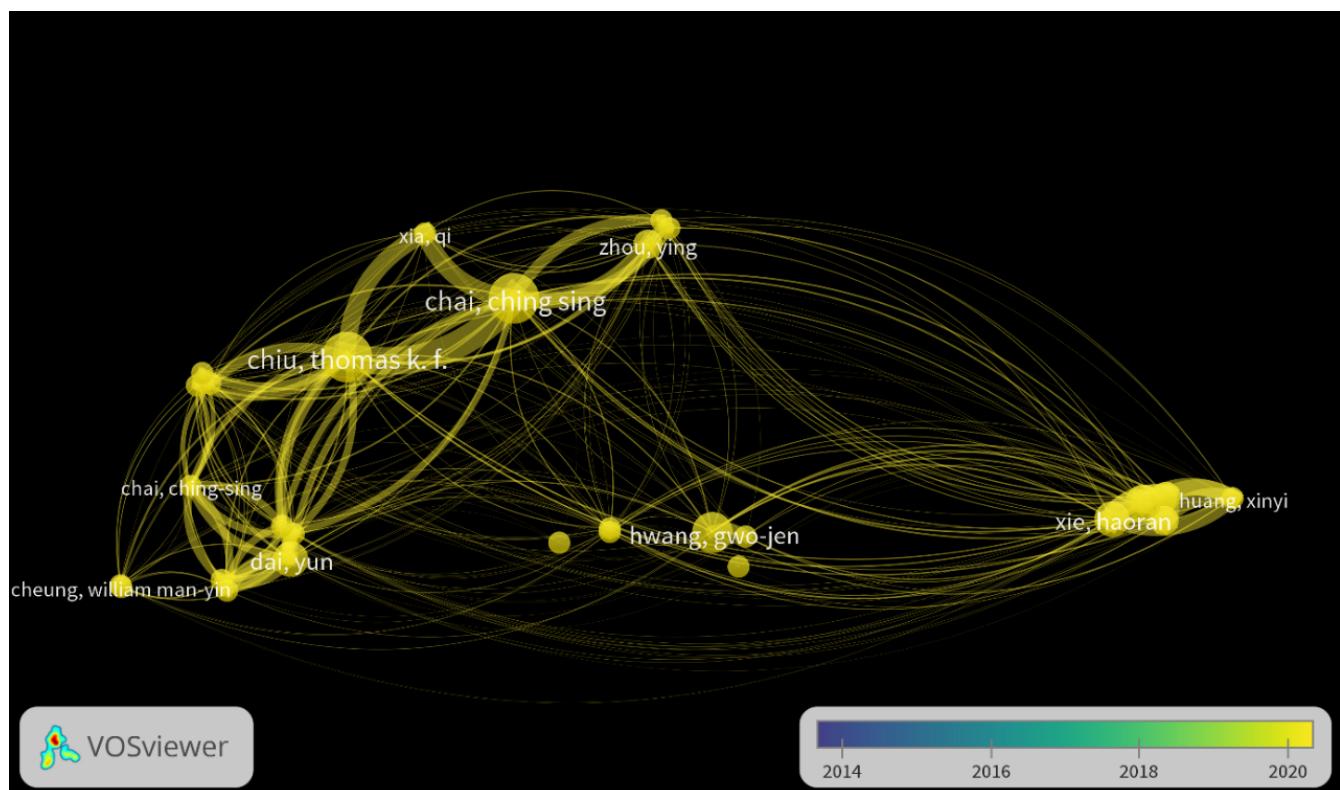
Au cours de la période 2014–2020, la couleur jaune indique que ces collaborations n'existaient pas avant 2020 et ont commencé à se former à partir de cette année. Selon l'échelle de couleurs, ces regroupements deviennent visibles au fil de l'année 2022. Cette période a été marquée par une forte évolution de la dynamique collaborative entre les chercheurs.

Structure et dynamique la collaboration internationale

Pour représenter les collaborations internationales entre les coauteurs d'articles, nous avons effectué une analyse par coauteurs-pays. Cette analyse révèle les réseaux de recherche internationaux et la dynamique de collaboration entre pays. Nous avons inclus tous les pays ayant publié au moins deux documents, sans minimum de citations. Sur les 19 pays inclus dans cette analyse bibliométrique, seuls 12 comptent des auteurs ayant publié au moins deux articles. Le tableau ci-dessous présente le nombre de documents publiés par pays, les citations des auteurs, ainsi que les co-citations entre auteurs de différents pays.

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Tableau 3

Citations et co-citations des auteurs

Selected	Country	Documents	Citations	Total link strength
✓	Peoples Republic of China	29	284	13
✓	USA	7	50	7
✓	Australia	5	30	6
✓	Finland	2	1	4
✓	South Africa	2	1	4
✓	Canada	3	42	3
✓	Germany	2	13	3
✓	Israel	3	41	3
✓	South Korea	2	41	3
✓	Taiwan	9	82	3
✓	Singapore	3	27	2
✓	Thailand	2	1	1

La carte de visualisation en réseau (Figure 13) illustre les performances et l'impact par pays dans le domaine de l'IA et l'enseignement supérieur.

Dans notre étude sur les publications scientifiques portant sur l'IA en enseignement supérieur, nous avons identifié six groupements distincts. Les groupements 1, 2 et 6 sont bien définis. Le groupement 1 est central, connecté à plusieurs groupements, sauf au groupement 2. La Chine est au cœur de ce groupe, avec une fréquence de liaisons élevée (13) et un total de citations important (284) (Tableau 3). Le groupe 2, composé du Canada, du Brésil, de l'Afrique du Sud, de la Pologne et d'Israël, a peu de relations avec les autres groupements, sauf une collaboration entre le Canada et l'Australie du groupe 1. Le groupement 6, formé des États-Unis et de la Suède, collabore avec les pays des groupes 1, 3 et 4, les États-Unis étant centraux avec huit liaisons et 50 citations (Tableau 3). Le groupement 4, incluant Singapour et le Vietnam, a deux liaisons, une avec les États-Unis et une avec la Chine *via* Singapour. Le groupement 5 est le plus isolé, avec une seule relation avec le groupement 1 par l'entremise de la Chine. Le groupement 3, composé des Émirats arabes unis, a deux liens avec les groupements 1 et 6, et cinq liaisons au total. La Chine est centrale dans le réseau de collaboration, avec

le plus grand nombre d'articles (29), de citations (284) et de liaisons (13) (Tableau 3). Les publications chinoises sont les plus performantes scientifiquement, avec une citation normalisée élevée (30,25). Les auteurs taïwanais se classent au deuxième rang avec une citation normalisée de 11,29, suivis des Américains (6,35).

Figure 13

Réseau de collaboration entre pays.
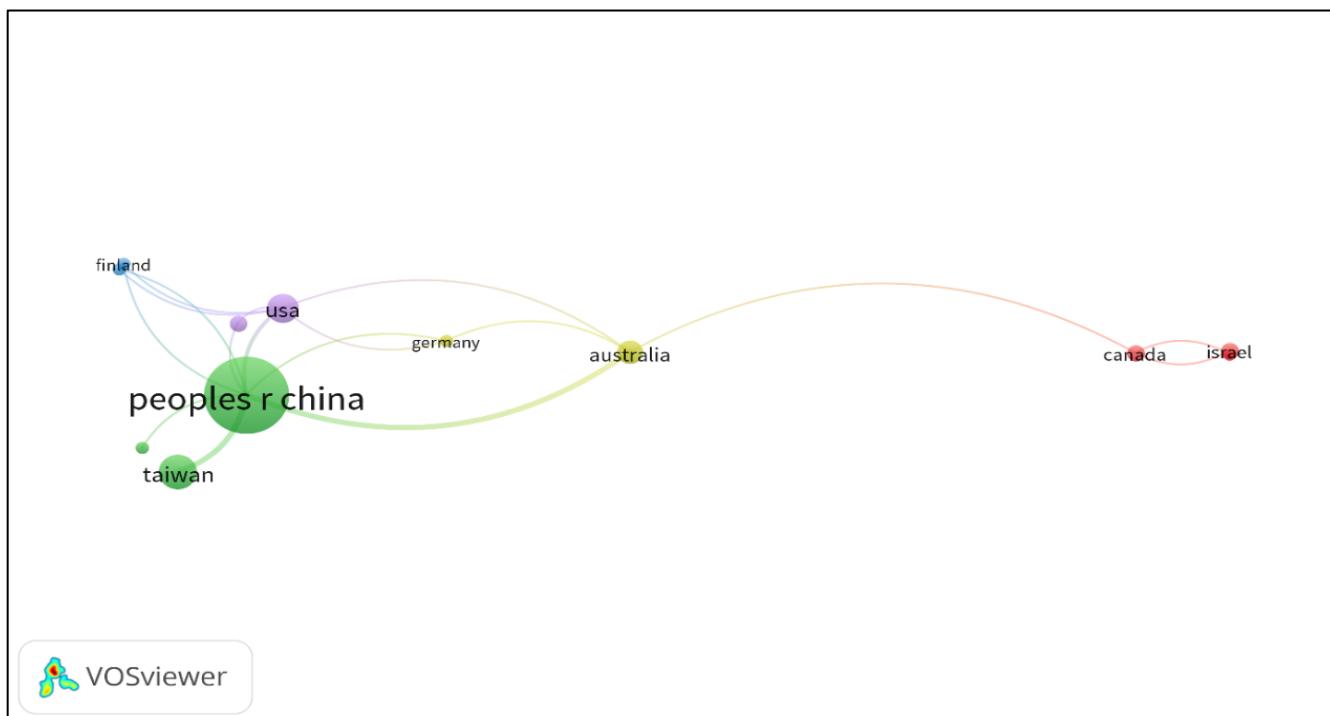
Note. Vert (1), rouge (2), bleu (3), jaune (4), rose (5) et violet (6).

En conclusion, la Chine est le pays central dans le réseau de collaboration sur l'IA en enseignement supérieur, suivie par les États-Unis. Une forte collaboration intra-groupe est observée dans les groupes 1, 2 et 3, tandis que les groupes 4 et 5 émergent dans ce réseau. L'analyse de la carte temporelle ci-dessous nous permet d'observer l'évolution chronologique des collaborations entre les pays.

Les groupes de recherche sont représentés par des couleurs allant du violet au jaune, le groupement Thaïlande-Philippines, le plus récent, étant en jaune pour l'année 2024. Les premières collaborations ont débuté en 2020 entre la Suède et les États-Unis, ainsi qu'entre le Canada et la Corée du Sud. La Chine a commencé à collaborer avec Taïwan et les États-Unis en 2022. Les groupements autour des États-Unis et de la Chine se sont formés respectivement au milieu et à la fin de l'année 2023. La Finlande, les Émirats arabes unis et l'Afrique du Sud ont collaboré avec les États-Unis en 2023, tandis que Singapour a commencé à collaborer avec les États-Unis et la Chine au début de la même année. En somme, la collaboration internationale est active et dynamique, avec toutes les collaborations établies entre 2020 et 2024.

Figure 14

Évolution chronologique de la collaboration entre pays (2020–2024)
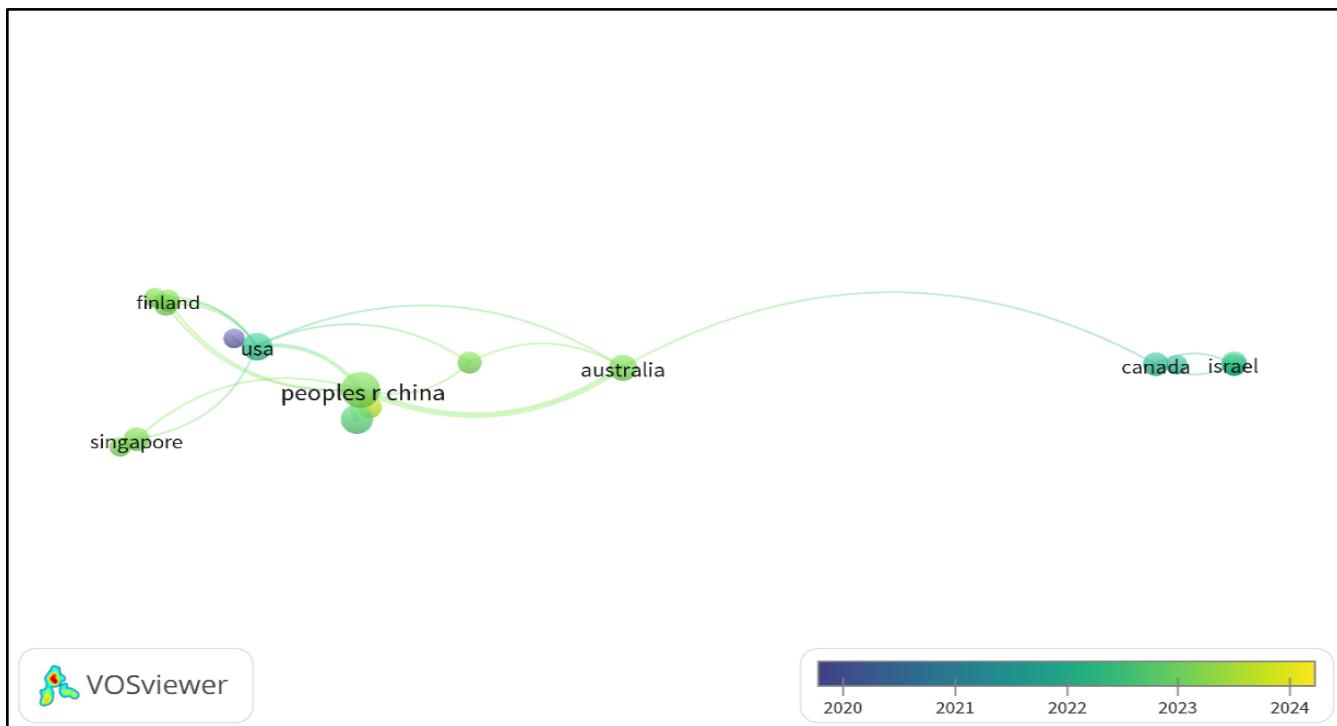
Structure et dynamique de la collaboration organisationnelle

Une analyse de coauteurs-organismes a été réalisée pour examiner les relations entre les coauteurs en fonction de leurs affiliations institutionnelles dans le domaine de l'IA et de l'enseignement supérieur. Cette analyse vise à répertorier les organismes clés qui publient dans ce domaine et a révélé les réseaux de collaboration entre eux. Nous avons inclus tous les organismes ayant publié au moins deux documents. Sur 78 organismes universitaires retenu dans le corpus des données, seuls 18 ont des auteurs ayant publié au moins deux articles. Le tableau 4 présente le nombre de documents publiés par organisme, les citations des auteurs, ainsi que les co-citations entre auteurs de différentes institutions.

La carte de visualisation en réseau ci-dessous présente les performances et l'impact des organismes dans ce domaine, en montrant les liens entre les coauteurs et leurs affiliations institutionnelles.

Tableau 4

Citation et co-citations d'auteurs par organisme universitaire

Selected	Organization	Documents	Citations	Total link strength
✓	Chinese University of Hong Kong	14	141	13
✓	Education University of Hong Kong	8	110	6
✓	National Taiwan University of Science and Technology	5	36	6
✓	South China Normal University	3	3	6
✓	Lingnan University	5	93	5
✓	University of New South Wales	3	28	5
✓	Beijing Normal University	3	15	4
✓	Nanjing Normal University	2	66	4
✓	National Taichung University of Education	2	11	4
✓	Beijing University of Civil Engineering and Architecture	2	46	3
✓	Seoul National University of Science and Technology	2	41	3
✓	Technion–Israel Institute of Technology	2	41	3
✓	University of British Columbia	3	42	3
✓	University of Eastern Finland	2	1	3
✓	University of Hong Kong	4	5	3
✓	University of Johannesburg	2	1	3
✓	Fu Jen Catholic University	2	21	2
✓	National Taiwan Normal University	2	16	2
✓	University of Sydney	2	21	2

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Dans un premier temps, nous remarquons que les groupes 1 et 2 sont bien structurés et visibles. Le groupe 1 est central et est directement lié aux groupes 2 et 5. Il est indirectement lié au groupe 6 *via* l'université de Sydney et aux groupes 3 et 4 *via* la South China Normal University. La Chinese University Hong Kong est au cœur de ce groupe, avec 20 liaisons et 141 citations. L'Education University Hong Kong suit avec huit liaisons et 110 citations, tandis que la Lingnan University occupe la troisième place avec sept liaisons et 93 citations (Tableau 4). Le groupe 2, composé d'institutions comme Education University Hong Kong et Macao Polytechnic University, collabore avec les groupes 1, 4 et 5. L'Education University Hong Kong est la plus influente dans ce réseau (huit documents, huit liaisons et 110 citations). Le groupe 3 collabore avec les universités du groupe 4 et 1 et regroupe les Fu Jen Catholic University, National China University Technology, National Taïwan Science de Technology et d'autres universités dont la collaboration reste intra-groupe. Le groupe 4 est constitué des National Taichung University de Education, National Taïwan Normal University et Guangdong University de Technology. Ce groupement collabore essentiellement avec la Chinese University Hong Kong. Le groupement 5 contribue avec les clostres 1 et 2 *via* la Chinese University Hong Kong. Les universités de ce groupement collaborent entre elles. Le groupement 6, comprenant des institutions comme Queen University, Western University, Kingston Health Sciences Centre, etc., collabore uniquement avec le groupe 1, avec des interactions principalement internes. La Chinese University Hong Kong est au centre du réseau de collaboration, avec le plus grand nombre d'articles (14), de citations (141) et de liaisons (20) (Tableau 4). Les publications de cette université sont les plus performantes scientifiquement, avec une citation normalisée de 14,10. Les auteurs de l'Université de l'éducation de Hong Kong suivent avec une citation normalisée de 10,05, puis ceux de l'Université nationale de science et technologie de Taïwan (9,05).

En conclusion, les universités chinoises dominent les publications sur l'IA et la formation universitaire. Les universités américaines occupent le second rang dans ce réseau de collaboration. Une forte collaboration est observée entre les chercheurs des groupes 4 et 5, qui sont des équipes de recherche émergentes. La carte temporelle ci-dessous décrit l'évolution des collaborations entre les organismes.

Figure 15

Réseau de collaboration internationale entre organisations
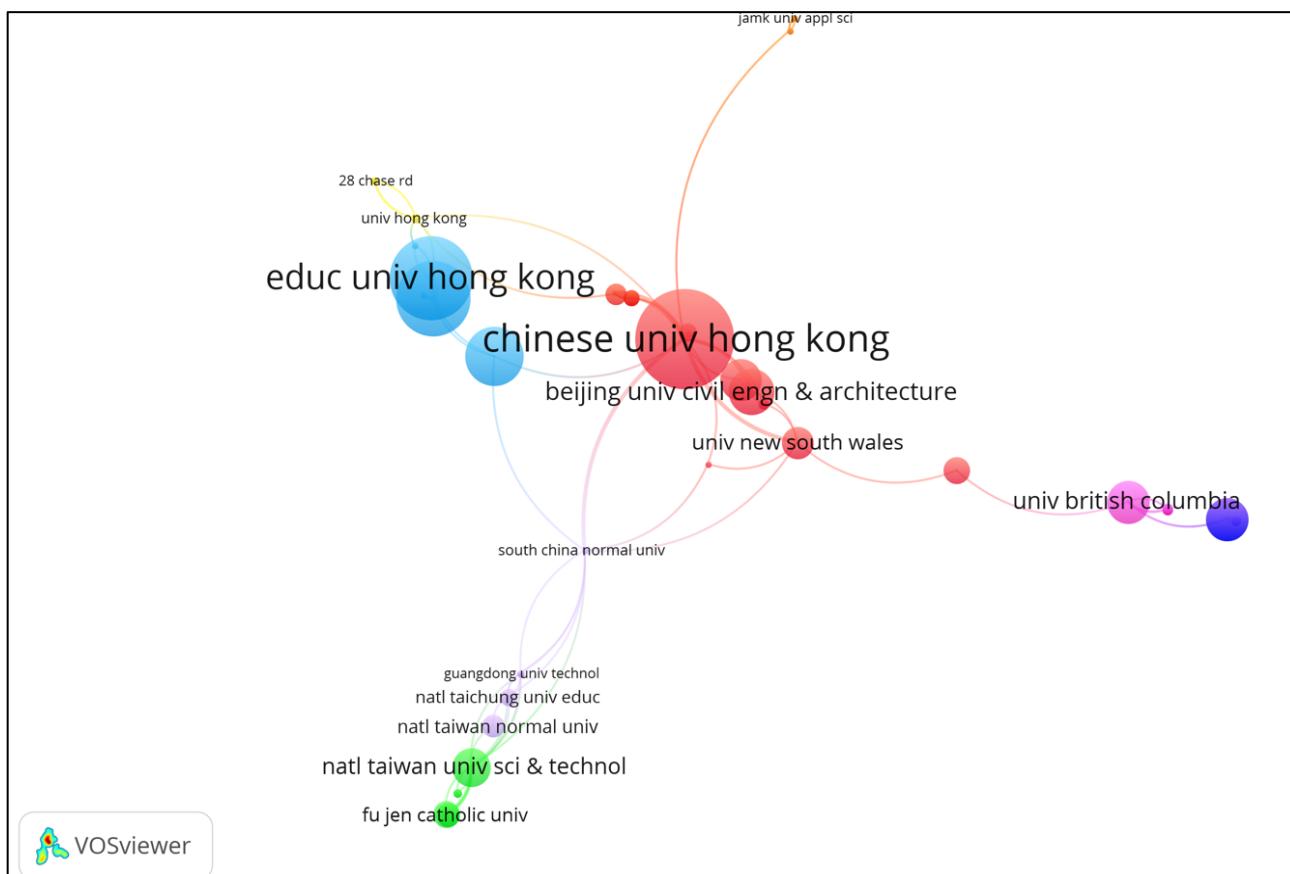
Note. Rouge (1), bleu (2), vert (3), violet (4), jaune (5) et rose (6).

L'échelle de couleurs montre que les groupes se situent entre le vert et le jaune. La première collaboration (2021) s'est construite entre le National Kaohsiung Normal University et la Chinese University Hong Kong (vert). Toutes les collaborations restantes se sont construites entre 2022 et 2023 (jaune). Le premier réseau de collaboration international le plus dense s'est construit en 2022 autour de la Chinese University Hong Kong et de l'Education University Hong Kong. Un réseau secondaire entre l'University British Columbia, l'University Sydney, le Kingston Health Science Center et la Seoul National University s'est ensuite connecté au réseau principal *via* l'University New South Wales en 2023. Un troisième réseau regroupant National Taïwan University Science & Technology, Fu Jen Catholic University, National Taïwan Normal University, National Taichung University Education et Guangdong University Technology a émergé en 2023, rejoignant le réseau principal par le biais de la South China Normal University fin 2023.

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Figure 16

Évolution chronologique de la collaboration internationale entre organismes
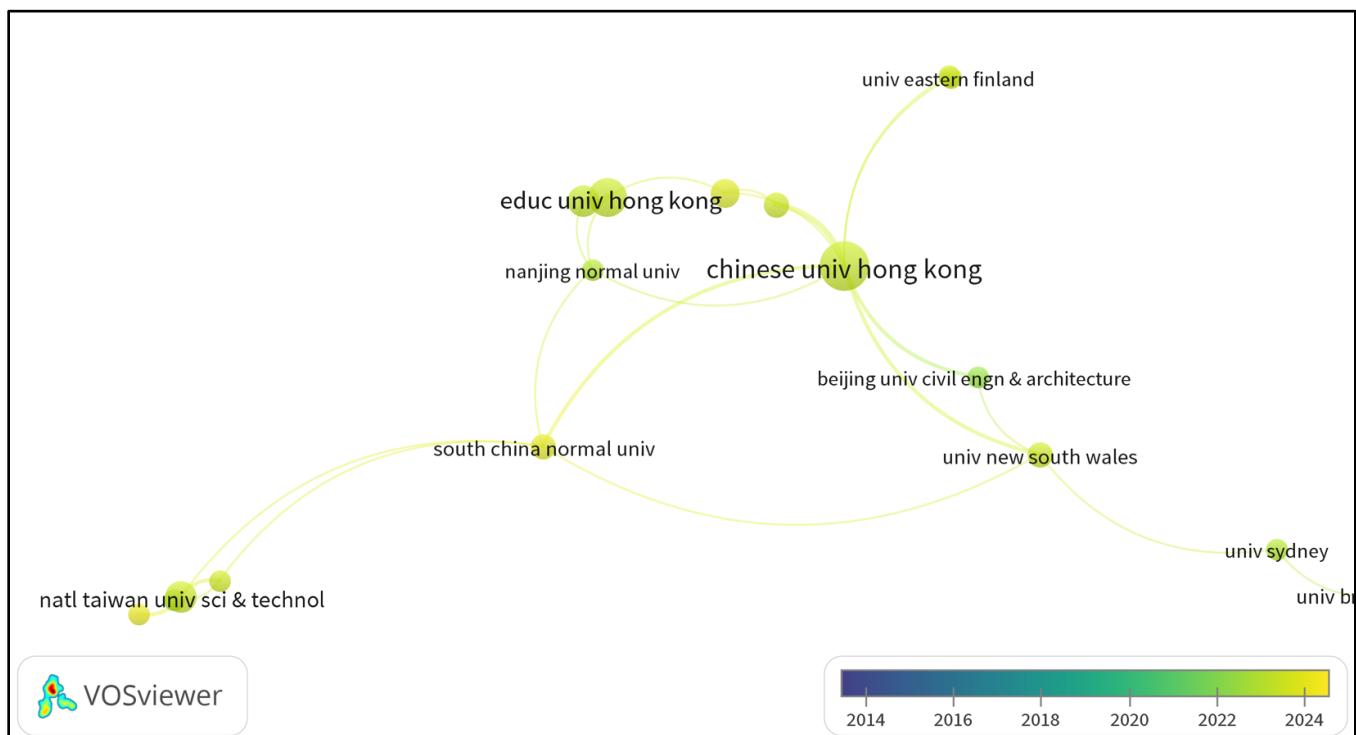
Cette analyse révèle une collaboration universitaire particulièrement dynamique et rapide, concentrée sur 2022–2023. Les recherches associant IA et enseignement supérieur, récentes et en forte expansion depuis 2022, expliquent probablement cette intensité collaborative entre institutions.

La performance et l'influence des sources dans la publication

Pour évaluer l'influence des revues sur la thématique de l'IA et l'enseignement supérieur, nous avons analysé leur taux de citations et de co-citations, dès lors qu'il y avait une citation par source et une publication d'au moins deux documents par source. Parmi 32 revues retenues dans cette analyse bibliométrique, huit d'entre elles ont publié au moins deux articles et ont été cités deux fois dans les autres sources de publication. Le tableau ci-dessous illustre cette collaboration entre les revues.

La revue *Educational Technology & Society* est la revue la plus citée (153). Elle a le plus important réseau de relation avec les différentes revues avec un total de sept liaisons (*total link strengh*). Elle est citée souvent en association avec la revue *Education and Information Technologies* dans les articles (six fois). La revue *International Journal of Educational Technology in Higher Education* est placée en second rang en ce qui concerne la visibilité internationale avec six articles publiés et 88 citations (Tableau 5). Cependant, elle n'est apparue qu'une seule fois avec la revue *Educational Technology & Society*. La revue *Education and Information Technologie* est citée 40 fois et elle est apparue six fois avec la revue *Educational Technology & Society* et quatre fois avec *IEEE Transactions in Education*. La revue *Interactive Learning Environments* est citée six fois (Tableau 5) et elle est

apparue une seule fois avec la revue *Journal of Education Computing Research*. Nous remarquons aussi que le nombre de citations de certaines revues comme *Journal of Engineering Education, Research in Science Education et Computer Assisted Language Learning* est faible et ne dépasse pas six citations pour chaque revue. Les résultats de cette analyse montrent que la recherche sur l'IA en formation universitaire est dominée par trois revues à savoir *Educational Technology & Society*, *International Journal of Educational Technology in Higher Education* et *Education and information technology*, qui sont considérées comme les revues les plus influentes dans ce domaine. D'autant plus que les documents publiés par ces revues sont les plus performants sur le plan scientifique, vu la valeur respective de la citation normalisée (*norm. citations*) (11.48; 6.3; 6.19). Nous constatons aussi que ce sont les revues spécialisées en éducation et en technologie qui publient souvent des articles sur l'IA et l'enseignement supérieur. La carte temporelle ci-dessous permet de visualiser l'évolution des publications scientifiques par les revues.

Tableau 5

Citations et co-citations entre revues

Selected	Source	Documents	Citations	Total link strength
✓	Educational Technology and Society	6	153	7
✓	Education and Information Technologies	10	40	6
✓	Interactive Learning Environments	3	25	1
✓	International Journal of Educational Technology	6	88	1
✓	Journal of Educational Computing Research	2	13	1
✓	BMC Medical Education	2	6	0
✓	British Journal of Educational Technology	3	25	0
✓	Nurse Education Today	2	27	0

Note. La figure 17 illustre la carte réseau de collaboration entre les revues.

Figure 17

Réseau de collaboration entre revues
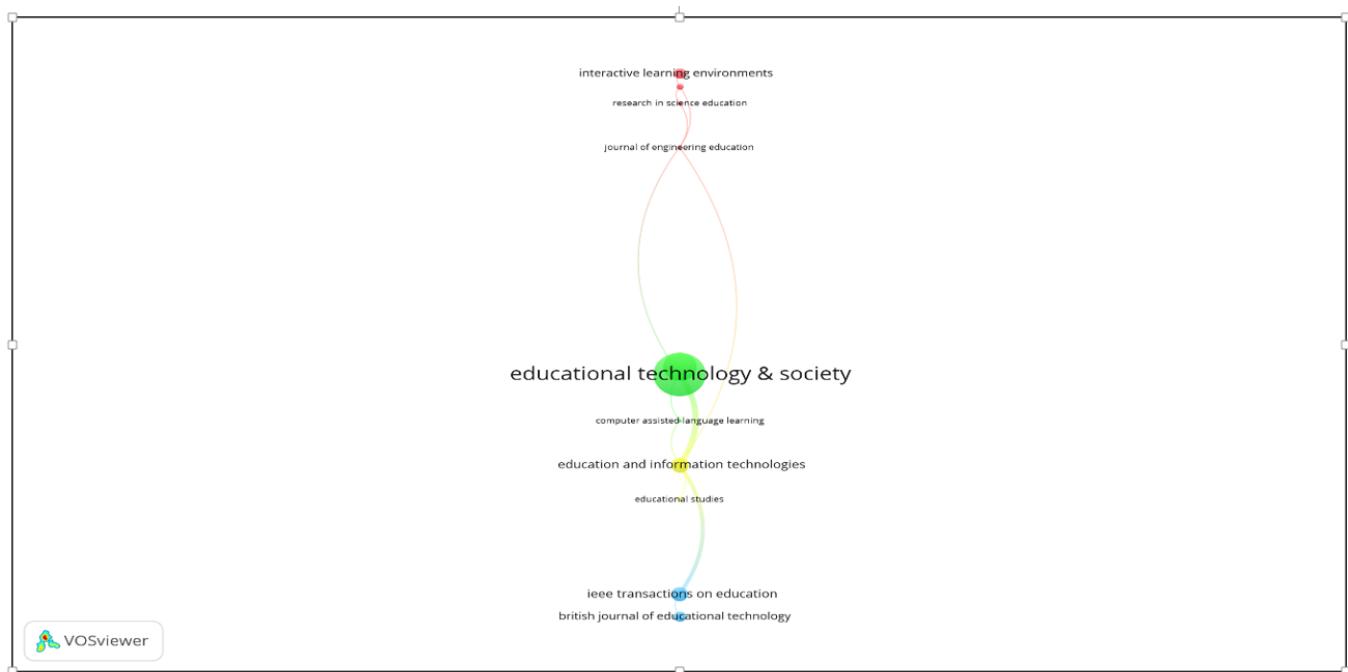
L'observation de l'échelle chronologique par couleurs montre que les couleurs attribuées aux différentes revues se situent entre le bleu et le jaune. La première revue qui a publié des articles sur l'IA et la formation universitaire est l'*International Journal of Educational Technology in Higher Education*, avec une moyenne de 33 articles en 2022 (*avg.pub.year*). C'est au cours de la même année que la revue *Educational Technology & Society* a commencé à publier des articles dans ce domaine avec une moyenne (*avg.pub.year*) de 17. La revue *Education and Information Technologie* a commencé la publication au cours de l'année 2023 (*avg.pub.year*), avec 20 articles.

L'émergence de publications sur l'IA et l'enseignement supérieur dans les revues universitaires est un phénomène récent. Il débute au début de 2022 et connaît une croissance rapide au cours des deux dernières années. Alors que la plupart des revues ont commencé à s'intéresser à la recherche sur l'IA et l'enseignement supérieur à partir de 2023, la collaboration entre ces revues, amorcée dès 2022, s'est progressivement étendue à de nouveaux acteurs, tels que le *Journal of Engineering Education, Research in Science Education* et *Computer Assisted Language Learning*.

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Figure 18

Évolution chronologique de la publication scientifique par revue
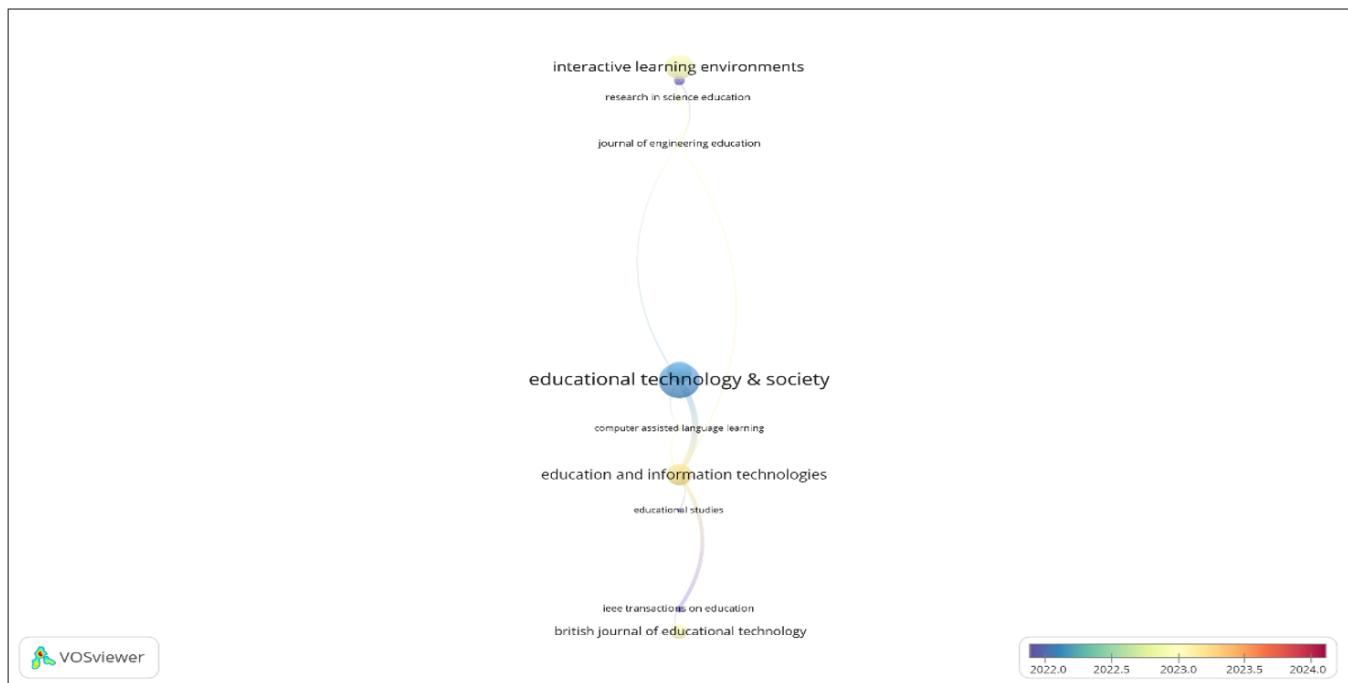
Discussion et conclusion

L'analyse bibliométrique des publications scientifiques sur l'IA et l'enseignement supérieur au cours de ces dix dernières années révèle que les recherches dans ce domaine sont très récentes et ont commencé à émerger à partir de 2018 (Zawacki-Richter et al., 2019). Les articles publiés abordent principalement l'utilisation des avantages de l'IA en éducation, en enseignement et en apprentissage, ainsi que le développement de la motivation, de l'engagement et de l'autonomie des étudiants (Ivanova et al., 2024). À partir de 2023, de nouvelles thématiques ont commencé à prendre de l'importance dans le réseau de recherche sur l'IA, telles que l'exploitation des acquis de ce champ de recherche dans les sciences de l'éducation et les technologies éducatives (Delen et al., 2024), le traitement automatique du langage naturel (Roxas & Recario, 2024) et la formation en soins infirmiers (Monaco et al., 2024).

L'analyse montre une forte dominance des publications sur l'IA et l'enseignement supérieur par deux auteurs influents, Chai et Chiu, qui ont établi un réseau dense de collaborations sur des problématiques, telles que la personnalisation des apprentissages et l'amélioration de la rétroaction étudiante grâce à l'IA. La Chine est le pays central dans ce réseau international de publications, suivie des États-Unis (Crompton & Burke, 2023). Bien que certains groupements de pays aient commencé à prendre place dans le réseau de collaboration international en 2023, tels que le Canada, le Brésil, l'Afrique du Sud, la Pologne, Israël, Singapour et le Vietnam, la collaboration intra-groupe domine et

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ces derniers sont peu connectés au réseau international le plus dense construit autour de la Chine et des É.-U.

L'analyse bibliométrique montre que la Chine et les États-Unis sont les principaux contributeurs à la recherche sur l'IA dans l'enseignement supérieur. Ces deux pays se distinguent non seulement par le volume de publications, mais aussi par le nombre de citations, ce qui souligne leur influence dans le domaine (Montalván et al., 2024). Les premières publications dans ce domaine ont eu lieu en 2022 dans des revues telles que *International Journal of Educational Technology in Higher Education* et *Educational Technology & Society*. En 2023, la publication d'articles a augmenté avec les revues *Education and Information Technology*, *Journal of Engineering Education, Research in Science Education* et *Computer Assisted Language Learning*.

En résumé, l'IA est devenue un sujet central dans le domaine de l'éducation, avec une croissance rapide des publications et des collaborations internationales ces deux dernières années. Par ailleurs, l'analyse bibliométrique de la revue sur l'IA et l'enseignement supérieur révèle une tendance croissante à adopter l'IA pour améliorer les processus d'apprentissage et d'enseignement, l'importance de la personnalisation et l'automatisation des apprentissages (Castro et al., 2024), de l'apprentissage individualisé, la collaboration et le suivi des apprenants (Farliana & Hardianto, 2024). L'analyse bibliométrique réalisée offre des intuitions précieuses sur les tendances et les développements récents de l'utilisation de l'IA dans le domaine de la formation et de l'apprentissage universitaires. Toutefois, il est important d'en reconnaître certaines limites. Tout d'abord, l'étude s'est appuyée uniquement sur la base de données *Web of Science*, ce qui peut entraîner des lacunes dans la sélection des publications pertinentes, sans tenir compte des travaux publiés dans d'autres sources ou disciplines connexes (Fărcașiu et al., 2023). Il serait ainsi nécessaire d'élargir la recherche en incluant d'autres bases de données, comme *Scopus*, pour obtenir une vue plus complète et diversifiée du sujet. De plus, l'analyse n'a pas examiné en détail le contenu des publications, limitant ainsi la compréhension approfondie des tendances et des développements dans ce domaine. Cette étude n'a pris en compte que 285 articles rédigés en anglais, ce qui restreint, d'une part, notre compréhension de la diversité des approches et des méthodes d'utilisation de l'IA dans différents contextes culturels (Calderón-Garrido & Gustems-Carnicer, 2018), et d'autre part, la généralisation des résultats (Yılmaz & Tuzlukaya, 2023). Sur le plan géographique, la collaboration entre pays reste dominée par la Chine et les États-Unis, ce qui peut limiter la représentativité des données utilisées et conduire à des conclusions biaisées ou incomplètes (Riazi et al., 2023). Cette faible diversité des perspectives et des approches peut également restreindre la compréhension globale de la dynamique de recherche dans le domaine de l'IA en éducation. Enfin, sur le plan méthodologique, l'analyse bibliométrique repose principalement sur des mesures quantitatives, qui peuvent ne pas refléter pleinement la qualité réelle des publications et des recherches. De plus, certaines études pertinentes ont été écartées en raison des critères de sélection stricts, tels que le nombre de citations ou de documents par auteurs, pays, organismes ou revue. En somme, ces limitations soulignent la nécessité d'une approche holistique et critique lors de l'interprétation des résultats et de la prise de décision en matière de recherche et de politique éducative.

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Perspectives

L'analyse bibliométrique de la littérature sur l'IA relativement à la formation universitaire, bien que limitée, offre des pistes pour orienter les futures recherches. Il est recommandé d'exploiter plusieurs bases de données et une approche interdisciplinaire pour enrichir les travaux existants. Face à la faible collaboration internationale observée, les chercheurs devraient envisager des partenariats pour améliorer la représentativité des données et intégrer des perspectives interculturelles. L'adoption de méthodes qualitatives complèterait utilement l'analyse bibliométrique pour une vision plus approfondie des apports de l'IA à la formation universitaire. Ces recommandations visent à guider les futures recherches sur l'intégration de l'IA dans l'enseignement supérieur, et ce en élargissant les perspectives et en combinant différentes approches méthodologiques.

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Privacy and Emotional Intelligence in Technology-Based Learning

Confidentialité et Intelligence émotionnelle dans l'apprentissage basé sur la technologie

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Abstract

This study explores the influence of emotional intelligence and privacy orientation on attitudes and intentions to learn with mobile technologies. Data were collected from 272 respondents in Kazakhstan, a country with a transitioning economy. The findings reveal that both emotional intelligence and privacy orientation positively affect attitudes and intentions, except for the dimension of concern about one's own informational privacy. Additionally, a model incorporating both emotional intelligence and privacy orientation explains variations in attitudes and intentions more effectively than models with either factor alone. This research contributes to the understanding of the multidimensional constructs of mobile learning, privacy, and emotional intelligence in non-Western contexts, providing valuable insights for technology adoption in transitional economies.

Keywords: emotional intelligence, Kazakhstan, mobile technologies, privacy orientation, technology adoption

Résumé

Cette étude explore l'influence de l'intelligence émotionnelle et de l'orientation vers la vie privée sur les attitudes et les intentions d'apprendre avec les technologies mobiles. Des données ont été recueillies auprès de 272 répondants au Kazakhstan, un pays dont l'économie est en transition. Les résultats révèlent que l'intelligence émotionnelle et l'orientation vers la vie privée affectent positivement les attitudes et les intentions, sauf pour la dimension relative à la protection de la vie privée personnelle. De plus, un modèle intégrant l'intelligence émotionnelle et l'orientation vers la vie privée explique mieux les variations dans les attitudes et les intentions que les modèles les considérant séparément. Cette recherche contribue à la compréhension des construits multidimensionnels de l'apprentissage mobile, de la vie privée et de l'intelligence émotionnelle dans des contextes non occidentaux, offrant des perspectives pertinentes pour l'adoption technologique dans des économies en transition.

Mots - clés: adoption technologique, intelligence émotionnelle, Kazakhstan, orientation vers la vie privée, technologies mobiles

Introduction

This study explores the relationships between the attitude and intention to learn with mobile technologies, privacy orientation, and emotional intelligence. In the current digital era, it is essential to comprehend attitudes and intents regarding technology because these elements have a big impact on technology adoption and usage patterns (Svenningsson et al., 2022). Privacy issues, which are becoming increasingly important as digital technologies spread, affect how people interact with technology and their willingness to adopt new technologies (Jeon & Lee, 2022; Sivakumar et al., 2024; Zhang & Zhang, 2024). Emotional intelligence, which influences how people manage their emotions, interact with others, and cope with stress, can also affect their attitudes toward technology and its use (Abu-Shanab & Abu-Shanab, 2022).

By examining the relationships between these concepts, this study aims to provide a holistic understanding of the factors influencing technology adoption and privacy behaviour. Such findings can form the basis for educational strategies, policy development, and activities to improve digital literacy and technology adoption while addressing privacy concerns. Integrating emotional intelligence with technology adoption and privacy fills a research gap in the literature, offering a more complete understanding of user behaviour (Audrin & Audrin, 2024). As digital technologies are increasingly being introduced into everyday life, it is essential to understand the psychological and emotional factors influencing the introduction and use of technology (Granić, 2022; Ling et al., 2021; Roberts et al., 2021).

The purpose of this study is to explore the interrelationships between technology use, privacy orientation, and emotional intelligence in Kazakhstan, a country with a transition economy located in Central Asia. The unique context of rapid technology adoption and changing privacy issues in Kazakhstan provides valuable information about these concepts. Transition economies characterized by rapid change and adaptation offer special conditions for studying technology adoption and related behaviours (Adhikary et al., 2021; Akpan et al., 2020; Davis et al., 2022; Liébana-Cabanillas et al., 2020).

Literature Review

Privacy Orientation and Attitude and Intention to Learn with Mobile Technologies

The relationship between privacy orientation and attitude and intention to learn with mobile technologies is grounded in established theories such as the technology acceptance model, unified theory of acceptance and use of technology, and theory of planned behaviour. According to technology acceptance model, perceived usefulness and perceived ease of use are pivotal in shaping users' attitudes toward mobile technologies, which subsequently influence their behavioural intentions to adopt such technologies (Bali et al., 2024; F. Li et al., 2024). Privacy attitudes also play a significant role, as

concerns about personal data protection affect users' willingness to engage with mobile applications, thereby shaping their attitudes and intentions (Dogruel et al., 2023). Furthermore, the privacy paradox, which highlights discrepancies between users' stated privacy concerns and their actual behaviour, suggests that risk-benefit evaluations and perceived negligible risks significantly influence privacy-related decision-making in mobile contexts (Barth & de Jong, 2017). The inclusion of privacy orientation within the technology acceptance model offers a nuanced understanding of how these factors contribute to mobile learning engagement, underscoring the need for effective strategies to enhance user participation in mobile learning environments (Tarhini et al., 2024).

The unified theory of acceptance and use of technology further elucidates the relationships among privacy orientation and attitude and intention to learn with mobile technologies by incorporating factors such as perceived privacy protection and social influence. Research shows that privacy protection perceptions strongly influence behavioural intentions toward mobile applications, including educational tools (Yang et al., 2024). Attitudes toward technology usage act as a mediator, linking facilitating conditions and social influence to behavioural intention (Hou & Yu, 2023). The framework highlights how personalized and environmentally conscious strategies can increase user acceptance, suggesting that a robust privacy orientation enhances positive attitudes and intentions to adopt mobile learning technologies (Krouska et al., 2023). The unified theory of acceptance and use of technology thus provides a comprehensive lens through which to understand how privacy concerns and other factors interact to shape users' engagement with mobile learning applications (Bayaga & du Plessis, 2024; Zhu & Huang, 2023).

Similarly, the theory of planned behaviour sheds light on the interplay between privacy orientation and attitude and intention in mobile learning. Privacy attitudes impact users' intentions to share personal information in mobile applications, particularly in sensitive contexts like health apps, thereby influencing overall behavioural intentions (Dogruel et al., 2023). The theory of planned behaviour identifies attitudes, subjective norms, and perceived behavioural control as key determinants of behavioural intentions, with cross-cultural studies affirming their relevance in mobile learning environments (Hagger et al., 2022; S.-H. Lin et al., 2020). While perceived trust and value enhance positive attitudes, leading to greater intention to use mobile technologies, perceived behavioural control moderates the intention-behaviour link in certain contexts (Davis Le Brun et al., 2023). Integrating privacy orientation within the theory of planned behaviour offers a comprehensive perspective on how privacy concerns influence user intentions in mobile learning, highlighting the complex interplay of internal and external factors (Hameed et al., 2024).

Based on the components of privacy orientation and attitude and intention to learn with mobile technologies as well as evidence from the theories, the study proposes the following hypothesis:

H_1: Privacy orientation correlates with attitudes and intentions to learn with mobile technologies.

Emotional Intelligence and Attitude and Intention to Learn with Mobile Technologies

The relationship between emotional intelligence (EI) and the intention to learn using mobile technologies is grounded in the principles of the affective events theory, the theory of planned

behaviour, and the unified theory of acceptance and use of technology. According to affective events theory, daily events trigger emotional responses that influence behaviours, offering a framework to explore the connections between EI and attitudes toward mobile learning. Individuals with higher EI are better equipped to manage their emotions, which positively affects their anticipated emotions towards mobile learning, reinforcing their intention to engage with such technologies (Huang, 2022). Moreover, the interaction of positive and negative emotions, particularly in mobile health contexts, suggests that while negative emotions can impede technology use, positive emotions can facilitate it (Y. Li et al., 2019). Emotional regulation also plays a moderating role in learning outcomes, highlighting how effectively managing emotions can enhance the intention to learn with mobile technologies (Lopes et al., 2017).

The theory of planned behaviour further clarifies the connections between EI and the intention to learn with mobile technologies by examining the roles of attitude, subjective norms, and perceived behavioural control. Research suggests that individuals with higher EI tend to develop more favorable attitudes toward mobile learning technologies, as they can manage emotions more effectively and empathize with others, which enhances relatedness and autonomy in learning settings (Bali et al., 2024). Additionally, subjective norms, such as peer and educator influences, significantly shape learners' intentions to use mobile technologies (Liu & Wang, 2024). Perceived behavioural control also plays a pivotal role, as learners who perceive themselves as capable of using mobile technologies are more likely to intend to engage in mobile learning (Hagger et al., 2022; Hsu et al., 2023). Therefore, theory of planned behaviour illustrates how EI influences attitudes and intentions toward mobile learning by enhancing emotional, social, and behavioural factors.

The unified theory of acceptance and use of technology provides another perspective on the relationship between EI and attitudes and intentions to learn using mobile technologies. The unified theory of acceptance and use of technology posits that emotions directly influence technology acceptance, which, in turn, mediates engagement with mobile learning (X. Lin et al., 2024). Key constructs of the unified theory of acceptance and use of technology such as performance expectancy and facilitating conditions are essential in shaping attitudes and intentions toward mobile learning (Bayaga & du Plessis, 2024; Zhu & Huang, 2023). Emotional intelligence enhances self-efficacy and social influence, both of which are critical in fostering positive attitudes and intentions to adopt mobile learning technologies (Hou & Yu, 2023). Integrating EI within the unified theory of acceptance and use of technology offers a comprehensive understanding of how emotional factors shape learners' technology adoption behaviours, thereby improving engagement and learning outcomes.

Based on the dimensions of emotional intelligence and intention to learn with mobile technologies constructs as well as evidence from the theories, the study proposes the following hypothesis:

H$_2$: Emotional intelligence correlates with attitudes and intentions to learn with mobile technologies.

Privacy Orientation and Emotional Intelligence

The relationship between privacy orientation and emotional intelligence can be understood through the lens of meta-emotional intelligence, a construct introduced in 2023. Meta-emotional intelligence extends traditional models of emotional intelligence by integrating metacognitive and meta-emotional components, such as beliefs about emotions, self-assessment of emotional abilities, and emotional self-evaluation (D'Amico & Geraci, 2023). This framework underscores the influence of an individual's awareness and understanding of their emotional processes on broader behavioural tendencies, including privacy management. Individuals with heightened meta-emotional awareness are likely to exhibit more sophisticated privacy management strategies, as they possess greater capacity for recognizing and regulating their emotional responses to privacy-related issues (Fiori et al., 2023). Consequently, the nuanced interaction between emotional regulation and privacy behaviour highlights the role of meta-emotional intelligence in shaping interpersonal boundaries and decision-making in privacy contexts.

Based on the results of previous studies and the assumptions underlying the structures of privacy orientation and emotional intelligence, the study proposes the following hypothesis:

H3: Emotional intelligence correlates with privacy orientation

Figure 1 presents the hypothesized research model, illustrating the key variables and their proposed relationships.

Figure 1

Hypothesized Research Model

Privacy Orientation (PO):
Privacy as a right (PR)
Concern about own informational privacy (OWN)
Other-contingent privacy (CON)
Concern about privacy of others (OTH)

Mobile Technologies (MT):
Perceived usefulness (PU)
Perceived ease of use (PEOU)
Attitude toward using MT (ATU)
Social influence (SI)
Facilitating conditions (FC)
Self-efficacy (SE)
Anxiety (ANX)
Behavioural intention to new MT (BI)
Reliability (REL)
Recommendation (REC)

Emotional Intelligence (EI):
Self-focused emotion appraisal (SA)
Other-focused emotion appraisal (OA)
Self-focused emotion regulation (SR)
Other-focused emotion regulation (OR)

Control Variables:
Gender (Gen)
Age
Year of Study (Year)
Area of Study (Major)

Methodology

This study adopted a multidimensional construct that was conceptualized by Briz et al. (2016) to assess the attitude and intention to learn with mobile technologies: perceived usefulness of technology, perceived ease of use of technology, attitude toward using technology, external or social influence and support to use or in the usage of technologies, facilitating conditions or available resources to use technologies, self-efficacy or ability to complete tasks with new technology, anxiety or apprehension of using technology, behavioural intention to use new technology in the coming future, reliability or necessity of quality certification for apps, and recommendation to use technologies. Sample item to assess the attitude and intention to learn with mobile technologies includes "Using new mobile technologies and applications/programs is a good idea".

This study used a four-dimensional privacy orientation construct developed by Baruh and Cemalcilar (2014) that includes privacy as a right, concern about own information privacy, other-contingent privacy, and concern about privacy of others. Sample item to assess privacy orientation includes "If somebody is not careful about protecting their own privacy, I cannot trust them about respecting mine".

This study followed Pekaar's et al. (2018) four-dimensional Rotterdam Emotional Intelligence Scale (REIS) that combines self-focused emotion appraisal, other-focused emotion appraisal, self-focused emotion regulation, and other-focused emotion regulation. Sample items to assess emotional intelligence includes "I understand why I feel the way I feel".

Data were collected from undergraduate students studying at universities in Kazakhstan. The study took several steps to enhance the reliability and validity of the survey constructs and the study's results. Since the questionnaire items were derived from previous research, they underwent translation and back-translation from English to native Kazakh to ensure clear comprehension of the questionnaire (Kowal, 2024). To mitigate response bias, participants were guaranteed the confidentiality and anonymity of their responses. This guarantee served to deter inaccurate responses and desirable answers from the participants (Ried et al., 2022). The study utilized a convenience sampling approach, which is recognized as a suitable method for enhancing data reliability and validity in known and homogeneous populations (Creswell & Creswell, 2022). All the constructs were measured on a 6-point Likert-type scale ranging from 1 = strongly disagree to 6 = strongly agree.

Results and Analysis

Participants

A total of 272 valid responses were analyzed, with participants aged 18 to 23. The majority (43%) were in their senior year of study, and the most represented fields were finance (29%), accounting (20%), marketing (18%), and management (13%).

The recruitment process primarily resulted in a significant proportion of participants majoring in business specializations due to their accessibility and the relevance of the study's focus on privacy and

emotional intelligence in technology-based learning to business-related fields. To broaden the diversity of the sample, students registered in courses taught by the authors were provided with several copies of the questionnaire and requested to distribute them among acquaintances from other universities, different academic specializations, and various cities and rural areas of Kazakhstan. This approach facilitated the inclusion of participants outside the authors' immediate academic environment and ensured a wider representation across geographical and disciplinary contexts.

Table 1

Demographic Profile

Variable	Grouping	Participants	%
Gender	Female	141	52
	Male	131	48
Age	≤ 18	27	10
	19	63	23
	20	57	21
	21	63	23
	22	41	15
	≥ 23	21	8
Year of study	Freshmen	16	6
	Sophomore	65	24
	Junior	75	28
	Senior	116	43
Area of study	Accounting	55	20
	Finance	79	29
	Management	35	13
	Marketing	49	18
	International relations	16	6
	Law	16	6
	Others	22	8

Reliability and Validity of the Survey Constructs

Table 2 provides descriptive statistics, indicating that all mean values exceeded 4.00, except for anxiety (M = 3.12) and concern about own informational privacy (M = 3.99). Standard deviations ranged from 0.84 to 1.23, showing narrow variability. Most dimensions exhibited skewness between -

0.5 and 0.5, implying symmetry, with moderate skewness in a few dimensions like perceived usefulness and reliability. Kurtosis values below 3 suggest a flatter distribution with few outliers.

Table 2

Descriptive Statistics

Construct	Mean	SD	Skewness	Kurtosis
Perceived usefulness	4.79	1.10	-1.191	1.172
Perceived ease of use	4.44	1.10	-0.539	0.089
Attitude toward using mobile technologies	4.54	0.97	-0.204	-0.487
Social influence	4.08	0.84	-0.039	0.035
Facilitating conditions	4.24	0.87	-0.471	0.216
Self-efficacy	4.31	1.01	-0.516	-0.046
Anxiety	3.12	1.15	-0.124	-0.618
Behavioural intention to use new mobile technologies	4.57	0.97	-0.267	-0.612
Reliability	4.37	1.23	-1.027	1.449
Recommendation	4.60	1.08	-0.770	0.615
Privacy as a right	4.68	1.04	-1.032	1.304
Concern about own informational privacy	3.99	1.02	-0.232	0.049
Other-contingent privacy	4.07	1.00	-0.189	-0.344
Concern about privacy of others	4.67	0.89	-0.636	0.177
Self-focused emotion appraisal	4.32	1.04	-0.547	0.074
Other-focused emotion appraisal	4.15	0.99	-0.541	0.640
Self-focused emotion regulation	4.00	1.00	-0.365	-0.110
Other-focused emotion regulation	4.04	0.95	-0.316	0.297

Table 3 reports Cronbach's alpha, composite reliability, and average variance extracted (AVE). Most constructs met the reliability thresholds (Cronbach's $\alpha > 0.7$, composite reliability > 0.6, AVE > 0.5). Notably, constructs like social influence and anxiety fell slightly below ideal thresholds, but values were acceptable for exploratory research (Creswell & Creswell, 2022).

Table 3

Construct Values

Construct	Number of items	Cronbach's α	Composite reliability	Average variance extracted
Perceived usefulness	3	.845	.858	.675
Perceived ease of use	3	.861	.863	.678
Attitude toward using	4	.851	.852	.590
Social influence	4	.650	.592	.294
Facilitating conditions	4	.685	.692	.364
Self-efficacy	3	.800	.814	.596
Anxiety	3	.688	.691	.430
Behavioural intention to use	3	.588	.736	.531
Privacy as a right	3	.869	.877	.706
Concern about own privacy	4	.772	.780	.473
Other-contingent privacy	4	.771	.779	.472
Concern about privacy of others	5	.850	.853	.539
Self-focused emotion appraisal	7	.922	.926	.646
Other-focused emotion appraisal	7	.900	.901	.568
Self-focused emotion regulation	7	.870	.871	.492
Other-focused emotion regulation	7	.884	.884	.523

Considering these findings, Table 4 delves deeper into the item-total statistics for the four dimensions: social influence, facilitating conditions, anxiety, and behavioural intention to adopt new mobile technologies. The analysis reveals that removing social influence item 4 increases its Cronbach's alpha from 0.650 to 0.707, indicating improved reliability. In contrast, eliminating items from the facilitating conditions or anxiety dimensions results in decreased Cronbach's alpha values. However, deleting behavioural intention item 3 significantly raises its Cronbach's alpha from 0.588 to 0.843. Therefore, based on item-total statistics, social influence item 4 and behavioural intention item 3 were removed to improve reliability.

Table 4

Item-Total Statistics

Construct and scale item	Cronbach's α if item deleted			
	Item 1	Item 2	Item 3	Item 4
Social influence	.482	.505	.582	.707
Facilitating conditions	.631	.618	.657	.571
Anxiety	.627	.614	.542	
Behavioural intention to use	.380	.260	.843	

Correlation Analysis

A bivariate Pearson correlation analysis was conducted using SPSS to assess the relationships among privacy orientation, emotional intelligence, and attitudes and intentions to learn with mobile technologies. The results are presented in Table 5.

Hypothesis 1 posited that privacy orientation would correlate with attitudes and intentions to learn with mobile technologies. As shown in Table 5, all dimensions of privacy orientation, except for concern about own informational privacy, exhibited statistically significant positive correlations with most dimensions of attitudes and intentions to learn with mobile technologies, except for anxiety.

Hypothesis 2 proposed a correlation between emotional intelligence and attitudes and intentions to learn with mobile technologies. The results confirmed that all dimensions of emotional intelligence were significantly positively correlated with attitudes and intentions to learn with mobile technologies. The only exception was the relationship between self-focused emotion appraisal and reliability, which did not exhibit a statistically significant correlation.

Hypothesis 3 suggested that privacy orientation would correlate with emotional intelligence. Table 5 indicates that, except for concern about own informational privacy, all dimensions of privacy orientation had statistically significant positive correlations with all dimensions of emotional intelligence.

The analysis revealed that males demonstrated higher levels of self-focused emotion appraisal and self-focused emotion regulation than females, as evidenced by significant positive correlations between gender and these dimensions of emotional intelligence. Additionally, males reported significantly higher levels of perceived ease of use and self-efficacy with respect to computer technologies compared to females, suggesting greater confidence and ease in technology use. In contrast, females reported significantly higher levels of anxiety associated with using computer technologies.

Age also demonstrated significant positive correlations with concern about own informational privacy and attitudes toward using computer technologies, suggesting that as individuals age, their

attitudes toward technology become more positive, although they simultaneously develop greater sensitivity toward privacy concerns. Similarly, the year of study showed a positive correlation with attitudes toward using computer technologies, further supporting the trend of more favorable attitudes toward technology with increasing age and experience.

Table 5

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12
5	-.01	.04	-.03	.09								
6	.05	.18**	.09	.08								
7	-.08	.05	-.04	.14*								
8	-.10	-.02	-.05	.10								
9	.22**	.08	.09	.10	.32**	.09	.12*	.35**				
10	.02	.03	.03	.12*	.32**	.03	.18**	.41**				
11	.21**	.01	-.01	.09	.23**	.17**	.15*	.24**				
12	.09	.06	.02	.07	.28**	.09	.21**	.28**				
13	.03	.07	.06	.06	.41**	.08	.16**	.43**	.37**	.35**	.29**	.31**
14	.20**	.07	.01	.01	.26**	.05	.14*	.28**	.34**	.36**	.26**	.39**
15	.08	.15*	.15*	.08	.31**	.05	.17**	.31**	.31**	.36**	.27**	.33**
16	.06	.07	.04	.01	.22**	.05	.19**	.20**	.23**	.20**	.16**	.23**
17	.15*	.05	-.04	.06	.33**	.09	.17**	.32**	.39**	.34**	.26**	.43**
18	.18**	.03	-.01	.08	.26**	.07	.14*	.30**	.27**	.29**	.27**	.37**
19	-.21**	-.09	-.05	.07	-.09	.23**	.18**	-.07	-.17**	-.2**	-.15*	-.18**
20	-.01	.02	.04	-.04	.31**	-.08	.02	.37**	.21**	.40**	.21**	.29**
21	.05	-.05	-.04	.02	.23**	.12	.12*	.20**	.08	.14*	.13*	.18**
22	.11	.07	.10	.10	.32**	.01	.17**	.39**	.28**	.33**	.21**	.24**

Note. *. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed). Variables: 1: Gender, 2: Age, 3: Year of study, 4: Academic major, 5: Privacy as a right, 6: Concern about own informational privacy, 7: Other-contingent privacy, 8: Concern about privacy of others, 9: Self-focused emotion appraisal, 10: Other-focused emotion appraisal, 11: Self-focused emotion regulation, 12: Other-focused emotion regulation, 13: Perceived usefulness, 14: Perceived ease of use, 15: Attitude toward using mobile technologies, 16: Social influence, 17: Facilitating conditions, 18: Self-efficacy, 19: Anxiety, 20: Behavioural intention to use new mobile technologies, 21: Reliability, 22: Recommendation.

Multiple Regression Analysis

To examine the effect of privacy orientation and emotional intelligence on attitudes and intentions to learn with mobile technologies, a series of multiple regressions were conducted on ten dimensions of these attitudes and intentions.

First, each dimension of attitudes and intentions to learn with mobile technologies was regressed on the four dimensions of privacy orientation (Models A; see Tables 6A–6E). Second, each dimension was regressed on the four dimensions of emotional intelligence (Models B). Third, each dimension was regressed on both privacy orientation and emotional intelligence simultaneously (Models C).

The F-statistics for Models A, B, and C indicated that all models were statistically significant, suggesting that they explained a significant proportion of variance in the dependent variables. Additionally, the adjusted R^2 values for Model C were consistently higher than those for Models A and B. This finding suggests that the combined model (Model C), which includes both privacy orientation and emotional intelligence, explains more variation in attitudes and intentions to learn with mobile technologies than models that include only privacy orientation or emotional intelligence alone.

For instance, as Table 6A shows privacy as a right and concern about the privacy of others from privacy orientation, as well as self-focused emotion appraisal and other-focused emotion regulation from emotional intelligence, were significant predictors of perceived usefulness in Model C. The adjusted R^2 for this model was 0.269, indicating that 26.9% of the variance in perceived usefulness could be explained by privacy orientation and emotional intelligence.

Additionally, Table 6B demonstrates that privacy orientation, specifically privacy as a right and other-contingent privacy, along with emotional intelligence (specifically other-focused emotion appraisal), significantly influenced attitudes toward using mobile technologies in Model C. These results suggest that both privacy concerns and emotional intelligence are critical factors in shaping attitudes toward mobile technologies.

In summary, these results indicate that privacy orientation and emotional intelligence, when considered together, provide a more comprehensive explanation of attitudes and intentions to learn with mobile technologies than when either factor is considered alone. The combined models explain a larger proportion of the variance, demonstrating the complex interplay between emotional intelligence, privacy concerns, and technology adoption behaviours.

Table 6A

Regression of Perceived Usefulness and Perceived Ease of Use on Privacy Orientation and Emotional Intelligence

Variable	Perceived usefulness			Perceived ease of use		
PO	Model A	Model B	Model C	Model A	Model B	Model C
PR	.267***		.207***	.151**		.064

Variable	Perceived usefulness			Perceived ease of use		
PO	Model A	Model B	Model C	Model A	Model B	Model C
OWN	-.014		-.014	-.037		-.028
CON	-.019		-.027	.046		.020
OTH	.297***		.210***	.193***		.081
EI						
SA		.220***	.136**		.182***	.153**
OA		.191***	.093		.142**	.102
SR		.074	.063		.039	.036
OR		.088	.070		.220***	.212***
Adj R²	*.220*	*.185*	*.269*	*.083*	*.195*	*.196*
F-stat	*20.087****	*16.354****	*13.467****	*7.172****	*17.444****	*9.272****

Note. Levels of significance for Tables 6A – 6E: ** significant at the 0.05; *** significant at the 0.01; Abbreviations used in Tables 6A – 6E: *PO – Privacy Orientation:* PR – Privacy as a right, OWN – Concern about own informational privacy, CON – Other-contingent privacy, OTH – Concern about privacy of others; *EI – Emotional Intelligence:* SA - Self-focused emotion appraisal, OA – Other-focused emotion appraisal, SR – Self-focused emotion regulation, OR – Other-focused emotion regulation.

Table 6B

Regression of Attitude Toward Using Mobile Technologies and Social Influence on Privacy Orientation and Emotional Intelligence

Variable	Attitude toward using			Social influence		
PO	Model A	Model B	Model C	Model A	Model B	Model C
PR	.197***		.128*	.149**		.102
OWN	-.060		-.055	-.091		-.091
CON	.070		.051	.170**		.161**
OTH	.197***		.096	.082		.028
EI						
SA		.132*	.087		.145**	.120
OA		.208***	.148**		.053	.006
SR		.092	.089		.009	.007
OR		.121*	.105		.145*	.120

Variable	Attitude toward using			Social influence		
PO	Model A	Model B	Model C	Model A	Model B	Model C
Adj R²	*.117*	*.168*	*.189*	*.064*	*.065*	*.085*
F-stat	*9.995****	*14.667****	*8.915****	*5.633****	*5.674****	*4.164****

Note. Abbreviations used in Tables 6A – 6E: *PO – Privacy Orientation:* PR – Privacy as a right, OWN – Concern about own informational privacy, CON – Other-contingent privacy, OTH – Concern about privacy of others; *EI – Emotional Intelligence:* SA - Self-focused emotion appraisal, OA – Other-focused emotion appraisal, SR – Self-focused emotion regulation, OR – Other-focused emotion regulation.

Table 6C

Regression of Facilitating Conditions and Self-Efficacy on Privacy Orientation and Emotional Intelligence

Variable	Facilitating conditions			Self-Efficacy		
PO	Model A	Model B	Model C	Model A	Model B	Model C
PR	.227***		.136**	.148**		.082
OWN	-.008		.000	-.009		-.012
CON	.032		.008	.025		-.001
OTH	.194***		.094	.214***		.141**
EI						
SA		.264***	.218***		.099	.054
OA		.058	.005		.072	.014
SR		-.018	-.027		.100	.094
OR		.304***	.289***		.250***	.241***
Adj R²	*.130*	*.238*	*.259*	*.091*	*.154*	*.170*
F-stat	*11.089****	*22.133*	*12.857****	*7.792****	*13.340****	*7.953****

Note. Abbreviations used in Tables 6A – 6E: *PO – Privacy Orientation:* PR – Privacy as a right, OWN – Concern about own informational privacy, CON – Other-contingent privacy, OTH – Concern about privacy of others; *EI – Emotional Intelligence:* SA - Self-focused emotion appraisal, OA – Other-focused emotion appraisal, SR – Self-focused emotion regulation, OR – Other-focused emotion regulation.

Table 6D

Regression of Anxiety and Behavioural Intention to Use New Mobile Technologies on Privacy Orientation and Emotional Intelligence

Variable	Anxiety			Behavioural intention		
PO	Model A	Model B	Model C	Model A	Model B	Model C
PR	-.144**		-.090	.211***		.164**
OWN	.199***		.198***	-.126*		-.107
CON	.140*		.155**	-.073		-.103
OTH	-.066		.011	.300***		.217***
EI						
SA		-.078	-.065		.017	-.058
OA		-.107	-.095		.329***	.237***
SR		-.046	-.084		.074	.083
OR		-.074	-.098		.062	.064
Adj R²	*.075*	*.040*	*.115*	*.170*	*.154*	*.230*
F-stat	*6.479***	*3.855***	*5.417***	*14.898***	*13.374***	*11.098***

Note. Abbreviations used in Tables 6A – 6E: *PO – Privacy Orientation:* PR – Privacy as a right, OWN – Concern about own informational privacy, CON – Other-contingent privacy, OTH – Concern about privacy of others; *EI – Emotional Intelligence:* SA - Self-focused emotion appraisal, OA – Other-focused emotion appraisal, SR – Self-focused emotion regulation, OR – Other-focused emotion regulation.

Table 6E

Regression of Reliability and Recommendation on Privacy Orientation and Emotional Intelligence

Variable	Reliability			Recommendation		
PO	Model A	Model B	Model C	Model A	Model B	Model C
PR	.163**		.152**	.172***		.129**
OWN	.064		.063	-.118*		-.112*
CON	-.003		-.018	.085		.078
OTH	.107		.101	.291***		.218***
EI						
SA		-.032	-.084		.151**	.082

Variable	Reliability			Recommendation		
PO	Model A	Model B	Model C	Model A	Model B	Model C
OA		.051	.000		.236***	.133*
SR		.079	.061		.047	.046
OR		.128*	.110		.025	.008
Adj R²	*.052*	*.023*	*.053*	*.169*	*.122*	*.192*
F-stat	*4.694****	*2.562***	*2.891****	*14.789****	*10.385****	*9.032****

Note. Abbreviations used in Tables 6A – 6E: *PO – Privacy Orientation:* PR – Privacy as a right, OWN – Concern about own informational privacy, CON – Other-contingent privacy, OTH – Concern about privacy of others; *EI – Emotional Intelligence:* SA - Self-focused emotion appraisal, OA – Other-focused emotion appraisal, SR – Self-focused emotion regulation, OR – Other-focused emotion regulation.

Structural Equation Model Analysis

The structural equation model was constructed using R software to investigate the relationships among various dimensions influencing attitudes and intentions regarding learning with mobile technologies. The endogenous (dependent) variables consisted of these dimensions, while the exogenous (independent) variables included privacy orientation and emotional intelligence, both of which demonstrated statistically significant correlation coefficients with the dependent variables. The model was specified based on established theoretical frameworks and previous research findings. The assessment of the model's goodness-of-fit revealed robust results: Comparative Fit Index (CFI) = 0.995, Root Mean Square Error of Approximation (RMSEA) = 0.039, and p-value = 0.014. CFI values of 0.900 and 0.950 indicate adequate and excellent fit, respectively (Creswell & Creswell, 2022), suggesting that the model effectively represents the data. Additionally, RMSEA values of 0.01, 0.05, and 0.08 correspond to excellent, good, and mediocre fit, respectively (Creswell & Creswell, 2022). In this context, a p-value less than 0.050 is considered statistically significant, while a p-value below 0.010 is classified as highly statistically significant. These findings provide valuable insights into the dynamics of attitudes and intentions toward mobile technology learning, contributing to the broader understanding of educational technology adoption.

Discussion and Conclusion

This research study investigated the relationships among attitudes and intentions to learn with mobile technologies, privacy orientation, and emotional intelligence among emerging adults in Kazakhstan. The results indicated a positive correlation between attitudes and intentions to learn with mobile technologies, privacy orientation (except for the dimension concern about own informational privacy), and emotional intelligence. Furthermore, the variability in attitudes and intentions to learn with mobile technologies was more effectively explained by incorporating both privacy orientation and emotional intelligence in the regression analysis, rather than considering each factor independently. This

suggests that (1) emotional intelligence significantly influences privacy orientation as well as attitudes and intentions toward learning with mobile technologies, and (2) privacy orientation is a critical determinant of positive attitudes and intentions toward mobile technology learning.

Demographic characteristics findings revealed that, on average, (1) males demonstrate greater proficiency in self-focused emotional appraisal and regulation than females; (2) males exhibit higher levels of ease and confidence in utilizing computer technologies compared to their female counterparts; (3) females experience greater anxiety when using computer technologies than males; and (4) as individuals age, their attitudes toward computer technologies tend to become more positive, although they also exhibit increased sensitivity to privacy concerns regarding their information.

It is important to note that the study focused specifically on post-secondary education, where mobile learning technologies are increasingly adopted but not yet uniformly integrated across institutions in Kazakhstan. While many students who participated in the study were already users of mobile technologies in their education, the degree of adoption varies significantly depending on the university and its resources. This variability may contribute to some of the anxiety reported by students, particularly females, suggesting that earlier exposure to technology and digital literacy—starting from primary or secondary education—could help reduce apprehension and enhance confidence. As Kazakhstan continues to develop its digital infrastructure, a comprehensive understanding of the local population's attitudes toward technology use and privacy is crucial for informing both academic research and practical applications in policy and business.

Theoretical Implications

This study advances the theoretical understanding of technology adoption by integrating emotional intelligence and privacy orientation into established frameworks like the unified theory of acceptance and use of technology and the technology acceptance model. By investigating these constructs within Kazakhstan, the study expands the cross-cultural applicability of these frameworks. The inclusion of emotional intelligence as a critical factor in technology adoption highlights the need to consider not only cognitive factors but also emotional and psychological drivers of technology acceptance. Emotional intelligence influences user confidence, stress management, and overall engagement with technology, suggesting that traditional models of technology acceptance need to account for the emotional readiness of users.

Moreover, the study provides a nuanced understanding of privacy orientation by demonstrating its multidimensional impact on mobile learning attitudes. Unlike previous research focused on Western economies, this study shows how privacy concerns are perceived in a transitional economy, which could affect the trust and willingness to adopt technology. By revealing that emotional intelligence and privacy orientation together explain user attitudes and intentions more effectively, the study calls for the refinement of existing models to include these emotional and privacy-related dimensions, especially in non-Western, rapidly evolving economic contexts.

However, caution is needed in interpreting the findings, as they are specific to a transitional economy with unique sociocultural and technological conditions that may not fully generalize to other

contexts. While the findings offer valuable theoretical contributions to non-Western economies and economies in transition, future research is encouraged to explore these relationships across diverse regions and economic settings to validate and refine these insights further. This will ensure a broader applicability of the proposed refinements to global technology adoption behaviour.

Limitations

It is important to acknowledge that the use of cross-sectional data and the convenience sampling method may have introduced potential limitations to the study. The reliance on university students as participants may not fully represent the broader population, as their attitudes and behaviours toward mobile technologies and privacy concerns might differ from those of working professionals or individuals in rural areas. Future research should aim to collect longitudinal data and explore these relationships in more diverse populations to capture changes over time and provide a more comprehensive understanding of the findings' applicability. These improvements will enhance the study's credibility and relevance, making the recommendations more impactful for the field.

Practical Implications

This study provides actionable insights for educational institutions, policymakers, and technology developers in Kazakhstan and similar transitioning economies. The findings suggest that improving emotional intelligence and addressing privacy concerns can enhance technology adoption and mobile learning. Educational institutions should integrate emotional intelligence training into digital literacy programs to help students manage stress and improve their confidence in using mobile technologies. Tailoring these programs to reduce technology-related anxiety, especially among female students, can boost engagement and learning outcomes.

For policymakers, the research highlights the importance of developing robust privacy protection policies that build trust in digital platforms. Clear, user-centric privacy guidelines are critical for increasing users' willingness to engage with mobile technologies, particularly in educational settings. Additionally, incorporating emotional intelligence into policy frameworks can create more personalized approaches to technology adoption, improving user experience and fostering long-term engagement.

For technology developers, this study emphasizes the need to design mobile applications that prioritize both emotional user support and strong privacy safeguards. Applications that consider users' emotional and privacy needs will likely see higher adoption rates, especially in economies experiencing rapid technological shifts. These insights can inform the creation of more effective, user-friendly digital learning environments.

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Évaluation comparative des formations en ligne relativement à la perception des étudiants vietnamiens aux études supérieures

Benchmarking Online Training in Higher Education: Vietnamese Students' Perceptions

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Résumé

Le Vietnam est considéré comme étant avancé dans l'adoption et l'usage des technologies de l'information et de la communication (TIC) en éducation, suivant les critères définis par l'UNESCO. Cependant, la plupart des établissements d'enseignement supérieur vietnamiens ne se limitent qu'à investir dans du matériel et des équipements technologiques pour encourager les initiatives individuelles d'enseignement en ligne chez les enseignants universitaires, sans disposer de véritable politique institutionnelle de formation en ligne ni de toutes les dimensions nécessaires à l'intégration systématique des TIC. Cela les empêche d'atteindre un niveau d'efficacité suffisant et une cohérence d'ensemble. Cet article vise à présenter les résultats de l'étude des modèles de développement du cyberapprentissage dans les établissements d'enseignement supérieur du monde entier, en particulier celui de l'Association européenne des universités d'enseignement à distance (EADTU), en vue de construire un modèle d'évaluation comparative de la politique institutionnelle de l'apprentissage en ligne en fonction de la perception des étudiants. Ce modèle a fait l'objet d'une enquête auprès de 460 étudiants de quatre établissements d'enseignement supérieur vietnamiens, dont les résultats d'analyse factorielle permettent de valider une version adaptée de l'enquête au contexte local.

Mots-clés : Association européenne des universités d'enseignement à distance, enseignement supérieur, évaluation comparative, formation en ligne, perception des étudiants, Vietnam

Abstract

Vietnam is ranked at the advanced stages in the adoption and use of information and communication technologies (ICTs) in education, according to the criteria defined by UNESCO. However, most Vietnamese higher education institutions are limited to investing in technological equipment and materials to encourage individual initiatives in online teaching among lecturers, without having a comprehensive institutional policy for online training, including all the dimensions necessary for the systemic integration of ICTs. This prevents them from achieving a sufficient level of efficiency and overall coherence. This article is a study of models for the overall development of e-learning in higher education institutions, in particular that of the European Association of Distance Teaching Universities (EADTU), for building a benchmarking model for e-learning institutional policy under students' perception. This model was subject to a survey involving 460 students from four Vietnamese higher education institutions, with the result of factor analysis validating an adapted version that fits to the local context.

Keywords: benchmarking, European Association of Distance Teaching Universities, higher education, online training, students' perception, Vietnam

Introduction

Depuis la fin du XXe siècle, l'éducation a connu des changements majeurs à l'échelle mondiale grâce au développement des technologies de l'information et de la communication (TIC), en particulier l'Internet et le Web, qui permettent l'utilisation de plateformes intégrant les outils de travail individuel et renforcent le travail interactif et collaboratif en ligne. Cela permet de développer différentes méthodes pédagogiques constructivistes à plusieurs échelles (Moore & Kearsley, 2012). Au Vietnam, afin de maintenir et de renforcer les résultats initiaux encourageants obtenus depuis la période de rénovation amorcée en 1986, l'État a adopté des politiques fortes pour améliorer la qualité de l'éducation dès la première décennie du XXIe siècle, dont le développement de l'utilisation des TIC dans l'enseignement et l'apprentissage figurait parmi les solutions prioritaires. Grâce à ces initiatives, le Vietnam a non seulement enregistré l'une des croissances les plus rapides au monde en matière d'infrastructures TIC pendant plusieurs années consécutives (Ca & Huong, 2009) mais il figure en bonne position relativement à l'intégration des TIC dans l'éducation (SEAMEO, 2010) selon les critères de l'UNESCO (Anderson, 2010).

Ces acquis ont permis au ministère de l'Éducation et de la Formation (MEF) vietnamien de promulguer assez tôt certains textes réglementaires régulant la mise en œuvre de la formation en ligne (FEL), en particulier la *Circulaire n° 12/2016/TT-BGDDT du 22 avril 2016 définissant l'application des technologies de l'information dans la gestion et l'organisation de la formation en ligne* (Circulaire 12/2016), et la *Circulaire n° 10/2017/TT-BGDDT du 28 avril 2017 établissant le règlement de la formation à distance de niveau universitaire* (Circulaire 10/2017). Bien que ces réglementations demeurent lacunaires, elles ont posé des bases nécessaires pour permettre à l'ensemble du système éducatif vietnamien de faire face efficacement à la pandémie de COVID-19 durant les années 2020-

2021. Cependant, en ce qui a trait à la perception de l'efficacité des mesures d'enseignement à distance (EAD) au cours de cette période, majoritairement mises en œuvre *via* des outils de vidéoconférence, ont été détectées des divergences considérables entre différents acteurs concernés, notamment enseignants et étudiants : les enseignants ont tendance à surévaluer leur performance, et à sous-estimer leurs propres faiblesses par rapport à la perception réelle des étudiants (Đại & Trang, 2022).

Durant cette période, le MEF a continué de publier de nouveaux textes officiels afin d'améliorer progressivement le cadre juridique de la FEL, en particulier la *Circulaire n° 39/2020/TT-BGDĐT du 9 octobre 2020 définissant le standard d'évaluation de la qualité des programmes de formation à distance de niveau universitaire* (Circulaire 39/2020). Cependant, dans l'ensemble, ces nouvelles réglementations relatives aux activités d'EEL en réponse à la pandémie COVID-19 n'ont pas eu d'influence significative, car elles ne proposaient pas de solutions fondamentales pour surmonter les problèmes techniques rencontrés lors des cours en ligne ouverts à tous (Phan Thị Ngọc Thanh et al., 2020), ni pour créer des espaces d'apprentissage privés et réduire les nuisances sonores (Oanh & Thuý, 2020). Bien que l'enseignement en ligne par vidéoconférence ait largement été utilisé comme modalité principale, l'utilité (*usefulness*) et l'utilisabilité (*ease of use*) de l'outil n'ont pas eu d'influence sur le comportement relativement à l'utilisation ou à l'usage réel chez les étudiants (Pho et al., 2020).

Dans ce contexte, nous avons proposé un projet de recherche scientifique et technologique de niveau ministériel intitulé « Formation en ligne de niveau universitaire dans les établissements d'enseignement supérieur vietnamiens : état des lieux et solutions », qui a été déployé de 2022 à 2024. Pendant la mise en place du projet, le MEF a successivement promulgué d'autres textes réglementaires, dont la *Circulaire n° 28/2023/TT-BGDDT du 28 décembre 2023 définissant le règlement de la formation à distance de niveau universitaire* (Circulaire 28/2023), qui remplace la Circulaire 10/2017, et la *Circulaire n° 30/2023/TT-BGDDT du 29 décembre 2023 définissant l'application des technologiques de l'information dans la formation en ligne de niveau universitaire* (Circulaire 30/2023), qui se substitue à la Circulaire 12/2016. Cependant, il faudra du temps avant de pouvoir évaluer les effets de ces mesures sur les problèmes existants.

La principale raison réside probablement dans le fait que les établissements d'enseignement supérieur (EES) vietnamiens ne disposent pas encore de véritable stratégie de développement de l'apprentissage en ligne, qui prendrait en compte toutes les dimensions indispensables à l'intégration des TIC dans l'organisation institutionnelle. La plupart se limitent à l'investissement dans les infrastructures et équipements pour encourager les initiatives individuelles, ce qui conduit à un manque de cohérence globale et réduit le niveau d'efficacité des initiatives lancées (Nguyen Tan, 2017).

En résumé, toutes ces lacunes ont montré qu'il est nécessaire d'avoir un outil de diagnostic complet qui permet aux EES vietnamiens de prendre en considération toutes les dimensions indispensables à la mise en place de leur stratégie de développement de la FEL. Ainsi, une question de recherche s'est posée : existe-t-il un ou des modèles de diagnostic de la stratégie de FEL dans le monde, notamment dans les pays développés, susceptibles d'être intégrés ou adaptés dans le contexte vietnamien? Cette question de recherche nous a conduits à étudier les approches d'évaluation de la qualité de l'enseignement supérieur en général et de la FEL en particulier, dans l'optique de concevoir

un modèle d'évaluation comparative de la qualité de la FEL adapté au contexte vietnamien. Cet article présente les résultats de notre projet, avec un modèle testé auprès des étudiants de quatre EES participant au projet.

Revue de la littérature

À travers le monde, l'amélioration de la qualité passe naturellement par le partage d'expériences entre les EES, et ce depuis l'origine même de l'institution universitaire. C'est sur cette base qu'est née l'approche d'évaluation comparative (*benchmarking*) dans l'enseignement supérieur. Celle-ci vise à comparer les méthodes et les pratiques, en particulier les bonnes, voire meilleures pratiques, dans l'organisation, la gestion et le fonctionnement des EES, tout en en permettant de diagnostiquer les problèmes existants ainsi que leurs propres points forts et faibles (Schofield, 1998). Cette approche permet aux EES non seulement de se situer vis-à-vis des standards établis ou de simplement collecter et traiter des données quantitatives, mais aussi de s'inspirer des expériences réussies ailleurs à travers les scénarios réellement mis en place avec succès (Achim et al., 2009).

Dans le domaine des TIC appliquées à l'éducation, il existe de nombreuses approches et formes de standards ou normes de qualité différentes, allant de la gestion de la qualité basée sur les processus, sur les produits ou sur les compétences, aux normes relatives au contenu, à la technologie et aux méthodes pédagogiques, etc. (Ehlers & Pawlowski, 2006). L'essentiel est que la démarche qualité dans chaque institution respecte trois étapes fondamentales :

1) sensibilisation des individus à la culture de la qualité;

2) définition d'une vision et d'une conception communes sur les objectifs et résultats à atteindre, fondées sur la conscience accrue des individus sensibilisés;

3) traduction de la vision et des objectifs de qualité en processus opérationnels quotidiens, en impliquant l'ensemble des détenteurs d'enjeux (Stracke, 2006, 2009).

Parmi les approches diversifiées dans la gestion de la qualité basées sur les processus, nombreuses portent sur l'étude de cas ou sur l'élaboration de concepts théoriques, de modèles, de facteurs d'évaluation, de standards et d'indicateurs, qui constituent des cadres de référence pour l'évaluation comparative de l'intégration des TIC dans l'enseignement supérieur, communément appelée « cyberapprentissage » (Huynh-Cam et al., 2021).

Bien que ce terme de « cyberapprentissage » donne aujourd'hui matière à différentes interprétations, il est souvent utilisé comme synonyme d'« enseignement et apprentissage en ligne » (J. L. Moore et al., 2011). Cette interprétation se rapproche de la définition proposée par l'auteur présumé du concept en 1998, Jay Cross (2004) : le cyberapprentissage est l'apprentissage à l'ère d'Internet, un point de convergence entre l'apprentissage et le réseau. Ce terme est aussi considéré comme le plus répandu parmi ceux associés à la modalité de l'« enseignement à distance » (Luppicini, 2005). Et parmi de nombreuses initiatives visant à évaluer le cyberapprentissage, ce sont celles qui

émanent des projets européens dans les années 2000 et 2010 qui se démarquent, dont celui intitulé « E-xcellence+ » coordonné par l'Association européenne des universités à distance (EADTU). Il s'agit d'un modèle conceptuel d'évaluation de la qualité du cyberapprentissage dans une perspective complexe et globale, centré sur l'étudiant et structuré autour de trois dimensions principales : services, gestion et produits, comprenant sept groupes de critères : personnalisation, flexibilité, accessibilité, transparence, interaction, participation et productivité, résumés dans la figure 1 (Ossiannilsson & Landgren, 2012).

Figure 1

Modèle conceptuel de la qualité du cyberapprentissage dans une perspective complexe et globale
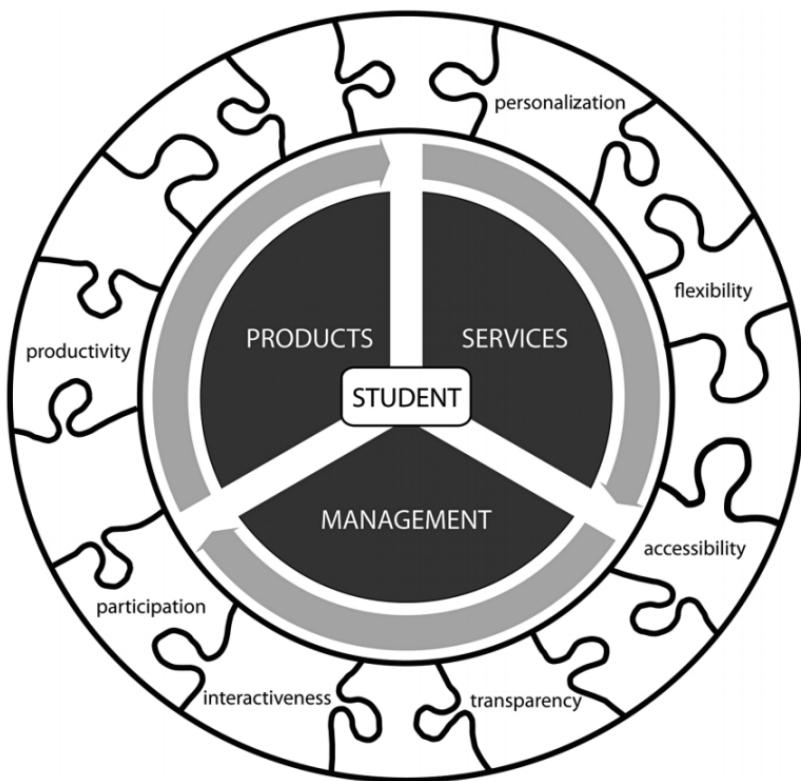
Source : Ossiannilsson et Landgren (2012).

Il existe depuis 2012 une version 2 de ce modèle appelé « E-xcellence » de l'EADTU, qui intègre les progrès technologiques dans la mise à jour de son standard d'évaluation comparative, notamment avec l'introduction des ressources éducatives libres (*Open Educational Resources* – OER). La version 3, quant à elle, intègre les cours en ligne ouverts à tous (*Massive Open Online Courses* – MOOC) (Kear et al., 2016). Actuellement, le cadre de référence « E-xcellence » comporte un outil de diagnostic rapide « *Quick Scan* » qui comprend 35 critères d'évaluation comparative dans six domaines : gestion stratégique (*strategic management*); conception de curriculum (*curriculum design*); conception de cours (*course design*); enseignement (*course delivery*); soutien aux personnels (*staff support*); et soutien aux étudiants (*student support*). Chaque établissement peut sélectionner les critères appropriés en fonction des publics cibles et des objectifs spécifiques de chaque évaluation.

En ce qui concerne les publics cibles, il s'agit en général d'une faiblesse des initiatives d'évaluation de la qualité dans l'enseignement supérieur, car on constate souvent que certains acteurs clés parmi les détenteurs d'enjeux à des étapes où ils sont pourtant directement concernés n'y participent pas (Datta, 2006). Pour un établissement ou programme universitaire, chaque détenteur d'enjeux a des attentes spécifiques vis-à-vis des résultats de l'évaluation de la qualité; dans le cas des étudiants, il s'agit des retours d'expérience des promotions précédentes (souvent rares ou peu accessibles, malheureusement) ou de leur propre satisfaction à l'égard de l'expérience d'apprentissage vécue (Hurteau, 2008; Weiss, 1983). La prise en compte de l'évaluation de l'enseignement par les étudiants (EEE) est une nécessité dans la démarche qualité de l'enseignement supérieur, comme l'ont montré de nombreuses recherches au fil des décennies, et elle sera d'autant plus facilitée par l'utilisation accrue des outils informatiques et d'Internet (Younès & Romainville, 2012).

À ce jour, la plupart des outils d'enquête qui permettent d'obtenir l'avis des étudiants se concentrent sur l'évaluation de l'enseignement, soit des programmes ou des cours. L'un des premiers modèles reconnus est le questionnaire « *Students' Evaluation of Educational Quality* » (SEEQ), utilisé à l'Université de Californie, à Los Angeles (UCLA) à la fin des années 1970 et au début des années 1980 (Marsh, 1982). Le « *Course Experience Questionnaire* » (CEQ), développé en Australie à la fin des années 1980 pour évaluer la qualité des formations universitaires du point de vue des diplômés, est un autre exemple (Ramsden, 1991). En s'inspirant du CEQ, Entwistle et ses collaborateurs (2002) ont élaboré le « *Experiences of Teaching-Learning Questionnaire* » (ETLQ) au Royaume-Uni, dans le cadre d'une collaboration entre les universités d'Édimbourg, de Durham et de Coventry, avec pour cible les étudiants en cours d'études. Au Canada, l'Université du Québec à Rimouski a également adapté le SEEQ à son propre contexte entre 2007 et 2011 (Harvey & Hébert, 2012).

Si les modèles SEEQ, CEQ et ETLQ se concentrent principalement sur les interactions entre les enseignants et les étudiants à l'échelle des cours, Ginns et ses collaborateurs (2007) à l'Université de Sydney ont adapté le CEQ en « *Student Course Experience Questionnaire* » (SCEQ) pour mesurer la qualité de l'ensemble des programmes universitaires, selon le point de vue des étudiants inscrits. Ils ont aussi fait évoluer le modèle en créant le « *e-Learning Experience Questionnaire* » (eLEQ), pour évaluer l'apport des technologies de l'information et de la communication dans la formation universitaire, notamment dans la modalité de formation hybride (*blended learning*) venant en appui des activités pédagogiques en présentiel (Ginns & Ellis, 2007). Plus précisément, l'eLEQ comporte 18 questions couvrant quatre dimensions de l'intégration des TIC dans la formation universitaire :

1) tutorat à distance des enseignants (*Good e-Teaching*);

2°) ressources pédagogiques en format numérique (*Good e-Ressources*);

3°) charge du travail à distance (*Appropriate Workload*);

4°) interaction entre les étudiants (*Student Interaction*).

Parallèlement, d'autres modèles étudiés portent sur le comportement des utilisateurs vis-à-vis des systèmes et outils technologiques mobilisés dans l'éducation et sur leur adoption de ceux-ci. L'un des plus notables est le « *Technology Acceptance Model* » (TAM), proposé par Fred D. Davis (1989), que

Venkatesh et ses collègues (2003) ont ensuite adapté en « *Unified Theory of Acceptance and Use of Technology* » (UTAUT). Concernant l'usage des technologies en classe, le modèle TPCK de Mishra et Koehler (2006), renommé ensuite TPACK (Thompson & Mishra, 2007), met en évidence les liens complexes entre technologie (T), pédagogie (P), contenu (C) et connaissances (K).

Il existe sans doute d'autres modèles que nous ne pouvons pas tous citer, qu'il s'agisse de l'apprentissage en ligne ou de l'EEE. Les quelques exemples explicités permettent en revanche de mettre en évidence l'existence d'une variété de modèles susceptibles de répondre au besoin des EES au Vietnam, qui sont dépourvus actuellement d'un outil de diagnostic et de développement global du cyberapprentissage. Parmi différents modèles susmentionnés, celui d'« E-xcellence » de l'EADTU apparaît comme le plus adapté car il couvre plusieurs dimensions qui ne sont pas toutes abordées dans d'autres modèles. Cependant, il est nécessaire de mener des études de cas pour déterminer progressivement l'adéquation des outils d'évaluation comparative d'EADTU à l'environnement spécifique de l'enseignement supérieur vietnamien. En outre, comme plusieurs détenteurs d'enjeux sont impliqués dans les processus variés d'un dispositif de FEL, ces études devraient porter sur des publics cibles particuliers, en priorité sur les étudiants, avec des ajustements adaptés à leurs caractéristiques spécifiques.

Méthode de recherche

Pour mener cette étude, nous avons réalisé les étapes suivantes :

1. À partir du référentiel d'évaluation comparative de l'EADTU, nous avons identifié les critères comprenant deux énoncés distincts pour les dissocier en deux critères séparés. Chaque critère final comprend un énoncé unique et indépendant des autres critères.

2. Parmi les critères distincts définis à l'étape 1, nous avons sélectionné ceux qui sont pertinents pour l'inclusion dans le questionnaire destiné aux étudiants.

3. Conception du questionnaire d'enquête par Google Forms.

4. Réalisation de l'enquête auprès des étudiants inscrits dans quatre EES vietnamiens participant au projet.

5. Collecte, traitement et analyse des résultats d'enquête.

À l'étape 1, parmi les 35 critères répartis dans six dimensions de l'outil de diagnostic rapide de l'EADTU (version 3), nous avons identifié sept critères de quatre dimensions qui devaient être subdivisés. À l'étape 2, nous avons obtenu un total de 42 critères distincts, dont 26 critères répartis dans cinq dimensions ont été retenus pour le questionnaire final auprès des étudiants. Les résultats de la subdivision et de la sélection des critères sont résumés dans le tableau 1.

Tableau 1

Résultats de la subdivision et de la sélection des critères d'évaluation comparative de l'EADTU destinés aux étudiants

Dimension	Notation conventionnelle	Nombre de critères initiaux	Nombre de critères à subdiviser	Nombre de critères après la subdivision	Nombre de critères sélectionnés pour l'enquête
1. Gestion stratégique	STR	5	2	7	3
2. Conception de curriculum	CUR	4	0	4	4
3. Conception de cours	CRS	9	2	11	8
4. Enseignement	DLV	6	2	8	5
5. Soutien aux personnels	STF	6	0	6	0
6. Soutien aux étudiants	STD	5	1	6	6
Total		35	7	42	26

Note : STR = *strategy*; CUR = *curriculum*; CRS = *courses*; DLV = *delivery*; STF = *staff*; STD = *students*.

Le questionnaire d'enquête en ligne avec la structure des questions est joint en annexe 1 et accessible en entier à l'adresse bit.ly/eadtu-vn_std. Les questions du modèle EADTU utilisent une échelle de Likert à cinq niveaux : 1) Complètement en désaccord; 2) Désaccord; 3) Neutre; 4) D'accord; 5) Complètement d'accord. L'enquête a été soumise aux étudiants de troisième et quatrième années (ayant expérimenté les deux modalités de cours en présentiel et en ligne, notamment durant la période de la pandémie de COVID-19), issus de quatre EES participant au projet : Université de Hué, Université des langues étrangères – Université de Danang, Université Nguyen Tat Thanh et Université de Can Tho. Les invitations à participer à l'enquête ont été envoyées aux étudiants *via* les systèmes de messagerie de chaque EES concerné. L'enquête s'est déroulée d'octobre 2023 à janvier 2024.

Les données brutes ont été extraites de Google Forms et converties en format Microsoft Excel pour le tri et le traitement préliminaire avant leur importation dans le logiciel SPSS (version 22.0) pour les analyses quantitatives. Le processus d'analyse des données quantitatives comprend quatre étapes :

1. Extraire les données statistiques de base pour décrire les caractéristiques de la population étudiée.

2. Réaliser le test de fiabilité alpha de Cronbach pour évaluer la consistance de l'échelle de mesure utilisée dans l'enquête. Généralement, une valeur alpha supérieure ou égale à 0,8 est considérée comme bonne; néanmoins, pour une enquête exploratoire, une valeur alpha de 0,7 est également acceptable (Nunnally & Bernstein, 1994).

3. Procéder à l'analyse factorielle exploratoire pour les variables obtenues à l'étape 2, avec les paramètres recommandés par Costello et Osbone (2005), notamment : extraction des facteurs par

axes principaux (*principal axis factoring*); méthode de rotation *Varimax*; détermination du nombre de facteurs par *eigenvalues*.

4. Poursuivre l'analyse factorielle confirmatoire à l'aide de modèles d'équations structurelles, en fonction des paramètres recommandés par Kline (2016) et des valeurs seuils proposées par Hooper et al. (2008) : un ratio χ^2/ df de 2:1 à 3:1; le *Comparative Fit Index* (CFI) supérieur à 0,95; les indices *Root Mean Square Error of Approximation* (RMSEA) et *Standardised Root Mean Square Residual* (SRMR) inférieur à 0,08.

Résultats

Caractéristiques de la population étudiée

Après trois mois d'enquête, nous avons obtenu un total de 460 réponses valides, avec une répartition de 66,7 % d'étudiants en troisième année et 33,3 % en quatrième année. Le taux des filles s'élève à 74 %, tandis que celui des garçons est de 25 %; 1 % ayant préféré ne pas préciser leur genre. La grande majorité des répondants suit des programmes de formation initiale (99 %), tandis que seulement 1 % sont inscrits aux programmes de formation continue. La répartition des répondants par domaines scientifiques est présentée dans le tableau 2.

Tableau 2

Répartition des répondants à l'enquête par domaines scientifiques.

Domaine scientifique	Quantité	Pourcentage
Sciences de l'éducation et formations des enseignants	22	4,8 %
Sciences humaines, sociales, langues étrangères et services	228	49,6 %
Économie, gestion et droit	49	10,0 %
Sciences naturelles, techniques et ingénieries	8	1,7 %
Mathématiques et statistiques	16	3,5 %
Informatique et technologies de l'information	31	6,7 %
Sciences de la santé	106	23,0 %
Total	460	100 %

En ce qui concerne l'expérience vécue de FEL à l'université (Figure 2), la répartition est relativement équilibrée entre les trois groupes : moins de 15 heures (32,6 %), de 15 à 30 heures (37,2 %) et plus de 30 heures (29,3 %).

Figure 2

Pourcentage de la population étudiée ayant fait l'expérience de la formation en ligne

- ■ Moins de 15 heures
- ■ De 15 heures à 30 heures
- ■ De 30 heures à 60 heures
- ■ Plus de 60 heures
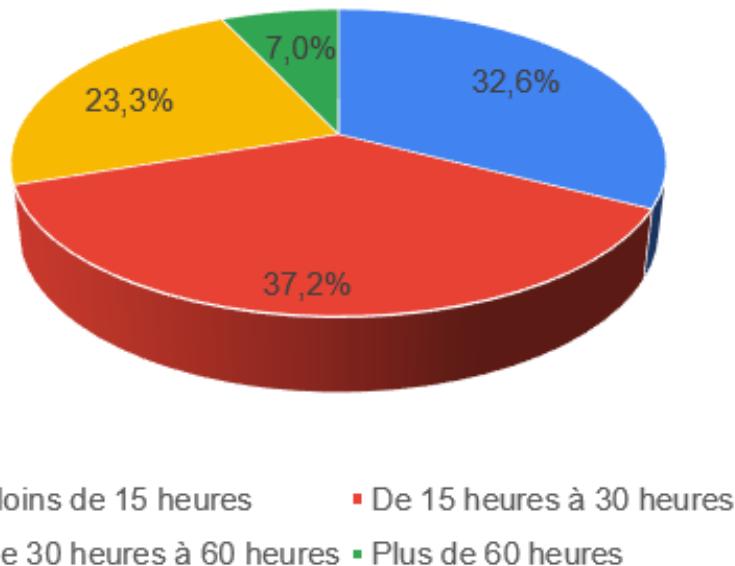
Test de fiabilité

Les données de l'enquête portant sur ces 460 étudiants de troisième et de quatrième années ont été utilisées pour analyser la fiabilité alpha, en référence aux cinq dimensions initiales codées respectivement comme suit : 1) Gestion stratégique [STR]; 2) Conception de curriculum [CUR]; 3) Conception de cours [CRS]; 4) Enseignement [DLV]; 5) Soutien aux étudiants [STD]. Pour chaque dimension, les items d'enquête sont numérotés de 1 à 3, 4, 5, 6 ou 8, selon le nombre de questions sélectionnées. Les résultats du test de fiabilité sont présentés dans le tableau 3. En général, la structure du questionnaire, composé de cinq dimensions et 26 critères pour les étudiants, s'est avérée d'une grande cohérence avec une fiabilité interne élevée, dont les valeurs alpha allant de 0,887 à 0,966 sont conformes aux attentes d'une analyse factorielle.

Tableau 3

Résultats de la fiabilité des dimensions

Dimension	Critère d'enquête	Valeur moyenne	Écart-type	Valeur alpha de Cronbach	Nombre d'items
1. Gestion stratégique (STR)	STR1	3,93	,911	,887	3
	STR2	3,93	,886		
	STR3	3,85	,902		

Dimension	Critère d'enquête	Valeur moyenne	Écart-type	Valeur alpha de Cronbach	Nombre d'items
2. Conception de curriculum (CUR)	CUR1	3,84	,940	,944	4
	CUR2	3,93	,864		
	CUR3	3,88	,864		
	CUR4	3,88	, 873		
3. Conception de cours (CRS)	CRS1	3,96	,872	,966	8
	CRS2	3,92	,889		
	CRS3	3,81	,881		
	CRS4	3,88	,862		
	CRS4	3,88	,862		
	CRS5	3,93	,856		
	CRS7	3,93	,861		
	CRS8	3,87	,912		
4. Enseignement (DLV)	DLV1	3,85	,882	,949	5
	DLV2	3,87	,881		
	DLV3	3,88	,889		
	DLV4	3,89	,904		
	DLV5	3,83	,882		
5. Soutien aux étudiants (STD)	STD1	3,95	,931	,952	6
	STD2	3,94	,895		
	STD3	3,93	,854		
	STD4	3,88	,892		
	STD5	3,93	,864		
	STD6	3,97	,858		

Résultats de l'analyse factorielle exploratoire

Les données recueillies ont ensuite été utilisées pour une analyse factorielle exploratoire. Après plusieurs essais, nous avons constaté une certaine inconsistance dans les résultats d'analyse, ce qui nous a conduits à éliminer progressivement quelques items susceptibles de générer des perturbations, en particulier les quatre suivants : STR3, DLV5, STD2, et STD6. L'analyse des 22 items restants a permis de valider la répartition de la majorité des items dans leurs dimensions correspondantes (Tableau 4).

Cependant, deux items, l'un de la dimension « Conception de cours » (CRS8) et l'autre de « Soutien aux étudiants » (STD1), ont été transférés dans la dimension « Enseignement » (DLV).

Tableau 4

Résultats de l'analyse factorielle exploratoire

Dimension	Item	Composante				
		1	2	3	4	5
Enseignement (DLV)	DLV2	,717				
	DLV3	,656				
	DLV4	,617				
	DLV1	,613				
	STD1	,603				
	CRS8	,592				
Conception de cours (CRS)	CRS2		,672			
	CRS4		,651			
	CRS5		,620			
	CRS7		,608			
	CRS1		,594			
	CRS6		,564			
	CRS3		,515			
Conception de curriculum (CUR)	CUR1			,682		
	CUR4			,664		
	CUR3			,630		
	CUR2			,604		
Soutien aux étudiants (STD)	STD3				,703	
	STD4				,681	
	STD5				,665	
Gestion stratégique (STR)	STR1					,716
	STR2					,649

Méthode d'extraction : analyse des composantes principales. Méthode de rotation : Varimax avec application de la normalisation de Kaise[a].

[a] La rotation a été obtenue en 10 itérations.

## Résultats de l'analyse factorielle confirmatoire

Les résultats d'analyse factorielle exploratoire sont utilisés à l'étape suivante conformément aux paramètres et indices présentés dans la rubrique « Méthode de recherche ». Les résultats obtenus sont :

- $\chi^2 = 673,869$, df $= 199$, p $= ,000$;

- ratio $\chi^2/\text{df} = 3,386$;

- CFI $= 0,963$;

- RMSEA $= 0,072$;

- SRMR $= 0,0208$.

Le schéma de modélisation par équations structurelles des données d'enquête obtenues est présenté dans la figure 3.

Figure 3

Résultats d'analyse factorielle confirmatoire

Chi-square=673.869; df=199; p=.000
Chi-square/df=3.386
CFI=.963
RMSEA=.072
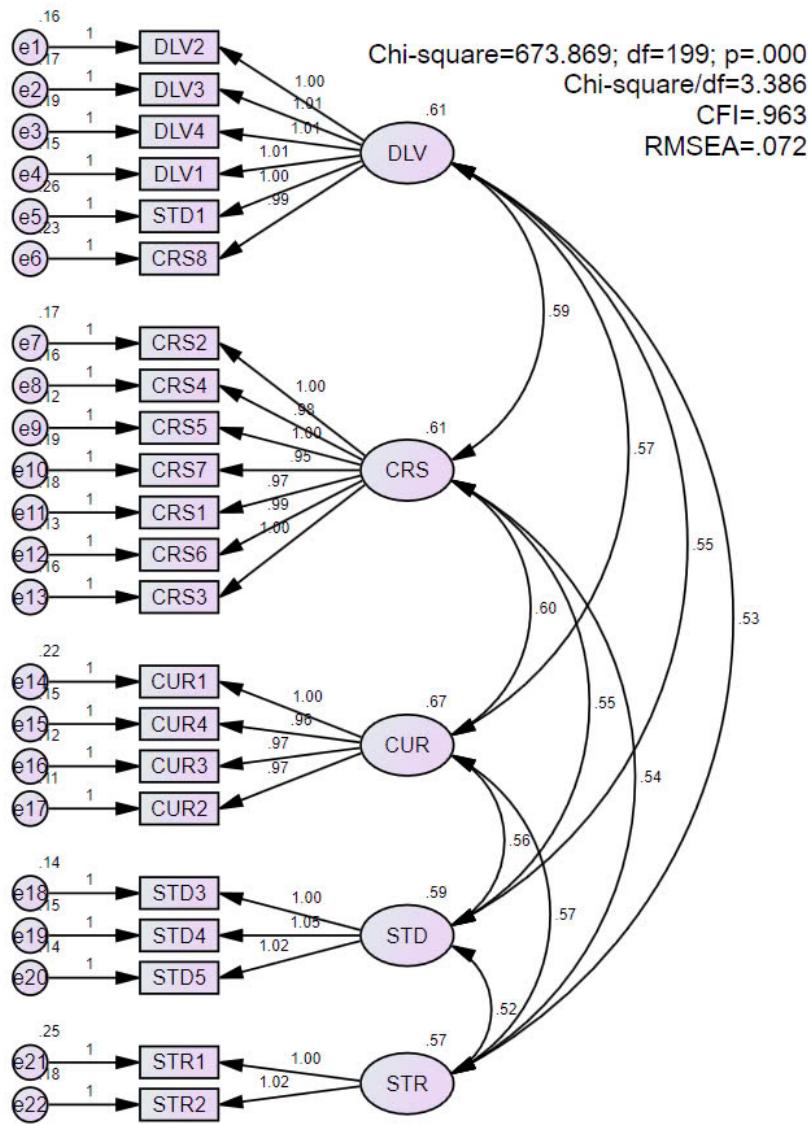
Discussion

Population étudiée

Les résultats d'analyse présentés ont montré que l'échantillon choisi est tout à fait conforme aux objectifs de l'étude. Le nombre de réponses valides obtenues indique un ratio de 18:1 par rapport au nombre d'items du questionnaire, ce qui est nettement supérieur au seuil de 10:1 recommandé par Costello et Osborne (2005). En ce qui concerne la répartition des domaines scientifiques, la

représentation totale des étudiants en « Sciences de l'éducation et formations des enseignants » et en « Sciences humaines, sociale, langues étrangères et services » est de 64,4 %, celle des domaines « Sciences naturelles, techniques et ingénieries », « Mathématiques et statistiques », et « Informatique et technologies de l'information » de 11,9 %, et finalement celle de « Sciences de la santé » de 23 %. Au total, le taux des filles est trois fois plus élevé que celui des garçons. Ces chiffres correspondent aux autres études dans le monde sur les orientations et les aspirations professionnelles des jeunes dans l'enseignement supérieur. En Europe, environ 65 % des étudiants inscrits dans les domaines de « Sciences sociales, journalisme et information » ou « Arts et humanités » sont féminins, voire plus de 72 % en « Médecine et santé » et plus de 79 % en « Éducation » (Eurostat, 2024). Au Vietnam, malgré l'absence des statistiques officielles actualisées, des études de la Banque mondiale sur l'enseignement supérieur vietnamien des années 2002-2005 ont également indiqué un taux d'étudiantes inscrites dans les domaines de sciences sociales et de l'éducation d'environ 70 % (Evans & Rorris, 2009). Ou plus récemment, les statistiques du MEF en 2018 montraient que le taux des filles dans les domaines de sciences, technologies, ingénieries et mathématiques (STEM) ne représentait qu'environ 34 % (World Bank, 2020).

Quant à l'expérience de la FEL, les répondants, dont approximativement les deux tiers étaient en troisième année et un tiers en quatrième année, sont répartis en trois groupes relativement équilibrés : moins de 15 heures, de 15 à 30 heures, et plus de 30 heures d'apprentissage. Les apprentissages ont pu avoir lieu principalement durant les périodes de continuité pédagogique lors de la pandémie de COVID-19 en 2020 et 2021. Après cette crise mondiale, les quatre EES vietnamiens participant au projet ont établi leurs réglementations internes pour réguler les activités de FEL dans tous les programmes de formation réguliers (communication interne), mais qui servent principalement à les encourager sans les exiger obligatoirement. Il existe peu d'études publiées sur le volume horaire des activités d'apprentissage en ligne des étudiants vietnamiens, tant durant la pandémie de COVID-19 qu'à la suite de celle-ci, mais une enquête menée auprès de 1 139 étudiants d'une université basée à Hô Chi Minh-Ville a montré qu'entre mars et mai 2020, le taux des étudiants participant à la FEL par vidéoconférence est d'environ 31 % pour 1-2 cours, 37 % pour 3-4 cours et 32 % pour plus de 5 cours (Đại & Trang, 2022).

Cette mise en perspective permet ainsi de confirmer que les caractéristiques principales de la population étudiée, telles que la répartition des domaines scientifiques, le taux des garçons-filles, l'ancienneté et l'expérience de la FEL, répondent tout à fait aux objectifs de recherche fixés. Cela permet de justifier la pertinence des résultats d'enquête obtenus et la poursuite des analyses de ces résultats sur le plan quantitatif.

Structure du modèle d'EADTU vis-à-vis de la perception des étudiants vietnamiens

Le résultat du test de fiabilité alpha a montré que le questionnaire d'enquête sur le modèle d'EADTU soumis aux étudiants vietnamiens indique une validité interne élevée. Et pourtant, plusieurs valeurs d'alpha dépassent le seuil de 0,90, ce qui correspond aux recommandations de Tavakol et Dennick (2011) au fait de rechercher des améliorations possibles, car il existe probablement des

questions répétitives, ou dont la formulation est trop longue. Ces perturbations sont constatées plus nettement pour les quatre items STR3, DLV5, STD2 et STD6 qui ont été finalement exclus du modèle.

Quant à chaque facteur analysé, la dimension « Gestion stratégique » (STR) comprend deux items retenus qui sont « Les politiques de cyberapprentissage sont conformes aux cadres juridiques et éthiques » (STR1) et « La politique de l'établissement garantit que les systèmes d'apprentissage en ligne […] sont compatibles avec les systèmes d'information de gestion connexes […] et qu'ils sont fiables, sûrs et efficaces » (STR2). En particulier, les aspects d'éthique et de cadre juridique font partie des composantes importantes dans les modèles de compétences numériques des apprenants aujourd'hui (Janssen et al., 2013; Janssen & Stoyanov, 2012), ce qui explique la pertinence, selon eux, d'avoir intégré l'item STR1 à la dimension stratégique. En ce qui concerne l'item STR2, une autre étude réalisée auprès de 453 étudiants de cinq programmes de formation universitaires vietnamiens en 2015 a montré que les systèmes d'information et d'assistance pédagogique institutionnels jouent un rôle complémentaire aux autres systèmes ou outils de travail individuels des étudiants et enseignants, ce qui permet de déterminer la satisfaction des étudiants dans les cours ayant recours aux TIC (Nguyen Tan, 2017).

Par ailleurs, la dimension « Conception de curriculum » (CUR) comprend quatre items qui sont tous adaptés au contexte de l'enseignement supérieur vietnamien. Il s'agit d'une différence notable entre le modèle d'EADTU et les autres modèles évoqués dans la revue de la littérature. En effet, la structure et le contenu des programmes de formation sont des critères importants dans l'évaluation de la qualité des programmes de formation universitaire au Vietnam, largement inspirés du référentiel de l'*ASEAN University Network Quality Assurance* (AUN-QA) (AUN, 2020). De la même façon, le standard d'évaluation de la qualité des programmes de formation à distance, promulgué par la Circulaire 39/2020, comporte aussi une dimension (numéro 2) sur « Le descriptif, la structure, le contenu du programme de formation »[1].

Une analyse plus approfondie permet de constater que la dimension « Conception de cours » (CRS) est constituée de sept critères concernant les buts et objectifs de formation (deux critères), le gabarit commun pour tous les cours (un critère), les ressources et activités pédagogiques (deux critères) et l'évaluation des apprentissages (deux critères). Tous ces critères ont été validés d'après l'enquête réalisée auprès de 460 étudiants. En comparaison avec les standards d'évaluation de la qualité des programmes de formation universitaire au Vietnam, y compris en ce qui a trait aux formations à distance, le nombre et la formulation de ces critères sont relativement clairs et concis.

En dehors du Vietnam, le standard de l'AUN-QA comprend trois dimensions avec au total 18 critères concernant les buts et objectifs de la formation, la stratégie pédagogique et l'évaluation (AUN, 2020). La raison est simple : le standard vietnamien régulé par la Circulaire 04/2016 a été conçu à partir de la version 3.0 du standard d'AUN-QA (Hung, 2024). Il existe aussi un standard des cours en ligne,

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[1] https://thuvienphapluat.vn/van-ban/EN/Giao-duc/Circular-39-2020-TT-BGDDT-assessing-quality-of-distance-education-program-for-higher-education-level/456609/tieng-anh.aspx

Quality Matters (2018), qui comprend quatre dimensions avec au total 19 critères relatifs aux objectifs d'apprentissage, ressources et activités pédagogiques, et évaluations des apprentissages. Il est certes utile d'avoir des dispositions spécifiques finement définies pour bien réguler la qualité des cours en ligne. En revanche, par rapport au besoin d'un modèle global de développement du cyberapprentissage pour un EES, se limiter à sept critères concis dans une dimension liée à l'aspect « Conception de cours » semble être un choix pertinent, ce qui a été validé par l'enquête réelle réalisée auprès des étudiants des quatre EES vietnamiens participant au projet. Il est à noter aussi que les ressources éducatives libres, sujet d'actualité ces dernières années et intégrées dans le modèle d'EADTU à partir de la version 2 (Williams et al., 2012), possèdent leur propre critère (CRS3).

En ce qui concerne la dimension « Enseignement », quatre des cinq items initiaux ont été validés à travers l'enquête auprès des étudiants des quatre EES vietnamiens participant au projet. Parmi ces items, deux critères relatifs à la sécurité (DLV2) du système technique de FEL, et les ressources d'information et guides d'utilisation des outils (DLV4) sont également abordés dans les standards existants, comme la Circulaire 39/2020 ou *Quality Matters*. Cependant, deux critères, DLV1, « Les spécifications techniques du système de cyberapprentissage sont basées sur les exigences des parties prenantes et impliquent des estimations réalistes de l'utilisation et du développement du système » et, DLV3, « Les systèmes de cyberapprentissage offrent un choix d'outils en ligne adaptés aux modèles éducatifs adoptés et aux besoins des étudiants et des éducateurs », apportent une véritable nouveauté, jamais abordée dans les aux standards susmentionnés. Quant à l'item DLV5, « Les documents institutionnels et les informations accessibles par l'intermédiaire de l'ENA [environnement numérique d'apprentissage] sont régulièrement contrôlés, révisés et mis à jour », le fait qu'il est exclu du modèle d'étude pose la question de la pertinence de ce contenu dans l'enquête menée auprès des étudiants. Le résultat de notre étude indique que cet item n'est pas pertinent, mais d'autres études complémentaires seront nécessaires pour apporter davantage d'éclairage à cet effet.

De même, deux items venant d'autres dimensions ont été intégrés à notre étude : STD1, « Les étudiants reçoivent des informations claires et actualisées sur leurs cours, y compris sur les méthodes d'apprentissage et d'évaluation », et, CRS8, « Des mesures appropriées sont en place pour empêcher l'usurpation d'identité et/ou le plagiat, en particulier lorsque les évaluations sont effectuées en ligne ». Dans ce cas, il est compréhensible que, pour les étudiants, les informations sur les cours et les mesures de prévention des fraudes en ligne appartiennent à la dimension « Enseignement ». La transposition de ces deux critères ne change pas la nature du sujet abordé dans les formulations concernées. Dans le cadre limité de ce projet, nous pouvons accepter ce résultat, mais davantage d'études seront nécessaires dans le futur pour y apporter des connaissances complémentaires.

Enfin, pour la dimension « Soutien aux étudiants » (STD), outre l'item susmentionné STD1, trois autres items sont tous retenus dans le modèle d'étude : STD3 (lignes directrices spécifiques au cyberapprentissage), STD4 (création des communautés d'étudiants en ligne) et STD5 (services de soutien, technique, administratif et de conseils). Deux de ces trois critères, STD3 et STD5, sont également présents dans les standards existants, et le dernier, STD4, représente la nouveauté du modèle d'EADTU. Ce point est évidemment crucial, car l'aspect social a été reconnu comme un facteur

indispensable dans les apprentissages en ligne (Tu & McIsaac, 2002), qui influençait la satisfaction, la motivation, l'assiduité et la perspective de réussite des étudiants (Richardson et al., 2017). De plus, il a été démontré qu'un dispositif d'apprentissage en ligne peut aujourd'hui tout à fait reposer sur les relations sociales dans la communauté d'apprentissage en ligne, ce qui permet de suggérer les cours plus pertinents par rapport aux besoins et aux préférences individuelles des étudiants (Senthil kumaran et al., 2014). Et à l'ère de l'explosion des applications de réseaux sociaux, la migration des interactions de la communauté d'apprentissage en ligne dans les ENA ou les *Learning Management System* (LMS) institutionnels vers les plateformes de médias sociaux publics, plus fonctionnels et confortables, devient une tendance inévitable (Garavaglia & Petti, 2015).

En résumé, pour l'ensemble des dimensions, le résultat de l'analyse factorielle confirmatoire et de modélisation par équations structurelles montre que le modèle d'évaluation comparative du cyberapprentissage d'EADTU vis-à-vis de la perception des étudiants est bien valide dans le contexte vietnamien, avec certaines adaptations telles que présentées dans l'annexe 2. Les paramètres et indices principaux se trouvent dans les seuils de valeurs acceptables.

Conclusions et perspectives

L'objectif de cette étude est de construire un modèle international d'évaluation comparative du cyberapprentissage vis-à-vis de la perception des étudiants, adapté au contexte de l'enseignement supérieur vietnamien. Ce modèle constituera un outil permettant aux EES vietnamiens de développer leur stratégie d'apprentissage en ligne de manière cohérente et globale. Les résultats d'analyse des données d'enquête auprès de 460 étudiants en troisième et quatrième années de quatre EES participant au projet ont montré que le modèle d'EADTU, avec certaines adaptations présentées dans l'annexe 2, est tout à fait pertinent.

Cette validation permettra aux EES vietnamiens d'utiliser ce questionnaire d'enquête (5 facteurs, 22 items) pour mesurer le niveau de satisfaction de leurs utilisateurs principaux vis-à-vis des dispositifs de formation en ligne qu'ils mettent en place. L'analyse multidimensionnelle de ces résultats d'enquête permettra aux EES vietnamiens de consolider leur plan stratégique de développement de l'apprentissage en ligne, en ajustant les aspects qui nécessitent des améliorations en fonction des commentaires des étudiants. Ce modèle initial pourra être source d'inspiration pour développer d'autres modèles plus spécifiquement adaptés aux autres groupes de publics cibles et de détenteurs d'enjeux, en particulier les enseignants-chercheurs et le personnel des services de soutien. Sur la base de ce cadrage général, certains sous-critères spécifiques ou indicateurs pourront être raffinés dans les processus quotidiens afin de bien articuler les mesures cohérentes à différents niveaux d'action, dans l'ensemble des programmes de formation et des cours dispensés.

Cependant, notre étude comporte certaines limites telles qu'explicitées dans les discussions concernées. Premièrement, il existe dans les critères du référentiel d'EADTU de nombreuses formulations longues et complexes qui, malgré le niveau de précision des détails, risquent de réduire la qualité des questionnaires d'enquête. Cette complexité impacte considérablement la cohérence des

résultats obtenus et la validité des construits. Les questions devront ainsi être réécrites pour faire en sorte qu'elles soient plus courtes et plus succinctes. Deuxièmement, l'exclusion des items STR3, DLV5, STD2 et STD6 du modèle initial ainsi que le transfert des items CRS8 et STD1 au groupe DLV mériteront des études plus approfondies pour confirmer ou infirmer notre modèle obtenu. Troisièmement, il sera souhaitable d'élargir l'éventail des étudiants bien au-delà des troisième et quatrième années, et ce dans plusieurs autres domaines de formation.

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Examining the Emotional Tone of Student Evaluations of Teaching

Analyse du ton émotionnelle des évaluations de l'enseignement par les personnes étudiantes

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Abstract

Student-written evaluation ($N = 600$) of professors was examined to determine the emotional tone of the words used to evaluate faculty. Using the revised Dictionary of Affect (DOA; Whissell, 2009), evaluation words ($N = 26,764$) uploaded to the *Rate My Professors* website between 2018 and October of 2023 were measured for their pleasantness, activation, and imagery. Overall, the emotional tone of the students' written evaluation was very close to the DOA's definition of everyday English ($M = 50$) for all three categories: pleasantness ($M = 51.1, SD = 6.3$), activation ($M = 52.2, SD = 4.8$), and imagery ($M = 50.2, SD = 7.4$). The results indicated that the written evaluations were uniform in expression and emotional tone: neither very pleasant/unpleasant, active/passive, or imagery/abstract. While significant relationships were found with professor quality and difficulty ratings, the number of words in the evaluation, and the instructor's gender, all associations had small correlational strengths and weak effect sizes, indicating that the variables might not be strong predictors of the emotional tone of student evaluations. If student written evaluations are not emotionally charged, then there is an opportunity to reduce any negative feelings faculty members have attached to the process.

Keywords: academia, emotional tone, student evaluation of teaching, student evaluations

Résumé

L'évaluation écrite des professeures et professeurs réalisée par les personnes étudiantes ($N = 600$) a été examinée pour déterminer le ton émotionnel des mots utilisés pour les évaluer. À l'aide du dictionnaire *Dictionary of Affect* (DOA ; Whissell, 2009), les mots d'évaluation ($N = 26,764$) téléversés sur le site web *Rate My Professors* entre 2018 et octobre 2023 ont été mesurés pour leur caractère agréable, leur activation et leur imagerie. Dans l'ensemble, le ton émotionnel de l'évaluation écrite réalisée par les personnes étudiantes était très proche de la définition de l'anglais courant du DOA ($M = 50$) pour les trois catégories : caractère agréable ($M = 51,1, SD = 6,3$), activation ($M = 52,2, SD = 4,8$) et imagerie ($M = 50,2, SD = 7,4$). Les résultats indiquent que les évaluations écrites étaient uniformes en

termes d'expression et du ton émotionnel : ni très agréables/désagréables, ni actives/passives, ni imagées/abstraites. Bien que des relations significatives aient été trouvées avec la qualité de la personne enseignante et les notes de difficulté, le nombre de mots dans l'évaluation et le genre de la personne enseignante, toutes les associations avaient des forces de corrélation faibles et des tailles d'effet faibles, ce qui indique que les variables pourraient ne pas être des prédicteurs forts du ton émotionnel des évaluations réalisées par les personnes étudiantes. Si les évaluations écrites réalisées par les personnes étudiantes ne sont pas chargées d'émotion, il est possible de réduire les sentiments négatifs que les personnes enseignantes attachent au processus.

Mots-clés: académie, ton émotionnel, évaluation de l'enseignement par les personnes étudiantes, évaluations par les personnes étudiantes

Introduction

Student evaluation of teaching (SET) is a controversial subject due to the subjective nature of the evaluation (Dahal & Rafiq, 2023). The use of SETs, including the research behind the practice, began in the early 1990s (Algozzine et al., 2004) and is widely used in academia today (Wagenaar, 1995). Although there are differences in questions posed to students across the various academic institutions, the goals include (1) providing feedback to faculty, (2) assisting academic institutions in decision-making (for example, tenure), (3) giving students data for course and faculty selection, and (4) providing data for SET research (Marsh & Roche, 1993). Kember et al. (2002) considered that the primary purposes of SETs are to (1) promote faculty improvement during the evaluation process, (2) provide data for appraisals, and (3) contribute to academic institution accountability. According to Penny (2003), SETs are frequently used by academic institutions as they are easy to collect and interpret.

Previous research has noted that students are interested in performing SETs (Foster, 2003; Howell & Symbaluk, 2001). Research has also demonstrated that faculty value SETs (Balam & Shannon, 2010; Kulik, 2001) and are concerned about how students view their teaching (Spooren et al., 2013). Nevertheless, faculty also have worries about SETs, which stem from their reliability (consistency, stability, and dependency of the instrument) and validity (the extent to which SETs measure what they intend to measure). Unfortunately, research on the reliability and validity of SETs is mixed. Whereas some studies have demonstrated their reliability (Barnes & Barnes, 1993; Feldman, 1989; Zhao & Gallant, 2012), others have indicated they lack reliability. In Clayson's (2018) comprehensive study on SET reliability, the author reviewed the challenges with the reliability measures that have been used and concluded the tool to be "inadequate" (p. 666). This paper addressed three significant challenges to establishing reliability in SETs, including (1) methodological difficulties, (2) problems in evaluating student ratings, and (3) a lack of instrument construct definitions. Clayson (2018) concluded that the challenge with SETs surrounds the lack of consistency among individual student responses, indicating that students may disagree on what they are being asked to evaluate; therefore, SETs lack both reliability and validity.

Here again, however, the evidence is mixed. Several research articles have concluded that SETs have many forms of validity (Blackburn & Clark, 1975; Burdsal & Bardo, 1986; Cook et al., 2024; Ellett et al., 1997; Overall & Marsh, 1980; Wright & Jenkins-Guarnieri, 2012). Other studies have questioned the validity of SETs as a tool to assess a teacher's effectiveness (Clayson, 2018; Shevlin et al., 2000). Quansah et al. (2024) cited student evaluators as a significant challenge due to inconsistencies in faculty ratings. Uttl (2021) conducted a comprehensive review of validity challenges in SETs, citing several key issues, including defining effective teaching, questioning whether students learn more from highly rated faculty, external factors that affect evaluations (for example, students' prior knowledge), and student preference factors. In an earlier paper, Uttl et al. (2017) conducted a meta-analysis of previous SET meta-analyses, concluding not only that SETs do not measure teaching effectiveness but also that academia "may want to abandon SET ratings as a measure of faculty's teaching effectiveness" (p. 22).

Spooren et al. (2013) drew a similar conclusion, stating that the accuracy of SETs in measuring effective teaching is uncertain. They further argued that faculty and students may disagree on what constitutes effective teaching, echoing Zhao and Gallant's (2012) argument that a significant challenge to establishing SET validity is the lack of consistency in the definition of effective teaching. Other SET concerns include the lack of space/time for students to explain their responses, the difficulty in interpreting their responses, and the lack of knowledge surrounding SET research and its reliability and validity challenges (Spooren et al., 2013).

Rate My Professors

The student evaluations in this study were pulled from the Rate My Professors[1] (RMP) website, a platform that allows students to review their instructors. At the time of writing (2023), the website had more than two million professor ratings. The website requires students to create an account, after which the user can rate a professor already included on the site or add a school/professor. The user selects the instructor to submit a rating, and a new webpage opens with various evaluation options. The user proceeds to select a course code and indicate whether it is an online delivery. Next, the user rates the professor's quality on a 5-point scale: awful (1), OK (2), good (3), great (4), and awesome (5). The following section asks the user to rate the difficulty of the professor's course on a 5-point scale: very easy (1), easy (2), average (3), difficult (4), and very difficult (5). Other questions include asking if the student would take a course with this professor again, whether the course was taken for credit, if it had a textbook, and whether attendance was mandatory. The final question asks the user to select the grade they received in the course using letter grades (for example, A+, C–) or indicate if the course had no grades, or state if the course was dropped or incomplete. Among the response options are "not sure yet" or "rather not say." Users are also given the option to select up to three tags for the post, with options such as "tough grader," "amazing lectures," "lots of homework," and "caring." Since its inception, much

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[1] https://www.ratemyprofessors.com

research has been devoted to evaluating the RMP website: some papers providing support for the validity of the rating scales (Brown et al., 2009; Colardarci & Kornfield, 2007; Otto et al., 2008; Sonntag et al., 2009; Timmerman, 2008) and others where researchers are unconvinced (Felton et al., 2004; Legg & Wilson, 2012; Murray & Zdravkovic, 2016).

Student-Written Evaluations

On many SETs students can write comments about their professor, but the literature on this component is limited. Most research on student SET comments uses instruments like Leximancer or Wordstat, an automated semantic analysis tool that finds themes within the text (Abd-Elrahman et al., 2010; Shah & Pabel, 2020; Stupans et al., 2016). A study by Olvet et al. (2021) noted that the challenge with student-written evaluations is reviewer hesitation to provide faculty names when giving negative or constructive criticism. Past research has demonstrated that students hesitate to give negative evaluations due to power dynamics, fear of reprisal, and student–teacher relationship breakdown (Afonso et al., 2005; Janss et al., 2012). Their concerns could be warranted as a study by Robins et al. (2020) interviewed 24 medical faculty and noted that they admitted to a likely bias against students who rated them negatively.

Very few studies have been carried out on students' written evaluations on RMP. Abd-Elrahman et al. (2010), Shah and Pabel (2020), and Stupans et al. (2016) used text analysis software to identify themes in student posts on RMP, but not emotional tone. Silva et al. (2008) examined the positivity/ negativity of written evaluations of psychology teachers. Using an instrument called the IUB Evaluation Services and Testing Multiple Option System (Multi-Op) of Course and Instructor Evaluation, they concluded that there were more positive than negative comments in the evaluations of both the course and faculty. Dahal and Rafiq (2023) used an instrument called DistilBERT to analyze the emotions shown in students' written evaluations on RMP and found that "joy" characterized most of the comments (over 60%), whereas negative emotions (anger, sadness, and fear) "accounted for less than 40% of the student review" (p. 5). However, "anger" was the second most noted emotion after "joy."

Teaching can be a demanding profession and the well-being of teachers is a highly complex area of research (Wang et al., 2023). One aspect of teacher well-being is how they react to reading student evaluations, but very little research exists. Studies have stated that, when reading SETs, teachers feel judged and experience deep emotional responses (Sidwell et al., 2025); feel anxious (Lutovac et al., 2017); feel rageful, sad, neglected, and have self-doubt (Carmack & LeFebvre, 2019); and even find the process painful when getting critical reviews (Arthur, 2009). These feelings can lead to faculty disengagement from SETs, hindering professional growth (Sidwell et al., 2025). The current study examines whether the written section of student evaluations contains emotionally charged words.

Research Questions

This paper will add to the research on SET by examining posts on RMP in the Canadian context to explore: (1) What is the emotional tone of student-written evaluations? and (2) What factors contribute to the emotional tone of student-written evaluations?

Method

A Canadian university was randomly selected from the RMP website. A total of 30 professors with more than 90 student evaluation posts were randomly selected, and the first 20 posts were recorded chronologically (600 posts in total). For the written professor evaluations, no minimum word count requirements were specified. Course quality and difficulty scores were also recorded as part of the analysis, as all 600 posts included the two scores. Unfortunately, the other questions listed previously in this study (for example, whether the course was online or taken for credit) were sparsely answered and therefore not included in the analysis. For example, the grade given in the course was recorded in only 32 of the 600 posts (5.3%) uploaded to the RMP website.

The date range of the evaluations was 2018 to 2023 and encompassed a total of 16 subjects ranging from the social sciences, sciences, business, arts and humanities, to information technology. While the gender of the professor was not listed as an option for students to input, an analysis of the pronouns in the written evaluation was used to create the variable of gender, and the results indicated 66.6% male and 33.4% female faculty.

The emotional tone of the students' written evaluations was analyzed using the revised Dictionary of Affect (DOA) (Whissell, 2009). Whissell had volunteers rate, outside of any context, the emotional tone of words on three scales: pleasantness, activation, and imagery (how easy it is to form a mental picture). Averages above or below the dictionary's mean score of 50, representing everyday English, were taken to indicate emotional tone differences in one direction. The three emotional scales have standard deviations of 22 for pleasantness and activation and 36 for imagery (Whissell, 2009). For example, a score above 50 would indicate the word or entire work is pleasant or active, while a score below 50 would indicate the word or entire work is unpleasant or passive. A score of 72 on the pleasantness scale would be one standard deviation above the mean, suggesting a more pleasant emotional tone than everyday English, while a word or work with a score of 94 would be even more pleasant, as it is two standard deviations above the mean. While the DOA has not been used in other research specifically to examine the emotional tone of SET, it has been used in multiple text examinations, including television dialogue (White et al., 1989), religious texts (Whissell, 2012a), song lyrics (Whissell, 1996), and political speech (Whissell, 2012b). As emotion is an aspect of language, the DOA can be used as a framework to examine the speech of SETs.

The revised DOA matching rate for the evaluation words studied was 76%, somewhat lower than the rate of 90% expected for everyday English texts (Whissell, 2009). The slightly lower matching rate was partially due to the faculty's name being frequently cited in the written evaluations. The DOA database consists of common words in the English language, rather than names.

Results

Mean Scores

Overall, the emotional tone of words in the student evaluations ($N = 26{,}764$) was very close to everyday English ($M = 50$) for pleasantness ($M = 51.1$, $SD = 6.3$), activation ($M = 52.2$, $SD = 4.8$), and imagery ($M = 50.2$, $SD = 7.4$). The average word count per student was 44.6 ($SD = 19.9$), and the average DOA match rate was 33.9 per evaluation post. Table 1 shows the quality and difficulty frequencies.

Table 1

Quality and Difficulty Frequencies in the Student Posts on RMP.com

Quality	Frequency	Difficulty	Frequency
Awful	24.2%	Very easy	5.8%
OK	10.8%	Easy	16.3%
Good	10.5%	Average	33.2%
Great	13.7%	Difficult	27.0%
Awesome	40.8%	Very difficult	17.7%

Concerning the quality of faculty, Table 1 shows that most students rated the professors as "awesome" (40.8%). Combined, "great" and "awesome," the two positive categories, represented 54.5% of the student ratings, whereas "awful" and "OK" together accounted for 35% of the ratings. For professor difficulty, most students rated the faculty as "average" (33.2%). Approximately twice as many students rated the professors as "difficult" or "very difficult" (44.7%) as compared with those who gave ratings of "very easy" or "easy" (22.1%).

Emotional Tone Differences and Quality and Difficulty Ratings

To evaluate whether the emotional tone of the students' written evaluations was related to their quality and difficulty ratings, the study conducted Pearson correlation analysis (Table 2).

As shown in Table 2, concerning quality, two of the three emotional scales (pleasantness and activation) were significantly related to student ratings. For pleasantness, a moderate positive correlation was noted ($r = .45$, $N = 600$, $p < .01$), indicating that as the quality rating of the faculty increased, the pleasantness of the words in the evaluations also increased. For activation, a weak positive correlation was noted ($r = .13$, $N = 600$, $p < .01$), indicating that as the quality rating of the professor increased, the activation of the words in the student evaluations also increased. No significant relationship was found between the professor's quality rating and the imagery in the written evaluations.

Table 2

Pearson Correlations Between Dictionary of Affect's (DOA's) Scales and Quality and Difficulty Ratings

Rating	DOA Scale	Correlation
Quality	Pleasantness	.45**
	Activation	.13**
	Imagery	.04
Difficulty	Pleasantness	−.15**
	Activation	−.01
	Imagery	−.02

Note. ** $p < 0.01$ level (2-tailed).

Concerning difficulty, only one of the three emotional scales was significantly related to the written evaluations. A weak negative correlation was noted for the emotional scale of pleasantness ($r = -.15$, $n = 600$, $p < .01$), indicating that as students gave more difficult ratings, their pleasant words decreased.

Word Count

Several significant relations were observed with the word count of written evaluations (Table 3). As Table 3 shows, concerning quality ratings, a weak negative correlation was noted ($r = -.21$, $N = 600$, $p < .001$); i.e., the professor's quality rating decreased as the evaluation word count increased. Concerning difficulty ratings, a weak positive correlation was noted ($r = .13$, $N = 600$, $p < .001$); i.e., as the evaluation word count increased, the professor's difficulty rating also increased.

In addition, all three DOA emotional scales were significantly related with the word count of the student evaluations. For pleasantness, a weak negative correlation was noted ($r = -.25$, $N = 600$, $p < .01$); i.e., as the student evaluation word count increased, the pleasantness of the words decreased. A weak negative correlation was also noted ($r = -.17$, $N = 600$, $p < .01$) with respect to activation; i.e., as the student evaluation word count increased, the words became increasingly passive. Lastly, a weak negative correlation was noted ($r = -.16$, $N = 600$, $p < .01$) for imagery; i.e., as the student evaluation word count increased, the words became increasingly abstract.

Table 3

Pearson Correlational Relationships with Student Evaluation Word Count

Variable	Word count
Quality	−.21**
Difficulty	.13**
Pleasantness	−.25**
Activation	−.17**
Imagery	−.16**

Note. ** $p < 0.01$ level (2-tailed).

Gender of the Professor

To determine if there were differences in student evaluations that depended on the gender of the professor, an independent-samples *t*-test was conducted, and significant differences were found both in one DOA scale and in word count. Concerning the DOA scales, significant differences were noted in the pleasantness of student evaluations ($t = –3.98$, $p = <.001$, eta squared = .02), with female professors ($M = 50$, $SD = 5.4$) having slightly fewer pleasant words than male faculty ($M = 52$, $SD = 6.6$). It noteworthy that, despite significant differences in pleasantness, the mean scores of both genders fell within the DOA pleasant range (mean of 50 or higher). Significant differences were also noted with respect to word count ($t = 2.63$, $p = .009$, eta squared = .001), with female faculty evaluations ($M = 48$, $SD = 18.3$) having an average of five words more than male faculty evaluations ($M = 43$, $SD = 20.5$).

Discussion

This study was conducted to examine the emotional tone of student evaluations posted on RMP and its relationship with both quality and difficulty ratings given by the student and evaluation word count. The results demonstrated that, outside of a moderate correlational relationship between pleasant words and professor quality ratings, all associations had either low correlational strength or weak effect sizes, indicating that the variables examined in this study may not be strong predictors of student-written evaluations.

All three DOA mean scores for the student-written evaluations were very close to its definition of everyday English ($M = 50$), with activation having the highest mean score ($M = 52.2$). These results imply that the student-written evaluations were neither very pleasant nor unpleasant, very active or passive, or very imagery or abstract. Even though most students rated the professors as "difficult" or "very difficult" (44.7%), the pleasantness mean was 51.1, which is very close to the DOA definition of everyday English at 50. There was also a high degree of uniformity of expression in the written

responses. The DOA has standard deviations of 22 for pleasantness and activation and 36 for imagery (Whissell, 2009). In this study, all three scales had very small standard deviations, ranging from 4.8 to 7.4, which suggests that the emotional tone of student responses was consistent across all evaluations.

Additionally, despite a significant correlation between the pleasantness of evaluations with the difficulty rating, the correlation strength was very weak ($r = -.15$), implying that pleasant words may not be a strong factor in predicting the difficulty ratings of the professors. The lack of significantly unpleasant written evaluations aligns with Olvet et al. (2021), who noted how difficult it is for students to give specific faculty names when giving negative evaluations. Due to the transparent nature of RMP, students must publicly rate an instructor by name, which could make them feel vulnerable and explain the lack of unpleasant words in the evaluations. Although RMP is anonymous, which could suggest protection against adverse reactions, the students might be affected by social desirability. Social desirability is the habit for individuals to acquaint themselves favourably, and has been demonstrated to be similar in online and in-person scenarios (see Dodou & de Winter, 2014).

The lack of a relationship between the written evaluations and imagery is interesting. In the DOA, imagery is defined as how easy it is to picture a word in your mind. Creating evaluations for faculty with high imagery could be difficult for students due to a lack of knowledge about terms associated with effective teaching. This is a challenge for SETs. While a comprehensive literature review on the definition of effective teaching would be beyond the scope of this paper, a study by Stronge et al. (2011) examined "the classroom practices of effective versus less effective teachers" (p. 339). The study extracted approximately 17 words that described effective teaching, including organization, responsibility, classroom management, feedback, clarity, fairness, caring, respect, encouragement, and more. Of the 17 words used in Stronge et al. (2011), 12 (70.5%) were used by the students in this study but appeared only 151 times in 26,764 words (0.6%). Therefore, student evaluations in this study did not include words that describe effective teaching, an observation that raises questions about students' ability to assess faculty teaching ability accurately. After the words that describe effective teaching in Stronge et al. (2011) were run through the DOA, the mean imagery score was 56.4, close to DOA's definition of everyday English ($M = 50$). Thus, imagery might not be a valid measure of effective teaching when using the DOA as an evaluation tool.

Earlier, this paper addressed the reliability and validity challenges with SETs. Some challenges are owed to the paucity of research on student-written evaluations. While Pearson correlational strengths were low in this study, word count had significant relationships with all the variables employed in the analysis (quality and difficulty ratings of the faculty, all three DOA emotional scales, and the gender of the professor). Concerning quality and difficulty ratings, the results demonstrated that when the word count increased, the quality rating decreased and the difficulty rating increased. Stated otherwise, students who rated professors as having poorer quality or being more difficult tended to write longer reviews. Concerning review pleasantness, as the number of words increased, the pleasantness of the words decreased. However, whether these results can be considered stable across all SETs is uncertain. Reliability refers to the consistency and stability of data, and student-written evaluations may pose a challenge for reliability assessment. Although research is limited, it is plausible that most SETs do not

require students to write a specific number of words or have a minimum/maximum word count. Written evaluations might also pose a challenge for validity. According to the results of this study, if students write longer written evaluations, this could affect not only the pleasantness of the evaluation but also other scores that the SET aims to assess, such as instructor quality and course difficulty. This study had an average word count of 44.6 (*SD* = 19.9), with a range of 2 words to 77 words in the evaluations. If formal academic SETs have word counts similar to those in this study, with wide variations of word count, then reliability and validity challenges with written evaluations might occur. If students were asked to write a longer faculty review in the SETs, could it affect institution-specific SET scales, such as quality and difficulty ratings? Again, if students were asked to write longer reviews, could the emotional tone of the words become increasingly unpleasant?

While this study did find significant differences in evaluations for male and female faculty, the effect sizes were weak for evaluation pleasantness (eta squared = .02) and evaluation word count (eta squared = .001). It is important to note that the gender identities of the professors in this study were not officially confirmed, and the identifiers were determined by analyzing the pronouns in the student evaluations. This study did find that fewer pleasant words were used for female faculty (*M* = 50) than male faculty (*M* = 52). Still, the difference was minimal, and, for both genders, the findings were within the pleasant range for the DOA. Additional research is needed to examine the relation between student-written evaluations and a professor's gender, since previous studies (for example, MacNell et al., 2015) have demonstrated a positive bias towards male teachers. In MacNell et al. (2015), the authors used an online teaching environment to determine if student ratings were based on the perceived gender of instructors. Students gave significantly higher ratings to the teachers with male identities than to those with female identities, regardless of the teacher's actual gender, which was disguised in the online environment. The article provided an example of this bias: "When the actual male and female teachers posted grades after two days *as a male*, this was considered by students to be a 4.35 out of 5 level of promptness, but when the same two teachers posted grades at the same time *as a female*, it was considered to be a 3.55 out of 5 level of promptness" (p. 300).

Limitations and Future Research

This study has several limitations. First, the DOA was created by having participants evaluate words context-free; thus, any evaluation and discussion on the emotional tone of student evaluations when using the instrument must be considered. This research also incorporated convenience sampling, a single academic institution, which may limit the generalizability to other institutions, disciplines, or countries. A single university was chosen due to RMP's website navigation, where users must pick an institution as an initial prompt. Aside from the reliability and validity challenges of SETs, which were addressed earlier in this paper, there are other limitations to examining online student evaluations. The most obvious limitation is that the posts could have been entered by anyone, not necessarily the student who took a course with the professor being rated. In addition, the student evaluations could have been carried out at various times during or after the course. Whether traditional and online courses are comparable is uncertain, constituting another limitation. While RMP does have an option for students to

indicate whether the course was online, students are not required to answer the question, and few posts did. The term "online" was used 48 times in the written evaluations, but without context. For example, some student posts referred to what could be described as an online course. In contrast, others described course material in an online learning management system, which could be in a traditional classroom delivery mode. Another limitation could be the lack of student-reported course format and grade received. It is possible that the emotional tone could be affected by the course format, especially if there was no face-to-face communication with the instructor. Concerning grades, many studies (see Stroebe, 2020) report strong positive correlations between SET and student expected grades. It is possible that the emotional tone of SET could be affected if the sample had many students with very high and very low grades.

While this research uses a transparent methodology, there are ethical concerns in using public data, such as privacy concerns (individual and organizational), bias in student response, replication of results, and possible website ownership censorship. For a more thorough examination of the ethics of using publicly available data, see Cooper and Coetzee (2020).

Recommendations for future research include examining student evaluations from various subjects to determine if they differ in emotional tone. Though this study covered 16 different subjects, the disciplines were unequally represented, making comparisons difficult. Finally, this study did not address any effects that minority professors might have on the emotional tone of student evaluations. Reid (2010) evaluated over 5,000 RMP student posts and noted that minorities, "particularly Blacks and Asians, were evaluated more negatively than White faculty in terms of overall quality, helpfulness, and clarity" (p. 137).

Conclusions and Recommendations for Academia

Using the DOA, student-written evaluation words from RMP were measured for their pleasantness, activation, and imagery. Overall, the emotional tone of the students' written evaluations was very close to the DOA's definition of everyday English, indicating that the words were not emotionally charged (pleasant/unpleasant, active/passive) nor imagery/abstract. The lack of moderate or strong correlational associations and effect sizes, outside of the relationship between professor quality ratings and pleasant words, could indicate that the professor quality and difficulty ratings, the number of words in the evaluations, and instructor gender are not strong predictors of student evaluations. This study offers an opportunity for academic institution administration, faculty, and students to find solutions to any negative feelings towards SETs. If the words in the student evaluations are not emotionally charged, yet some faculty report negative feelings about reading them, then training on feedback literacy may assist. Feedback literacy is the act of giving, exploring, accepting, and applying feedback to maximize personal improvement (Yan & Carless, 2022). Faculty could collaborate with the institution's administration and students to provide feedback literacy training, create multiple feedback sources beyond formal SETs, and guide students through the feedback process (Cook et al., 2024), thereby mitigating any negative feelings associated with the written portion of SETs.

Declaration of Conflicting Interests

The author declares no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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Educational Technology Integration Strategies in Colleges of Teacher Education in Ethiopia

Stratégies d'intégration des technologies éducatives dans les établissements de formation des personnes enseignantes en Éthiopie

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Abstract

Research on educational technology (EdTech) integration has extensively explored determinants; however, strategies remain underexamined. Existing models predominantly focus on identifying the determinants of technology adoption yet fail to offer systemic frameworks for sustainable EdTech integration. This study bridges that gap by investigating strategies proposed by stakeholders in a college of teacher education, culminating in a theoretical framework. The research was conducted across four Ethiopian colleges of teacher education by employing a constructivist grounded theory. Data were collected through semi-structured interviews and document analysis, involving 23 participants selected through purposive and theoretical sampling. Data analysis was performed using MAXQDA (Version 2020) software. The results revealed six key strategies categorized into teacher-related, institution-related, and organization-related. A co-constructed theoretical framework illustrates the roles of various stakeholders in EdTech integration, underpinned by ecological systems theory, diffusion of innovations, and the unified theory of acceptance and use of technology. Credibility was ensured through a member-checking survey. The study advocates for further quantitative research to evaluate the correlation between strategies and educational technology integration outcomes, with replication across diverse contexts and stakeholders.

Keywords: Ethiopia, constructivist grounded theory, educational technology, teacher education, strategies

Résumé

La recherche sur l'intégration des technologies éducatives (EdTech) a largement exploré les déterminants, mais les stratégies restent sous-examinées. Les modèles existants se concentrent principalement sur l'identification des déterminants de l'adoption des technologies, mais ne parviennent pas à proposer des cadres de référence systémiques pour une intégration durable des EdTech. Cette étude comble cette lacune en examinant les stratégies proposées par les parties prenantes dans les établissements de formation des personnes enseignantes, pour aboutir à un cadre théorique. La recherche a été menée dans quatre établissements éthiopiens de formation des personnes enseignantes en utilisant une théorie constructiviste ancrée. Les données ont été collectées par le biais d'entretiens semi-structurés et d'une analyse de documents, impliquant 23 personnes participantes sélectionnées par le biais d'un échantillonnage raisonné et théorique. L'analyse des données a été réalisée à l'aide du logiciel MAXQDA (version 2020). Les résultats ont révélé six stratégies clés classées en trois catégories : liées à l'enseignant, liées à l'institution et liées à l'organisation. Un cadre théorique coconstruit illustre les rôles des différentes parties prenantes dans l'intégration des EdTech, étayé par la théorie des systèmes écologiques, la diffusion des innovations et la théorie unifiée de l'acceptation et de l'utilisation de la technologie. La crédibilité a été assurée par un sondage de vérification auprès des membres. L'étude préconise la poursuite des recherches quantitatives pour évaluer la corrélation entre les stratégies et les résultats de l'intégration des technologies éducatives, avec une reproduction dans divers contextes et auprès de diverses parties prenantes.

Mots-clés : Éthiopie, théorie constructiviste ancrée, technologie éducative, formation des personnes enseignantes, stratégies

Introduction

Digital educational technology (EdTech) is becoming an indispensable component of modern-day education. Multiple studies claim its importance for promoting student performance (Asratie et al., 2023; Saal et al., 2020) and teacher development (Hennessy et al., 2022). However, integrating EdTech is not without challenges (Scanlon, 2021). Many studies have addressed challenges in terms of technology infrastructure, technical support, equipment, and software (Maatuk et al., 2022), poor digital competence of teachers and students (Turnbull et al., 2021), and poor technology leadership (Elsholz et al., 2021). Further, there is a growing interest in exploring how EdTech can be effectively implemented in higher education (Ray, 2020).

Recent studies on EdTech integration in higher education have predominantly focused on identifying determinants, with limited attention devoted to formulating actionable strategies. While existing research offers discrete recommendations for key stakeholders (e.g., Chugh et al., 2023; Dexter & Richardson, 2020), the absence of a holistic, evidence-based strategy framework remains a critical gap in guiding comprehensive integration efforts. The problem worsens in developing countries where the culture of EdTech integration is at its early stage (Alemu, 2017). Deacon et al. (2023) indicated the existence of a scholarly gap in understanding the organizational layers involved in EdTech implementation in higher education.

Ethiopia is a developing nation and home to over 120 million people—Africa's second most populous country (World Bank, 2023). The government endorsed the Digital Ethiopia 2025 strategy to harness technology in various sectors, including education (Federal Democratic Republic of Ethiopia, 2020). However, poor Internet connection, inadequate information and communication technology (ICT) infrastructure, and poor digital competence deter digitalization in higher education (Adamu, 2024). A recent study on EdTech integration in colleges of teacher education (CTE) revealed the existence of systemic challenges including gaps in institutional readiness, teacher preparedness, ICT infrastructure, and disparities in digital literacy among educators and students (Woldemariam et al., 2025).

Teaching and learning activities in Ethiopian CTEs are confronted with various problems that affect the quality of education. Studies have argued that pedagogical insufficiencies lead to a decline in the quality of education (Mihiretie, 2023). Additionally, poor quality educational resources such as modules, inadequate facilities, low staff compensation, and academic staff commitment are some of the challenges (Nemomsa & Beyesa, 2023). The strategic integration of EdTech holds potential to mitigate systemic quality deficits in education by deploying adaptive digital solutions and evidence-based pedagogical frameworks. Ultimately, it enhances instructional efficacy and learning outcomes.

Despite the recognized potential of EdTech to improve teaching quality and address critical challenges in higher education in developing countries, research on actionable strategies is scarce. Current studies primarily address the determinants of EdTech integration (Ferede et al., 2022a), leaving a substantial gap in practical, context-specific strategies. This study aimed to fill this critical gap by exploring context-specific strategies and developing a theoretical framework. The resulting strategy framework could serve as a valuable resource for educational leaders, policymakers, and educators, offering structured guidance to promote EdTech integration.

The paper first details the grounded theory (GT) methodology used in this research. GT intentionally omits a traditional literature review phase to avoid preconceived theoretical biases; instead, emergent findings are inductively derived and integrated post hoc with the existing literature. The results consist of several co-constructed categories, verified through a member-checking survey, and we discuss the theory development, which consists of the emergent theory and theoretical mapping, and key findings with support from the literature and implications for policy and practice. Finally, this article concludes with the major findings, limitations, and future research avenues.

Methods

A qualitative research approach was employed to explore the insights of teacher educators (TEs), academic, research, and community service vice deans (ARVDs), and ICT directors into strategies for effectively integrating EdTech. Grounded theory is a qualitative methodology useful to understand insights and experiences affecting processes and events (Glaser & Strauss, 1999). Based on the aim of this study, constructivist GT was selected for exploring strategies and developing theoretical explanations (Charmaz, 2014).

Participant Information

According to the Ethiopian Ministry of Education (2023), 39 CTEs are distributed across 12 regional states. Our study includes four CTEs from four different states. A total of 23 participants (17 TEs, three ICT directors, and three ARVDs) were selected using purposive and theoretical sampling techniques. As constructivist GT follows an iterative approach, 7, 14, and 2 participants were involved in the first, second, and third phases of the study, respectively. Participants were selected from the language, natural and social science, information technology, education, and mathematics departments to ensure the depth and breadth of data. Table 1 summarizes the aggregated demographic characteristics of participants.

Table 1

Participant Demographic Information

Participant role	*n*	Qualification		Departments represented, *n*	Years of experience		
		MSc	PhD		*n*	*M*	*SD*
Teacher educator	17	14	3	6	5–25	15.5	5.5
Academic vice dean	3	2	1	2	4–5	4.7	0.58
ICT director	3	3	0	1	1	1	0

Note. Departments = total unique departments across roles (e.g., 6 departments for teachers). ICT = information and communication technology.

Data Collection

Data were collected using a separate semi-structured interview protocol developed for each data source (Charmaz & Belgrave, 2012). Domain area experts and supervisors validated the protocols before actual data collection. Additionally, the TE interview protocol was piloted with four participants from one of the CTEs. Face-to-face and online platforms were used, and the interviews were recorded and transcribed manually using MAXQDA software (Version 2020; https://www.maxqda.com/). To supplement the interview data, additional data were collected from the institution's strategic plan document.

Data Analysis

The constructivist GT data analysis involved coding, memo writing, constant comparison, and theoretical saturation (Charmaz, 2014). It started with data collected from the first teacher educator (TE1) and then iterated back and forth between new data and the previous until saturation was reached. The initial coding used gerunds and in vivo codes to represent the meanings and processes. Recurring initial codes were used to categorize related codes to form categories. This process continued until saturation was reached in each category. The categories reached saturation points at the 13th, 14th, and

15th TEs. Categorical saturation implies the point at which no new properties, dimensions, or insights emerge within a specific category (Charmaz, 2014).

Next, core categories were constructed by connecting categories with related concepts. After interviewing and analyzing two more TEs (16 and 17), theoretical saturation was confirmed. Theoretical saturation is the stage at which further data collection and analysis no longer generate new theoretical insights (Saunders et al., 2018). Despite caution to not impose prior understandings during the initial stages of analysis, we believe that our preconceived concepts, experiences, and theoretical perspectives affected our interpretations. The constructivist GT recognizes that researchers cannot fully bracket preconceptions but can transparently account for their role in knowledge co-construction (Charmaz, 2014). We employed strategies such as recording positionality memo, theoretical sampling, peer debriefing, member checking, and constant comparison to ensure participants' voices were truly incorporated. All data analysis activities were conducted using MAXQDA software.

Results

The core categories and subcategories that were co-constructed between the participants and the researchers are described. Six core categories were co-constructed through a high-level categorization of 23 subcategories (Figure 1). These included continuous professional development, institutional support, stakeholder engagement and collaboration, curriculum and instructional design, evaluation and feedback, and foundational support. We identified and categorized 407 coded segments, representing the categories, through rigorous, cyclic data collection and analysis. Evidence from the interview excerpts supported all findings. Furthermore, a member-checking survey was conducted to confirm the credibility of the key findings.

Figure 1

Number of Coded Segments Used to Determine Each Core Category
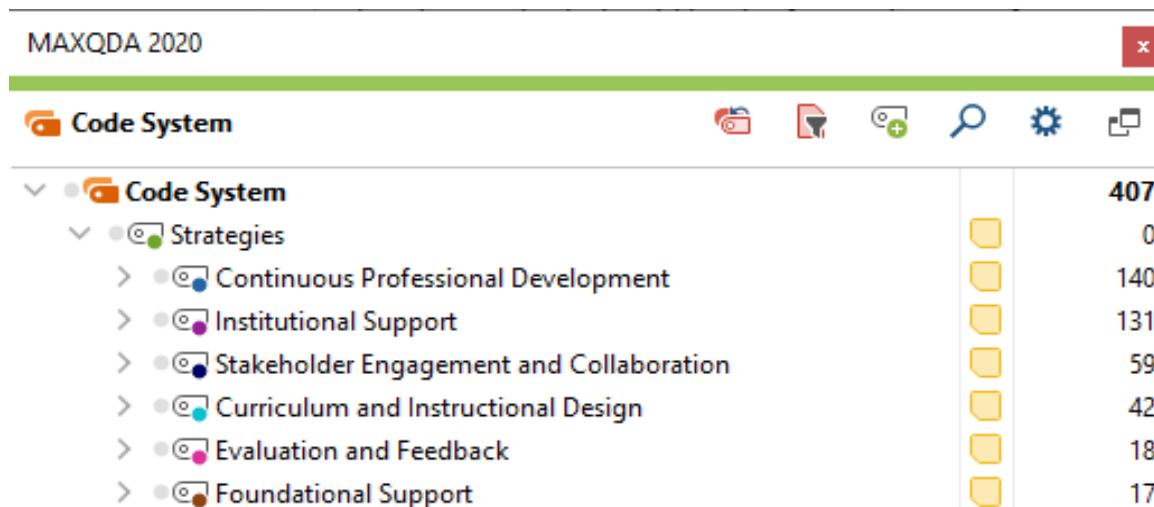
Continuous Professional Development

Continuous professional development (CPD) refers to the ongoing process of acquiring new skills, knowledge, and expertise that help TEs improve their teaching practices and, in this case, integrate EdTech. CPD consists of three subcategories: comprehensive training programs, professional development, and self-directed learning. CPD was the most common concept among the identified strategies, with 140 coded segments (34.4%). Table 2 shows the three subcategories with interview excerpts that support the findings.

Table 2

Subcategories of Continuous Professional Development

Subcategory	Coded segments		Example quote
	n	%	
Comprehensive training programs	68	48.6	"CTEs should plan trainings for all staffs." (TE1)
Professional development	54	38.6	"Updating self, filling the gap, giving continuous trainings, are very important." (TE14)
Self-directed learning	18	12.8	"I am exerting my effort to familiarize myself with the new technologies." (TE8)

Note. TE = teacher educator.

Comprehensive training programs are structured and systematic training provided by CTEs aimed at equipping educators with the necessary skills and knowledge for integrating EdTech. Most participants stressed the significance of training programs for integrating EdTech. For example, six TEs claimed that training on emerging technologies could help them prepare electronic lessons, animations, and simulations.

Professional development is an aspect of CPD that ensures educators maintain and enhance their teaching competencies throughout their careers. Almost all participants revealed the importance of professional development in becoming successful in EdTech integration. Further, a few participants highlighted the benefit of establishing staff development programs to foster EdTech integration.

Self-directed learning refers to the efforts of TEs to learn new skills and knowledge through personal initiatives, such as taking online courses, reading, and peer collaboration. It is a flexible and personalized element of CPD, allowing TEs to focus on areas of interest or need at their own pace. More than half the participants claimed it as an option for effectively integrating technologies in education. Five TEs emphasized the use of existing Internet connections to engage in self-paced training and acquire essential skills.

Institutional Support

Institutional support is crucial for creating an environment conducive to EdTech integration. It was the second most frequently perceived strategy with 131 coded segments (32.2%). As indicated in Table 3, this subcategory comprised different dimensions of support from the institution.

Table 3

Subcategories of Institutional Support

Subcategory	Coded segments		Example quote
	n	%	
Leadership support	31	23.7	"The leadership tries to facilitate the materials needed for EdTech in our college." (TE13)
IT infrastructure development	24	18.3	"Internet access should be in every corridor of the college, and even teachers should have their own laptop." (TE4)
Strategic planning	21	13.7	"In addition to clear vision, the college should have a clearly prepared strategic plan." (TE8)
Resource provision	19	14.5	"The college should try to avail different apps for supporting teaching and learning practices." (TE7)
Student support	12	9.2	"It would be good to provide trainings to develop the technology knowledge and skills of students." (TE15)
Technical support	11	8.4	"Experts who are well trained must be standby always to support TEs when they face a challenge while utilizing those technologies." (TE3)
IT facility development	9	6.9	"The college should plan to install digital technologies in the classrooms." (ICT director 2)
Policy development	4	3	"It needs some rules which should be developed and included in the college's laws to facilitate the use of technologies." (TE10)

Note. TE = teacher educator; IT = information technology; ICT = information and communication technology.

Leadership support highlights the role of administrative support, budget allocation, facilitation, and cultural shifts within an institution to promote and sustain the integration of EdTech. Four TEs described its key role in facilitating technology integration.

IT infrastructure development in terms of hardware, software, and the Internet plays a significant role in effective EdTech integration. Such tools must be provided in sufficient amount and strength to

accommodate every faculty member. Nine of the interviewed TEs indicated the strategic benefit of IT infrastructure development in CTEs to facilitate EdTech integration.

Strategic planning involves defining long-term goals, objectives, and actions for integrating EdTech within an institution, aligning these goals with that institution's overall mission and vision. Seven TEs, one ARVD, and one ICT director stated that EdTech integration should be adopted as a strategic direction.

Resource provision refers to the allocation of material resources, such as educational software, computers, projectors, and access to digital content, to support EdTech initiatives. Similarly, this category of institutional support was highlighted by seven TEs and two ARVDs.

Student support refers to providing services and resources, such as training, resources, and academic advice, to help students effectively use EdTech. Out of the 17 TEs involved in the interview, seven argued that student support is key to facilitate the effective integration of EdTech in CTEs.

Technical support involves the provision of ongoing technical assistance to TEs, including technical and user support. Several participants stated that technical support could facilitate the path toward effective integration of EdTech. One college administrator and two ICT directors indicated their commitment to providing technical support to facilitate the integration of EdTech in CTEs.

IT facility development refers to creating or upgrading physical spaces such as computer labs, smart classrooms, and collaborative learning environments. For instance, One TE claimed the importance of organizing classrooms with Internet access for EdTech integration. Overall, six participants stated the importance of having technology-enabled classrooms, digital libraries, and computer laboratories to promote technology integration.

Policy development involves the development and implementation of policies to guide the effective integration of EdTech. Our findings revealed that CTEs do not have institutional policies to govern technology use. One TE expressed the opinion that rules or guidelines should be developed and integrated into each CTE's laws to facilitate technology integration.

Stakeholder Engagement and Collaboration

This core category emphasizes the active involvement and cooperation of various internal and external stakeholders in the process of integrating EdTech. It was the third most frequently mentioned core category, with 59 coded segments (12.5%). As shown in Table 4, this category comprises resource use, stakeholder collaboration, stakeholder engagement, experience sharing, and external support.

Table 4

Subcategories of Stakeholder Engagement and Collaboration

Subcategory	Coded segments		Example quote
	n	%	
Resource use	19	32.2	"I usually use Google Classroom to assist my students in the classroom." (TE6)

Subcategory	Coded segments		Example quote
	n	%	
Stakeholder collaboration	14	23.7	"The college has to work with different stakeholders to effectively integrate EdTech." (TE17)
Stakeholder engagement	10	16.9	"The college should seriously engage and plan to prepare a kind of training, assign technicians for this service, and engage the TEs through continuous practice with the help of those technicians." (TE3)
Experience sharing	8	13.6	"Experienced teachers should share their experience among the college staff." (TE1)
External support	8	13.6	"The government should finance CTEs to get ample resources." (TE4)

Note. TE = teacher educator; CTE = college of teacher education.

Resource use refers to the effective use of existing resources, including personal, Internet, simple technologies, and educational software. Seven TEs and one ARVD stated that TEs should try to incorporate technologies that may be simple but essential for enhancing their teaching practices.

Stakeholder engagement involves stakeholders, including TEs, curriculum developers, EdTech experts, administrators, and ICT directorate staff, promoting EdTech integration. The significant role of engaging concerned stakeholders in designing EdTech-integrated activities, lessons, and contents was identified by four TEs.

Stakeholder collaboration refers to cooperation and coordination among various stakeholders to ensure the effective practice of EdTech. Four TEs as well as two of the ICT directors described the significant role of collaboration within an institution and beyond to bring a change in technology integration.

Experience sharing involves TEs' engagement in communicating their experiences, challenges, and successes with EdTech integration through formal or informal networks, communities of practice, and peer mentoring. Only three TEs discussed the importance of experience sharing among academic staff to increase EdTech integration practices.

External support refers to partnerships and collaborations with external entities such as government and nongovernmental organizations, EdTech companies, and educational institutions. The need for external support to reinforce institutional EdTech initiatives was mentioned by four TEs and one ICT director. Support in terms of funds, expertise, and infrastructure development was identified by two TEs.

Curriculum and Instructional Design

As presented in Table 5, this core category focuses on ensuring technology integration at the curriculum, course, and instruction levels. It was the fourth most frequently stated strategy, with 42 coded segments (10.4%). It reflects the need for a coordinated effort to redesign curricula, innovate instructional methods, and refine course offerings to meet the demands of technology-enhanced education.

Table 5

Subcategories of Curriculum and Instructional Design

Subcategory	Coded segments		Example quote
	n	%	
Curriculum redesign	32	76.2	"Especially the Ministry of Education and other stakeholders at a higher rank should consider EdTech integration in the curriculum." (TE5)
Instructional innovation	6	14.3	"One of the strategies is, due attention has to be given to technology, our teaching has to be based on technology, and we should have to use it." (TE1)
Course redesign	4	9.5	"The courses need to be integrated with technology." (TE10)

Note. TE = teacher educator.

Curriculum redesign refers to the modification of existing curricula to better integrate EdTech. More than 82% of participants identified the significance of redesigning the curriculum by incorporating technology. The revision should consider more about the practical aspects of technology use to enable TEs to become competent, according to one TE and one ICT director. Additionally, one TE said that curriculum developers should pay attention to incorporating EdTech into the curriculum and teaching materials.

Instructional innovation involves the adoption of new teaching and assessment methods, leveraging technology to create engaging, interactive, and effective learning experiences. For example, one TE indicated the positive aspect of integrating technologies with teaching methods and assessment techniques.

Course redesign involves revising the structure, content, and delivery of individual courses to incorporate EdTech effectively. Three TEs underscored the significance of incorporating technologies in each unit or specific lesson.

Evaluation and Feedback

This category refers to the systematic process of assessing the effectiveness of EdTech integration and providing actionable insights to improve teaching and learning practices. It focuses on evaluating EdTech integration efforts and advancing research in CTEs. Ranked as the fifth most significant strategy according to participants' comments, it comprised 18 coded segments (4.5%). Subcategories, along with illustrative interview excerpts, are detailed in Table 6.

Table 6

Subcategories of Evaluation and Feedback

Subcategory	Coded segments		Example quote
	n	%	
Assessment and feedback	12	66.7	"There should be a continuous follow up." (TE14)
Promotion of EdTech research	6	33.3	"The college should conduct different studies on lessons that are conducted with integration of EdTech vs. lessons taught using conventional methods of teaching." (TE1)

Note. TE = teacher educator.

Assessment and feedback involve the evaluation of TEs' integration of EdTech and provide data-driven feedback for their improvement. Findings revealed the absence of strategies to monitor and evaluate technology integration in CTEs, according to two ARVDs interviewed. However, participants stated its potential to ensure integration and sustainability.

The promotion of EdTech research refers to encouraging research activities aimed at exploring the effectiveness, challenges, and opportunities related to EdTech integration. It was claimed by three TEs and one ARVD that promotion of research would be a vital tool to explore the existing scenario and identify future directions.

Foundational Support

This core category highlights the importance of starting EdTech integration early in primary and secondary education to build a strong foundation for higher education. Although ranking last in the category of codes with only 17 coded segments (4.2%), foundational support was mentioned in the interviews at all study sites (Table 7).

Table 7

Subcategories of Foundational Support

Subcategory	Coded segments		Example quote
	n	%	
Early integration	13	76.5	"The curriculum has to accommodate technologies beginning from the lower level to higher education." (TE17)
IT infrastructure support	4	23.5	"The primary and secondary schools should be equipped with an IT infrastructure to nurture the usage of technology in education." (TE15)

Note. TE = teacher educator; IT = information technology.

Early integration highlights the importance of starting EdTech integration in lower grades. Eight participants claimed the inclusion of technologies in the curriculum of primary and secondary education would provide foundational support.

IT infrastructure support involves equipping primary and secondary schools with essential IT infrastructure. Some participants highlighted its impact on EdTech integration; infrastructure support promotes TEs' engagement and students' learning in CTEs. They said the absence of an IT infrastructure in primary and secondary schools had greatly contributed to students' digital illiteracy in CTEs.

Validation of Findings

A member-checking survey was used to assess the credibility of the key findings. Among the 23 survey participants, 19 completed and returned their feedback on each co-constructed core category (Figure 2). Institutional support and stakeholder engagement received unanimous agreement. Evaluation and feedback and continuous professional development had near-unanimous approval. Curriculum and instructional design also received a clear majority, with only one dissent. Though it was also predominantly agreed upon, foundational support showed the lowest consensus, suggesting a more nuanced perception. Results confirm the credibility of the categories, with minor discrepancies highlighting areas for refinement.

Figure 2

Participants' Feedback Collated From the Member-Checking Survey
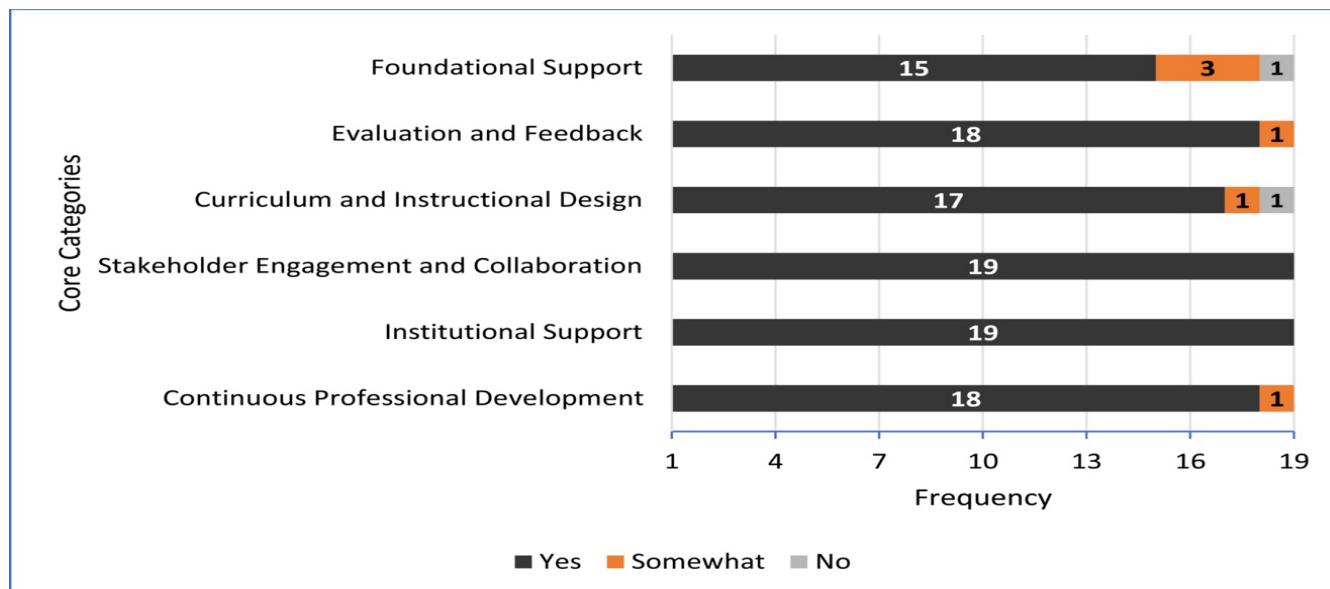
Theory Development

In this section, the prevailing theory, grounded in empirical data and theoretical mappings, is presented. The theory was developed based on the principles of constructivist GT, highlighted in the Methods section (Charmaz, 2014). To confirm theoretical saturation, we performed theoretical mapping based on the reviewed literature. Demonstrating how the GT integrates with and contributes to existing theories is important in GT research. This argument is also supported by the methodological suggestions made for GT research (Idrees et al., 2011).

The Emerging Theory

As evident in the findings, EdTech integration involves the collaborative effort of multiple stakeholders. Each stakeholder plays a particular role in integrating EdTech. Thus, the emerging theory solely depends on the strategies identified based on the GT data analysis. This implies strategies for integrating EdTech demand the effective engagement and collaboration of stakeholders, including TEs, college deans, ICT directors, curriculum developers, government, and nongovernmental organizations.

Considering the role of stakeholders in EdTech integration, the strategies were grouped into three categories: teacher-, institution-, and organization-related. Teacher-related strategies rely directly on the practices of TEs in integrating EdTech. Institution-related strategies are those deemed to be executed by CTEs. Organization-related strategies require the involvement of the government (Ministry of Education and Regional Education Bureau) and nongovernmental organizations (Table 8).

Concerning teacher-related strategies, CPD, SEC, and CID were included. We included CPD considering the subcategory self-directed learning, which requires a TE's self-initiative. Similarly, SEC

is another strategy that falls under this category, which involves the engagement and collaboration of TEs in existing EdTech initiatives. Under this core category, all subcategories except external support represent the role of TEs. Finally, CID was included because of the role of TEs in innovating instruction. Hence, instructional innovation is an individual teacher's role in transforming pedagogical practices.

Table 8

Summary of Teacher-, Institution-, and Organization-Related Strategies

Core category	Teacher-related	Institution-related	Organization-related
Continuous professional development	✓	✓	
Institutional support		✓	
Stakeholder engagement and collaboration	✓	✓	✓
Curriculum and instructional design	✓		✓
Evaluation and feedback		✓	
Foundational support		✓	✓

As evident in Table 8, institution-level strategies were those owing to institutional stakeholders. Concerning CPD, the subcategories of comprehensive training programs and professional development are the roles of CTEs. Subcategories representing IS and EF exclusively represented institution-level strategies. SEC was included because of the following subcategories: stakeholder engagement, stakeholder collaboration, and experience sharing. These subcategories indicate the role of CTE engagement and collaboration as key contributors to effective EdTech integration. FS was not mentioned in any way as a role of the CTE before the member-checking survey. However, almost all participants (15 of the 19 who completed the survey) drew our attention to the importance of CTEs' engagement in supporting primary schools through training and IT resources.

Concerning organization-related strategies, the core categories that call out the involvement of external organizations, including SEC, CID, and FS, were included (Table 8). In SEC, the subcategories of stakeholder engagement, collaboration, and external support were evidence of its inclusion. Similarly, curriculum redesign and course redesign are subcategories under CID, highlighting its inclusion in this group. Moreover, all the subcategories within FS represent organization-level strategies; therefore, it would be rational to include it as part of this group.

Based on the identified theoretical connections among the three groups of strategies, a theory was generated. SEC was a role shared among the three groups. CPD was found to exist under teacher-related and institution-related strategies. CID was identified as the role of both teacher-related and organization-related strategies. FS was found under institution-related and organization-related

strategies. The strategies IS and EF were found only under the institution-related group. Overall, the indicated relationships inform the development of a theory representing the roles in common, as well as exclusive to each group. Figure 3 presents the theoretical framework explaining the strategies for effective EdTech integration in CTEs.

Figure 3

A Strategy Framework for Effective EdTech Integration
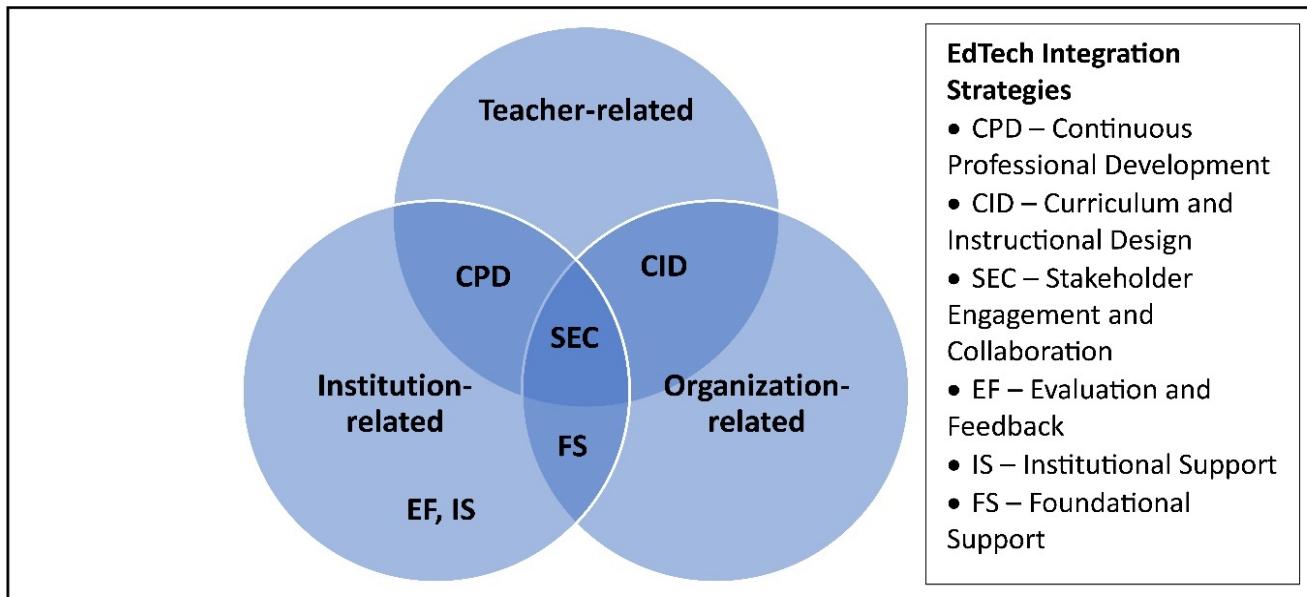
Theoretical Mapping

The final stage of GT research (known as the maturity stage) involves mapping emergent theory to existing theories (Idrees et al., 2011). Integrating the constructed GT with literature supports verification of the theory and unveils its contribution to the field. Accordingly, ecological systems theory (Bronfenbrenner, 1979), diffusion of innovations (Rogers, 2003), and unified theory of acceptance and use of technology (Venkatesh et al., 2003) were found fit for theoretical mapping.

The ecological systems theory is a developmental psychology theory used to explain how various environmental systems interact to influence human development (Bronfenbrenner, 1979). This theory emphasizes the complex interplay between an individual and the surrounding environment. It highlights development as not exclusively the result of individual characteristics; rather, it is shaped by the broader set of ecological systems. The ecological systems theory comprises five categories of ecological systems: microsystems, mesosystems, exosystems, macrosystems, and chronosystems (Yang & Sanborn, 2021). The microsystem is the immediate environment where an individual directly interacts. The mesosystem refers to the interrelations between the settings containing the person. The exosystem links environments that do not involve individuals but affect the microsystem. The macrosystem consists of the larger cultural and societal context that shapes the environments in which

an individual lives. The chronosystem encompasses the dimension of time, reflecting the environmental events, transitions, and changes that occur throughout an individual's life.

Considering the involvement of multiple stakeholders in the constructed GT, mapping with ecological systems theory could maximize its robustness. Teacher-related strategies of the constructed GT align with the microsystem; hence, strategies including CPD, SEC, and CID can be performed at an individual level. The institution-related strategies such as IS, EF, CPD, and SEC are accomplished by CTEs, which align with the mesosystem. The organization-related strategies align with the exosystem. Hence, strategies such as FS, CID, and SEC can be managed at the organizational level. Due to high-level categorization, the overlapping strategies of CPD, SEC, CID, and FS, connecting the three systems, emerged. These strategies contain related categories; however, they differ in terms of the stakeholders being represented. Further, recent studies used ecological systems theory as a theoretical lens to explain EdTech integration (Nyanzi et al., 2024; Tanhan et al., 2023). Thus, it is plausible to use and explain the constructed GT through the lens of ecological systems theory.

The diffusion of innovations is an important theory in the information system literature that explains how, why, and at what rate new ideas, technologies, or practices diffuse through cultures or social systems (Rogers, 2003). According to Rogers (2003), relative advantage, compatibility, complexity, trialability, and observability are the characteristics that explain why a technology is adopted more quickly. These features can effectively explain the constructed strategies. Furthermore, recent studies have employed this theory as a lens to elucidate technology integration in education (Damiano et al., 2024). Consequently, it is reasonable to map the strategies in the theoretical framework to the characteristics of the diffusion of innovations.

The unified theory of acceptance and use of technology is another theory in the information system literature that predicts technology adoption using the constructs performance expectancy, effort expectancy, facilitating conditions, and social influence (Venkatesh et al., 2003). Similar to diffusion of innovations, GT constructs can be effectively explained by the unified theory of acceptance and use of technology constructs. Further, considering the wide applicability of unified theory of acceptance and use of technology in technology integration studies (Alowayr, 2022; Qiao et al., 2021), embedding the GT constructs to this theory enhances the theoretical framework's robustness.

Discussion

The purpose of this GT research was to explore the insights of TEs, ARVDs, and ICT directors into effective EdTech integration strategies and construct a theoretical framework. As illustrated in Figure 3, CPD, IS, SEC, CID, EF, and FS were the key strategies that emerged. These strategies were grouped into three ecosystems: teacher-related, institution-related, and organization-related. Additionally, a theoretical framework claiming multistakeholder engagement and collaboration as a central strategy was constructed and explained based on existing theories such as ecological systems theory, diffusion of innovations, and unified theory of acceptance and use of technology. This section presents a discussion of the key strategies and theoretical and practical implications.

Engaging TEs in CPD was the first key strategy suggested in the study. Previous studies have also highlighted the importance of enhancing CPD programs to strengthen EdTech integration practices (Atabek, 2020; Koh, 2020). According to Wohlfart and Wagner (2023), institutions are expected to provide CPD for in-service teachers to promote the effective integration of EdTech. Similarly, Rich et al. (2021) highlighted the impact of CPD in changing teachers' beliefs about teaching coding and computational thinking. Furthermore, Ferede et al. (2022b) recommended crafting CPD-based interventions to empower teachers with ICT competence and attitudes. Therefore, the strategic role of CPD in proliferating EdTech integration was found to be in line with the literature.

According to Trevisan et al. (2023), the IS determines faculty members' online teaching competence. For instance, leadership support was found to be a key strategic direction for promoting and sustaining EdTech integration. Multiple reviews (Deacon et al., 2023; Dexter & Richardson, 2020) and empirical evidence (Landa et al., 2023; Uzorka & Olaniyan, 2023) boldly ascertained its impact. Notably, IT infrastructure development was found to be a key IS and was claimed by prior reviews (Chugh et al., 2023; Deacon et al., 2023). As a further illustration, a study conducted in Nigerian universities highlighted leadership support, IT infrastructure, policies, equitable access, and motivation as key strategies for effective EdTech integration (Uzorka & Olaniyan, 2023).

Petko and Prasse (2018) claimed stakeholder engagement as fundamental for effective EdTech integration. The engagement is a foundation to collaborate and leverage EdTech. For example, through a collaboration of different stakeholders, virtual labs can be implemented in higher education (Kleine & Pessot, 2024). Moreover, in a community of practice, stakeholders can share the best experiences related to innovative classroom pedagogies (Smith & Becker, 2021). However, a review by Chugh et al. (2023) claimed that stakeholders' perceptions favour technology use rather than pedagogy, which affects the effective integration of EdTech. Therefore, SEC has an undeniable role in integrating EdTech and impacting implementation success.

The finding concerning CID aligns with studies emphasizing curriculum redesign as crucial for integrating modern technologies (Shohel et al., 2023; Stahl, 2021). Owing to the COVID-19 pandemic, most countries redesigned their curricula to sustain teaching practices (Clausen et al., 2021). Likewise, technologies were used to redesign courses for blended learning during the pandemic (Stahl, 2021). Additionally, an experimental study conducted in Ethiopian higher education revealed the impact of blended instruction on improving students' writing performance (Bekele Sime et al., 2024). Therefore, CID can be regarded as one of the enablers of effective EdTech integration.

The effective integration of EdTech demands a holistic EF strategy to assess and provide feedback on the use of EdTech tools and their impact on teaching and learning. This finding is supported by the literature, where the use of automated classroom analytics, such as TEACHActive (Kelley et al., 2021) and student grade improvement (Jaiswal, 2020), were suggested mechanisms to evaluate the effective use of EdTech. Additionally, studies have revealed that the usability of EdTechs in CTEs can be evaluated via a well-established system usability scale (Vlachogianni & Tselios, 2022). Overall, holistic EF mechanisms are pivotal for EdTech integration effectiveness.

EdTech integration in developing countries primarily focuses on tertiary education. Primary and secondary schools, which are believed to lay the foundation for tertiary education, have not gotten

enough attention. For example, in Ethiopia, primary school teachers do not have access to EdTech tools (Gonfa et al., 2024). The problem also extends to secondary schools (Hunduma & Seyoum, 2023). This has resulted in students joining higher education with poor digital capabilities. Accordingly, the FS strategy has a fundamental role in creating opportunities for effective EdTech integration beginning from the lower grades. Although most of the strategies are already recommended in previous studies, the FS strategy is a new contribution to the EdTech literature.

The current study contributes a novel theoretical framework for planning and implementing EdTechs in higher education. The framework is grounded in empirical data and aligns with prominent theories such as ecological systems theory (Bronfenbrenner, 1979), diffusion of innovations (Rogers, 2003), and unified theory of acceptance and use of technology (Venkatesh et al., 2003). The strategies are categorized into three overlapping categories based on the stakeholders. Notably, the constructed framework highlighted the need for multistakeholder engagement to effectively integrate EdTech. Moreover, recent systematic reviews on EdTech have shown a scarcity of research outputs, particularly from the Global South (Granić, 2022). Therefore, this study begins to fill the gap in the literature in terms of new insights and methodological knowledge, particularly concerning GT. Furthermore, the constructed GT would be a new addition; hence, the existing models and theories address factors contributing to the diffusion, acceptance, and use of technology. In contrast, the current study unveils new theoretical explanations for governing EdTech integration, particularly in developing countries.

The constructed theory offers a roadmap for stakeholders to plan effective EdTech integration. Teacher educators could leverage the framework's CID component to reshape their instruction using existing EdTechs. To address this issue, they should engage in professional development endeavours. Institutional leaders could use the framework to prioritize resource allocation, plan appropriate EdTech integration evaluation and feedback strategies, and develop a CPD implementation plan. The framework could alert policymakers to revisit the educational policies through the lens of EdTech. The Ethiopian Ministry of Education, the Regional Education Bureau, and CTEs should support EdTech integration practices at primary and secondary schools. Generally, the framework highlighted the significant role of stakeholder engagement and collaboration in realizing effective EdTech integration.

Conclusion

In this study, we explored and identified EdTech integration strategies and constructed a theoretical framework that could help in planning and implementing technologies in education. The strategies include CPD, IS, SEC, CID, EF, and FS. SEC was found significant in the framework; it promotes the engagement and collaboration of every stakeholder in the ecosystem of higher education. Additionally, CPD, CID, and FS link teachers and institutions, teachers and organizations, and institutions and organizations, respectively. The theoretical framework is grounded in empirical data and explained by existing theories. Additionally, the member-checking survey contributed to reinforcing the credibility of the identified strategies.

Despite this study's significant contribution, it has limitations. First, the data was collected from four CTEs until reaching saturation, which is susceptible to subjectivity. Second, the methods used to

collect data relied on interviews and document analysis, which need to be reinforced with quantitative methods. Third, a lack of perspectives from policymakers and students could lower the comprehensiveness of the framework. Future research could expand to other educational contexts, involve diverse stakeholders, conduct a comparative study in other developing countries, experiment with intelligent systems to support EdTech integration, and employ quantitative methods to assess the correlation between the strategies and EdTech integration outcomes.

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