OPEN PRAXIS

A Systematic Review of e-Portfolio Use During the Pandemic: Inspiration for Post-COVID-19 Practices

RESEARCH ARTICLE

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ABSTRACT

As the COVID-19 pandemic fades into the background, higher education institutions think about what they can learn from the vast shift to online teaching and learning—the recent period emphasized the significance of autonomous learning abilities, as students who were skilled in self-regulation were able to cope with the challenges of remote education with more success. The e-portfolio was a crucial instrument in online education, aligning well with self-regulated learning processes. Evaluating and learning from these experiences after the pandemic is necessary to improve future educational approaches. The review adhered to a thorough methodology. Starting with 221 publications, the PRISMA protocol and the Ryaan tool were implemented to refine the data. The content analysis approach was further employed to evaluate 12 selected papers. The results suggest that e-portfolios were well-welcomed during the pandemic because of their flexibility in remote learning environments and their ability to showcase continuous student learning and achievement. However, concerns were identified regarding sufficient guidance, support, privacy, and plagiarism. Furthermore, the study examines the digital designs and infrastructures of e-portfolios, offering significant insights into their functionality and user experiences. Drawing upon the synthesized data, this article presents practical suggestions for integrating e-portfolios within the educational post-pandemic environment, with a particular focus on collaboration from a learning co-design approach. Additionally, it suggests possibilities for further investigation to enhance the evolution of e-portfolios in higher education.

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INTRODUCTION

The COVID-19 pandemic, which once posed a formidable challenge to traditional face-to-face education, has now receded, leaving behind a transformed landscape of higher education (Nurhas et al., 2021). Institutions that once scrambled to adopt online learning as a regular practice during the pandemic (Mudau & Modise, 2022) now assess the efficacy of these emergent virtual educational models in a post-COVID-19 context. The rapid and necessary transition to digital platforms to sustain academic activities has underscored the resilience and adaptability of higher education (Devarajoo, 2020; Toquero, 2020). Bozkurt and Sharma (2020) emphasize the need to create supportive and collaborative e-portfolio practices during COVID-19. They advocate for secure learning environments that encourage sharing and mutual support, where educators and learners work together, emphasizing care and compassion to navigate the pandemic's challenges. Furthermore, as educators and learners navigated material organization, instructional approaches, and assessment in a virtual space, digital technology tools, particularly e-portfolios, which gained prominence due to their capacity to facilitate emergency virtual education (Ismailov & Laurier, 2021; Schiff et al., 2021; Rahiem, 2021; Rodriguez et al., 2022).

E-portfolios have been defined as integrated electronic compilations of multimodal artifacts that serve as learning evidence, supporting teaching, learning, assessment, and showcasing, focusing on skill development through self-regulation, self-reflection, and self-evaluation (Beckers et al., 2016). Their utility in fostering student learning and assessment was magnified during the COVID-19 pandemic (Domene-Martos et al., 2021; Rodriguez et al., 2022), marking them as a significant digital tool in the online learning landscape. As the pandemic has hastened the adoption of e-portfolios, it is vital to investigate their role in supporting student learning in remote and hybrid environments and to identify best practices and barriers to their adoption (Mudau & Modise, 2022). After the pandemic, e-portfolios have continued to provide learners with a platform to document learning and reflection, showcase achievements, and receive feedback in a digitally accessible format (Ismailov & Laurier, 2021). Moreover, they have been instrumental in improving learners' digital literacy skills, an increasingly important competency in modern education (Buglass & Jenkins, 2020).

Despite the rich empirical studies on e-portfolio implementation during the pandemic, comparatively fewer comprehensive literature reviews consolidate these findings and provide post-pandemic implications. Therefore, this systematic review is conducted to retrospectively evaluate e-portfolio practices during the COVID-19 pandemic and inform the future application of such tools in higher education.

The study is structured to answer the following research questions:

- RQ 1: What are the characteristics of the literature about e-portfolios during the pandemic?
- RQ 2: What are the main discussions made in the literature regarding e-portfolios' strengths and challenges, usage and design, and recommendations?

By addressing these questions, this review aims to synthesize the body of knowledge on e-portfolio use during the pandemic and to provide actionable insights for educators and institutions in the post-COVID-19 era. This will inform current best practices and shape the direction of future research and implementation strategies in higher education.

METHODS

To answer the research questions, a systematic review approach was employed, following the processes outlined by Boland et al. (2017). This approach included planning and preparation, scoping search, research question and protocol development, literature search, screening titles and abstracts, article retrieval, data extraction, quality assessment, data analysis and synthesis, writing, editing, and publicizing. To streamline the review procedure, this study focused on three main steps: establishing inclusion and exclusion criteria, devising a search strategy, and selecting and extracting papers. The study used Ryaan, a data screening tool, and NVivo, a data analysis tool, to screen and analyze the selected publications. Qualitatively, the systematic review approach allowed for a rigorous and comprehensive analysis of the literature, ensuring

that all relevant studies were included, and that the analysis was transparent and replicable. The use of Ryaan and NVivo further added to the rigor and transparency of the study, enabling efficient and consistent screening and analysis of the data.

SEARCH CRITERIA

Before any search was conducted, inclusion criteria were established to decide which articles would and would not be included in the final list (see Figure 1). Included are empirical studies published during the last three years that address both the usage of e-portfolios in education and the challenges posed by the COVID-19 pandemic.

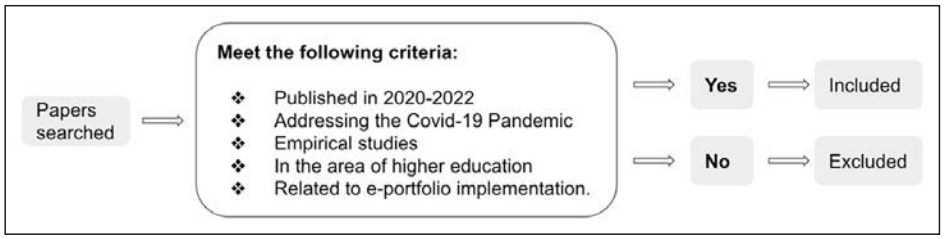

Figure 1 Inclusion criteria.

SEARCH STRATEGY

This study seeks to present a complete picture of empirical research without the bias of only including papers written in English. As a result, review articles written in English, Chinese, and Spanish were included in the initial search. In each of the three languages, different variants of the following keywords were utilized (the boolean operators "AND" and "OR" were employed to separate the keywords): "e-portfolio," "electronic portfolio," "digital portfolio," and "COVID-19." Two researchers produced search strings in three languages based on these terms (see Figure 2). Due to the fact that different databases contain academic publications in different languages, six academic databases that cover these three languages were chosen: Web of Science (WOS), Scopus, ERIC, Science Direct, Dialnet, and China Academic Journals Full-text Database (also known as CNKI). In light of COVID-19's emphasis on e-portfolio usage in higher education, a publication date filter after 2020 and a higher education descriptor were adopted throughout the search.

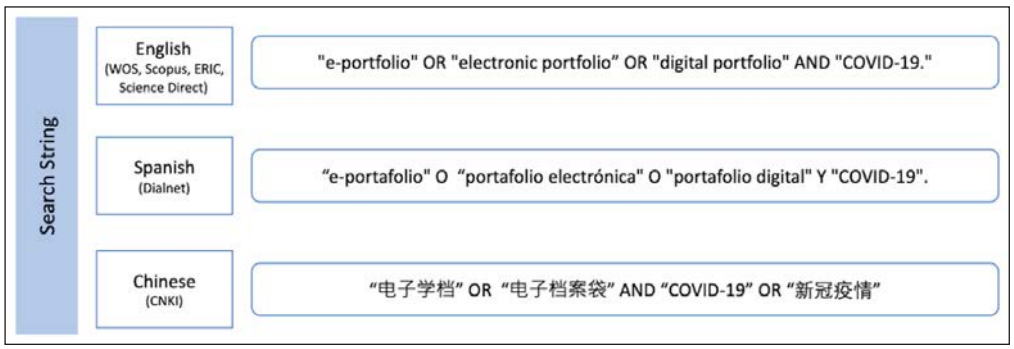

Figure 2 The search strings.

PAPER SELECTION AND EXTRACTION

Using the predetermined search criteria, 221 publications were identified: ERIC (n = 36), Web of Science (n = 83), Scopus (n = 8), Science Direct (n = 82), Dianet (n = 12), and CNKI (n = 0). The publications were then downloaded and uploaded to Rayyan, a collaborative platform for systematic literature reviews (Ouzzani et al., 2016). Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) reporting guidelines (Page et al., 2021) were utilized for data screening and eligibility assessment (see Figure 3). The tool Rayyan discovered five duplicates, which were automatically eliminated. Rayyan's initial screening of two hundred and sixteen articles was fruitful. Then, two researchers examined the titles, keywords, and abstracts using agreed-upon inclusion criteria. During this process, one hundred eighty-five papers that did not match the target criteria were excluded. After the screening, thirty-one papers were searched for retrieval. Then, the researchers downloaded the full text of the papers and conducted the

eligibility check using the previously stated criteria. Nineteen of them were excluded, leaving twelve empirical publications to finalize the systematic review. There were no articles written in Chinese from the CNKI database among the publications included in this study; the final list contained eleven papers written in English and one in Spanish.

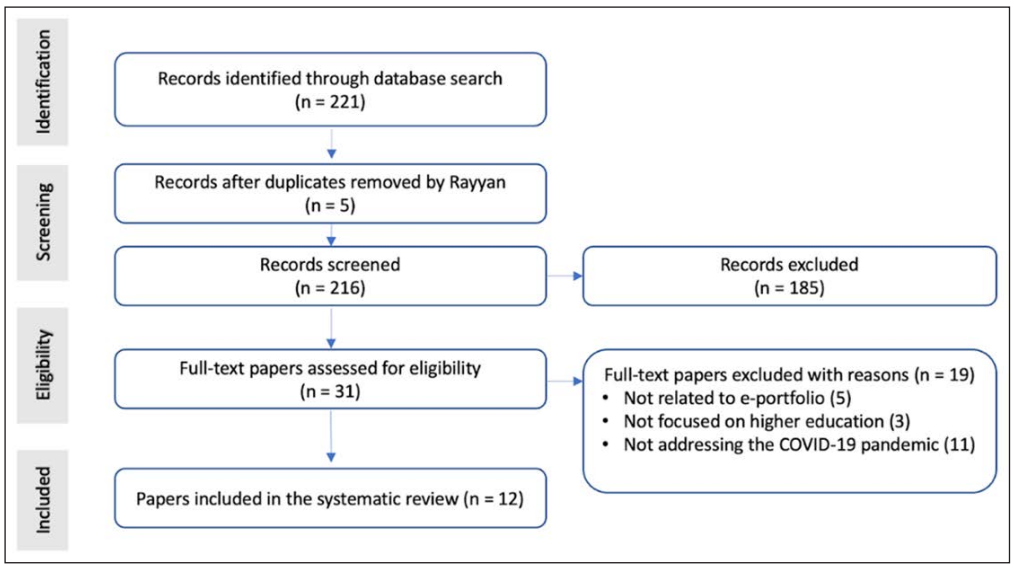

Figure 3 PRISMA flow diagram.

RETRIEVED DATA ANALYSIS

The collected data was recorded in an Excel Sheet for analysis, adapting the instrument developed in early stages of the research, in which qualitative data is collected (Zhang & Tur, 2022). It is important to note that the analysis involved careful reading and synthesis of the findings. The results from the articles were categorized into different themes. Each theme was guided by the previously stated research questions Subsequently, a qualitative analysis was conducted, wherein the texts were extracted and compared across recurring themes, considering the various contexts in which e-portfolios were implemented in educational settings during the pandemic. To increase the efficiency and efficacy of the qualitative analytic process, computer-assisted qualitative data analysis software (CAQDAS) was utilized rather than manual analysis (Leech & Onwuegbuzie, 2011). Following the final selection of papers, NVivo, the CAQDAS tool, was used as a data analytics tool to further analyze the selections led by the predefined research questions. NVivo is believed to be one of the most often used software applications for qualitative data analysis in educational research (Leech & Onwuegbuzie, 2011). Using NVivo, this study applied the Eight Step Pedagogy (N7 + 1) instructional paradigm, which includes three phases, preparation, analysis, and writing, proposed by O'Neill et al. (2018):

- Preparation
  - Step 1: Set up NVivo project
  - Step 2: Search literature using the NCapture tool
  - Step 3: Sort literature, prepare Endnote, and import into NVivo
- Analysis
  - Step 4: Classify literature and create a snapshot of your NVivo project
  - Step 5: Visualize data
  - Step 6: Perform 1st-level descriptive and topic coding of literature for themes
- Writing a Literature Review
  - Step 7: Summarize your NVivo project
  - Plus 1: Write the literature review

The N7 + 1 steps entail creating an NVivo project, importing and categorizing the literature, and then categorizing and displaying the data to produce review topics (O'Neill et al., 2018). The study provides a detailed account of the qualitative analysis methods and the process of qualitatively coding the papers.

FINDINGS

On the basis of the aforementioned research questions, the results were grouped into the following categories: bibliometric profile and general findings of themes (RQ 1), e-portfolios' strengths and barriers (RQ 2), e-portfolio use and design (RQ 2), and synthesized implementation suggestions (RQ 2) in the context of higher education during the COVID-19 pandemic implementation practice.

RQ1: CHARACTERISTICS OF THE LITERATURE ABOUT E-PORTFOLIOS DURING THE PANDEMIC

To address RQ 1, the study compiled and categorized the bibliometric data of eligible empirical studies (see Table 1). All papers were published during the previous three years, 2020, 2021, and 2022, and are applicable to higher education contexts. The majority of the studies examine the use of e-portfolios during the COVID-19 pandemic from the students' perspective, either by investigating the students' perceptions or their e-portfolio work. Some publications also involve teachers and institutions of higher education in their empirical research in the settings of virtual classrooms, including virtual emergency education due to the outbreak of the COVID-19 pandemic and the emergence of Open Distance eLearning (ODeL). Several publications addressed the use of e-portfolios in clinical practice, such as teaching practicum and other supervised professional on-the-job training. Regarding the publisher and their types, the vast majority of the selections (n = 10, 83%) were publications from different journals. However, one was from a chapter in a book titled Teaching, technology, and teacher education during the COVID-19 pandemic: Stories from the field, and another was from conference proceedings. When it comes to the index information, most of the papers are indexed by Scopus (n = 9, 75%), and some of them are indexed by Science Citation Index Expanded (SCIE) and Social

Table 1 Bibliometric information of the chosen papers.

AUTHOR/DATE	PARTICIPANTS	PUBLISHER	TYPE	INDEX INFO
Devarajoo, 2020	Students and teachers	International Journal of Social Science And Human Research	Journal article	Crossref, Google Scholar
Hendrith et al., 2020	Students	Association for the Advancement of Computing in Education (AACE)	Ebook	NA
Abuzaid et al., 2021	Students	International Journal of Current Research and Review	Journal article	Scopus
Domene-Martos et al., 2021	Students	International Journal of Environmental Research and Public Health	Journal article	Scopus, Science Citation Index Expanded (SCIE), Social Science Citation Index (SSCI)
Ismailov & Laurier, 2021	Students	E-Learning and Digital Media	Journal article	Scopus
Miyoshi et al., 2021	Higher education institutions	Yonago Acta Medica	Journal article	Scopus, Science Citation Index Expanded (SCIE)
Modise, 2021	Students	Journal of Learning for Development	Journal article	Scopus
Mudau, 2022	Teachers	International Journal of Educational Methodology	Journal article	Scopus
Tucker et al., 2021	Students	ASEE Annual Conference and Exposition, Conference Proceedings	Conference Proceedings	Scopus
Mudau & Modise, 2022	Students	Journal of Information Technology Education: Research	Journal article	Scopus

(Contd.)

AUTHOR/DATE	PARTICIPANTS	PUBLISHER	TYPE	INDEX INFO
Rodriguez et al., 2022	Students	Frontiers in Psychology	Journal article	Scopus, Social Science Citation Index (SSCI)
Viscarret et al., 2022	Students	Research in Education and Learning Innovation Archives (REALIA)	Journal article	Emerging Sources Citation Index (ESCI)

Science Citation Index (SSCI) (n = 2, 16.7%, respectively). There is also one publication indexed by the Emerging Sources Citation Index (ESCI) and one by Crossref and Google Scholar.

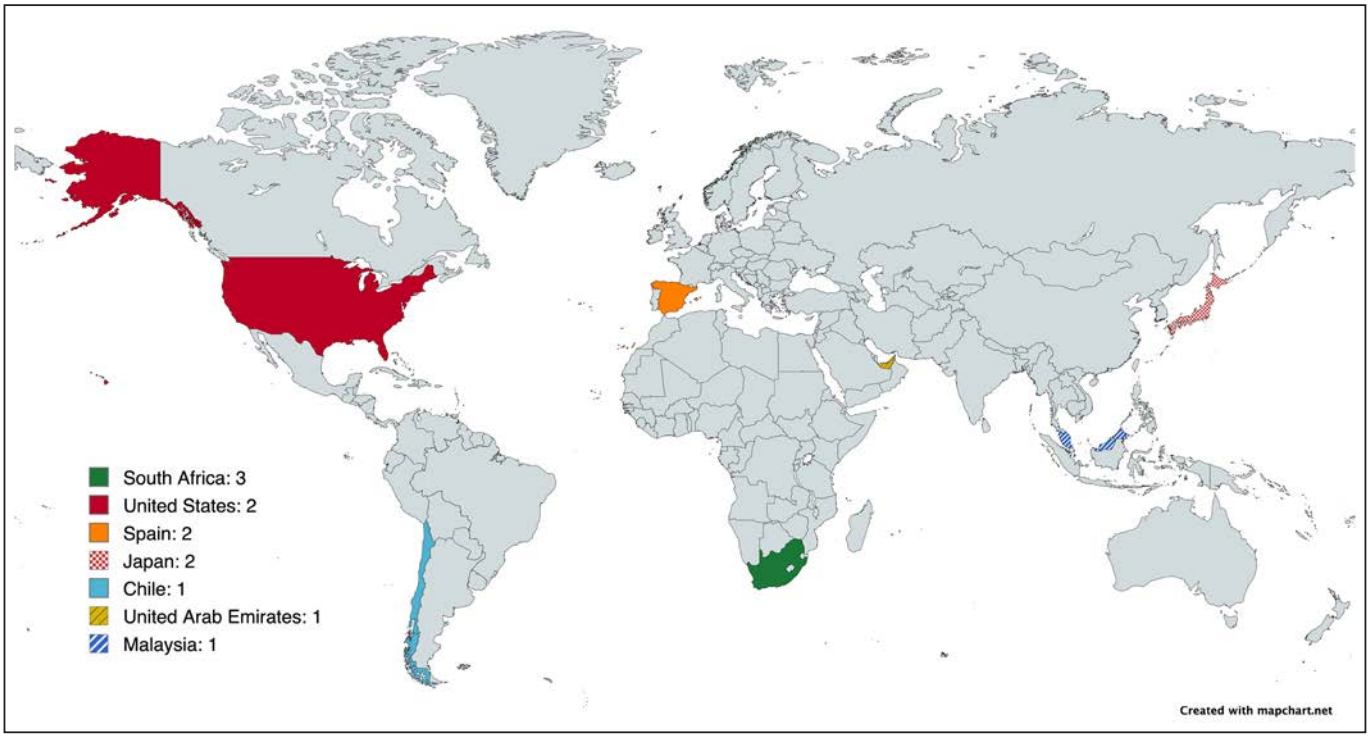

Figure 4 Country contexts of the selected publications.

The selected articles reflect a variety of countries across multiple continents, including African, European, North American, and Asian nations (see the countries in Figure 4).

Regarding the research methodology, the following findings were uncovered (see Figure 5): Most of the research applied qualitative approaches (n = 11, 92%), or involved exploratory and descriptive research in a variety of ways. Additionally, only one study combined quantitative and qualitative methodologies through factor analysis and descriptive statistics, and another was fully quantitative through the use of a survey.

NVivo was used to code the selected papers and explore the underlying themes. An item cluster diagram of these themes was created to illustrate the synthesized themes found in these articles, highlighting that relevant factors in different studies were clustered together into the same category (see Figure 6). Some research (n = 3, 25%) specifically focused on e-portfolio use in practicum, including teaching internships and other clinical practice; two studies specifically investigated e-portfolio use associated with Learning Management Systems (LMS). The vast majority of reviewed empirical studies (n = 11, 92%) were contextualized in the setting of virtual emergency learning due to the COVID-19 pandemic. Additionally, a variety of e-portfolio practices were discovered. Almost half of the empirical research (n = 5, 42%) made use of the e-portfolio in diverse ways as an assessment tool for summative and formative assessments, which are linked to formal and informal learning as well as the visualization of learning outcomes (n = 4, 33%). One study implemented e-portfolios as the approach for formative assessment to engage students by introducing self-directed mini-projects, which are associated with project-based learning (PBL). The selected publications included a wide

range of topics related to learner engagement. Some papers focused specifically on students' engagement during the e-portfolio implementation process, while others expounded on self-regulated learning (SRL) and self-directed learning (SDL) (n = 3, 25%). Notably, the reviewed research covered collaborative learning widely. Most papers addressed the importance of

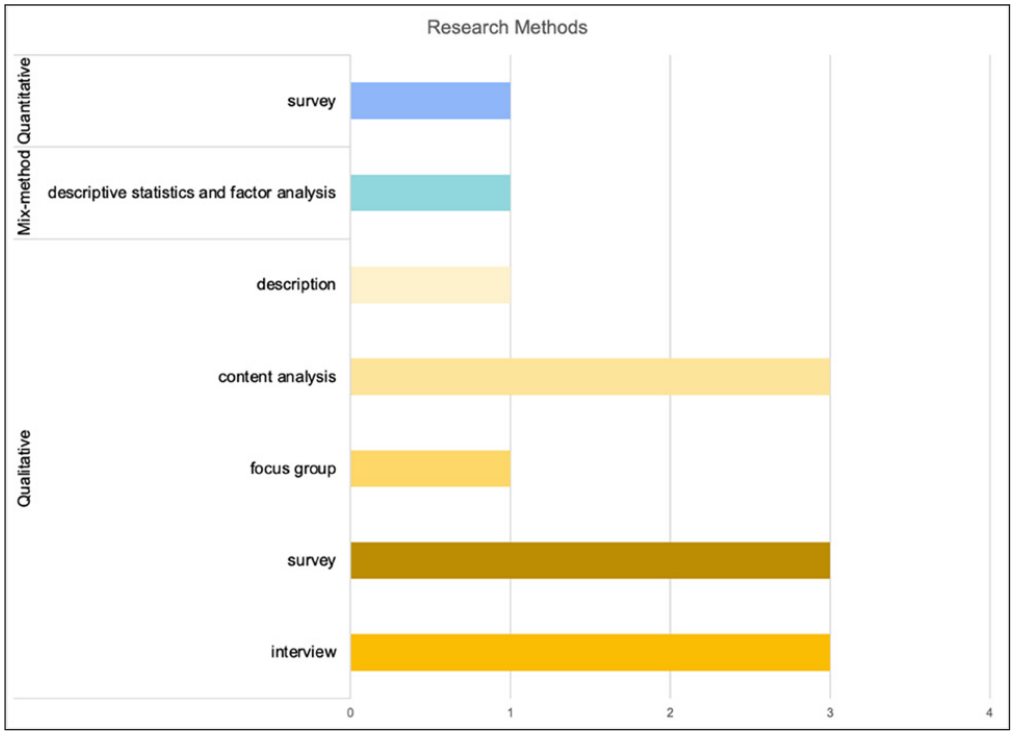

Figure 5 The methodology applied in the selected papers.

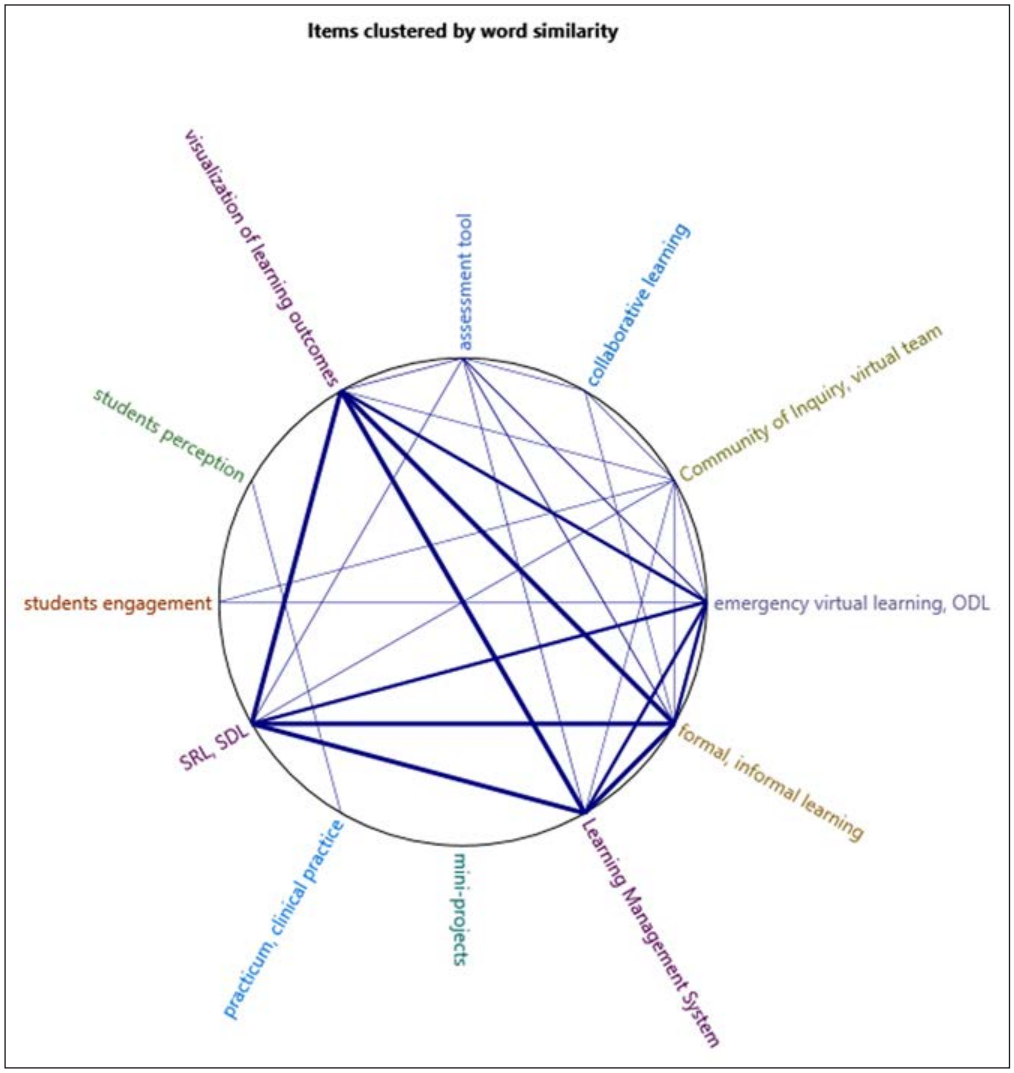

Figure 6 Cluster diagram of the underpinning themes of the papers.

collaboration in e-portfolio implementation; some (n = 3, 25%) concentrated primarily on virtual teams and learning communities.

RQ2: STRENGTHS AND CHALLENGES, USAGE AND DESIGN, AND RECOMMENDATIONS

In the reviewed articles, the benefits of adopting e-portfolios into education during the COVID-19 pandemic were described in great detail; nevertheless, several underlying concerns and hurdles were also noted as needing to be addressed.

All studies stated benefits such as enabling self-regulated/self-directed learning and encouraging autonomous learning, while slightly more than half of them focused on their ability to facilitate collaboration (n = 7, 58%). Among other of the most commonly cited (between 33% and 42% of them) benefits of e-portfolio implementation during the COVID-19 pandemic are enabling reflective and effective learning (Modise, 2021; Mudau & Modise, 2022; Rodriguez et al., 2022; Tucker et al., 2021; Viscarret et al., 2022), increasing student involvement (Abuzaid et al., 2021; Modise, 2021; Mudau & Modise, 2022; Tucker et al., 2021), developing professionalism (Abuzaid et al., 2021; Miyoshi et al., 2021; Rodriguez et al., 2022; Tucker et al., 2021; Viscarret et al., 2022), facilitating clinical practice (Abuzaid et al., 2021; Miyoshi et al., 2021; Viscarret et al., 2022), and fostering 21st-century skills, such as problem-solving abilities (Ismailov & Laurier, 2021; Modise, 2021; Mudau & Modise, 2022; Rodriguez et al., 2022). In addition, the selected articles saw e-portfolios as authentic learning tools to enhance formative assessment, leveraging existing knowledge and facilitating reflective, critical, and creative learning (Domene-Martos et al., 2021; Modise, 2021; Rodriguez et al., 2022; Viscarret et al., 2022). Other focuses are on fostering metacognitive capacity, and improving learning outcomes management by visualizing learners' progress with educators' help and lifelong learning (Abuzaid et al., 2021; Mudau & Modise, 2022; Viscarret et al., 2022). With lower frequency, e-portfolios were viewed as a very flexible instrument that helps students build technological confidence (Viscarret et al., 2022).

In addition to discussing the advantages of electronic portfolios in higher education, implementation obstacles, and concerns were also explored. Among all, it can be seen that the main difficulties are due to technical difficulties with e-portfolios, learners' unfamiliarity with e-portfolios, issues of accessibility, along with underdeveloped systems, and a lack of guidance and support, which results in a lack of common knowledge when utilizing e-portfolios (Abuzaid et al., 2021; Miyoshi et al., 2021; Modise, 2021; Mudau & Modise, 2022; Viscarret et al., 2022). Derived from this, some work relates to an overwhelming workload and increased working time while creating e-portfolios (Modise, 2021; Viscarret et al., 2022). Furthermore, insufficient input from lecturers or teachers was discovered in some practices (Abuzaid et al., 2021; Mudau & Modise, 2022; Viscarret et al., 2022). On the contrary, some practitioners were found to be excessively monitoring the learners throughout their e-portfolio implementation journey (Viscarret et al., 2022). The open access to e-portfolios is also controversial, and some studies raise discussion on privacy issues (Rodriguez et al., 2022; Viscarret et al., 2022) and plagiarism problems because it might facilitate unethical behaviour if it isn't properly addressed (Rodriguez et al., 2022).

In the reviewed empirical research, e-portfolios were utilized in various ways, including reflection and feedback, assessment, learning evidence gathering, and showcasing. The most mentioned way to utilize e-portfolios is to use them as tools to facilitate reflection and receive feedback from lecturers and classmates (Abuzaid et al., 2021; Miyoshi et al., 2021; Mudau & Modise, 2022; Rodriguez et al., 2022; Tucker et al., 2021). The use of e-portfolios in formative and summative assessment is also extensively discussed in the selected publications (Abuzaid et al., 2021; Miyoshi et al., 2021; Mudau & Modise, 2022; Rodriguez et al., 2022; Tucker et al., 2021; Viscarret et al., 2022). Apart from that, e-portfolios are used to collect learning evidence (Miyoshi et al., 2021; Mudau & Modise, 2022; Rodriguez et al., 2022) and showcase learning outcomes (Miyoshi et al., 2021).

For the e-portfolio implementation designs, the study identified various models and tools from reviewing the chosen empirical studies that address e-portfolio use during the pandemic. Miyoshi et al. (2021) proposed an e-portfolio model that addresses five aspects: collect, reflect, self-regulate, integrate, and collaborate. Rodriguez et al.'s (2022) e-portfolio practice used

a project-based assessment of the learning model. Each lecturer supervised five students; students were asked to complete formative assessments via e-portfolio and present them to supervisors to seek feedback weekly; the summative assessment was also conducted at the end using e-portfolios. Self-evaluation and peer evaluation were also incorporated into the whole process. Similarly, Tucker et al. (2021) applied self-directed mini-projects using e-portfolios to engage learners. In the setting of a university second-year level Design for Manufacturability course, mini-projects were scaffolded, comprising complicated design projects broken down into smaller components and integrating e-portfolios (Tucker et al., 2021). Tucker et al. (2021) further stated that the progression of scaffolded mini-projects provides an opportunity for students to develop and exhibit essential engineering abilities, particularly when presented in conjunction with teaching-learning-assessment via e-portfolios. Other implementation models that were widely talked about were collaborative, as stated in the previous section, including virtual teams (Ismailov & Laurier, 2021) and Community of Inquiry (CoI) (Modise, 2021; Mudau & Modise, 2022). These models require a higher level of collaboration to engage learners and facilitate the learning process, as well as to address the unprecedented challenges in educational provision during the pandemic.

Regarding the systems for e-portfolios implementation, it was discovered that most empirical research associates e-portfolio implementation with the Learning Management System (LMS) (n = 8, 67%), such as Moodle (Miyoshi et al., 2021), Sakai LMS: Sakai Learning Management System (Viscarret et al., 2022), and myUniSA (Mudau & Modise, 2022). The most commonly used e-portfolio platform in the reviewed studies was Mahara (Modise, 2021; Mudau & Modise, 2022). Google Sites was also utilized in a preservice teacher training practice (Tucker et al., 2021). Other tools were also mentioned, such as One Drive, Google Apps, Microsoft Teams, and social media platforms (i.e., Blog, WhatsApp, and Facebook) (Domene-Martos et al., 2021; Ismailov & Laurier, 2021; Mudau & Modise, 2022). Domene-Martos et al. (2021) remarked that OneDrive emphasized the convenience of organizing and securing the material to have all the information on the subject better organized, which is consistent with the learner autonomy dimension since it promotes the organization of the material. During the COVID-19 pandemic, it was believed that incorporating social media into Open Distance eLearning (ODeL) settings would enhance student engagement (Mudau & Modise, 2022).

Table 2 Synthesised suggestions for e-portfolio implementation.

REVIEWED PAPERS	SYNTHESIZED SUGGESTIONS OFFERED IN THE PAPERS
Ismailov & Laurier, 2021; Miyoshi et al., 2021; Modise, 2021; Mudau & Modise, 2022; Rodriguez et al., 2022;	Teachers should facilitate the collaboration among the participants, including students, teachers, learning community or teams, etc.
Miyoshi et al., 2021; Modise, 2021; Mudau & Modise, 2022; Viscarret et al., 2022	Teachers should enable and facilitate students' reflection, particularly their self-reflection by setting guidelines and rubrics, offering guidance and ongoing support for students, and strengthening their higher-order thinking and critical reflection skills.
Ismailov & Laurier, 2021; Mudau & Modise, 2022; Rodriguez et al., 2022; Viscarret et al., 2022	Teachers should motivate learners by encouraging them, addressing positive aspects, engaging students using various platforms (WhatsApp, email, and discussion forums), and using different approaches for teaching and learning.
Miyoshi et al., 2021; Modise, 2021; Viscarret et al., 2022	Teachers can use examples and templates with detailed descriptions to scaffold during the e-portfolio-making process.
Ismailov & Laurier, 2021; Modise, 2021; Viscarret et al., 2022	Teachers should set clear guidelines and rubrics, and explicitly explain them to students during orientation, support sessions, etc.
Abuzaid et al., 2021; Modise, 2021; Viscarret et al., 2022	Students should be given constant technical support and proper training on e-portfolio use, and troubleshooting skills.
Modise, 2021; Viscarret et al., 2022	Teachers or practicum supervisors should allow students autonomy and flexibility in the usage of e-portfolios by encouraging them to take ownership and pick the e-portfolio platforms they wish to use, leaving "space" for students, and providing accompaniment.
Miyoshi et al., 2021; Modise, 2021	A well-designed e-portfolio should be built, and it will serve as a foundation to support learning activities and enhance learning.

(Contd.)

REVIEWED PAPERS	SYNTHESIZED SUGGESTIONS OFFERED IN THE PAPERS
Modise, 2021; Viscarret et al., 2022	Constant and constructive feedback should be given to learners along their learning journey with e-portfolios.
Mudau & Modise, 2022	Emphasize the e-portfolios' role as learning evidence, and purposefully compile multimodal artefacts, including discussion forum participation, podcasts, social media posts, and other multimedia content (texts, visuals, audio), etc.
Viscarret et al., 2022	Encourage the integration of e-portfolios across many disciplines and involve all faculty in order to assist student development.

Based on empirical research on e-portfolio practice in higher education during the COVID-19 pandemic, the reviewed publications provided diverse recommendations for using e-portfolios in higher education teaching and learning. The paper synthesized the papers and provided a summary of the suggestions made in the reviewed papers (see Table 2), to further inspire post-pandemic practices in e-portfolio implementation.

DISCUSSION

The integration of e-portfolios into higher education during the COVID-19 pandemic has revealed a multifaceted landscape where the benefits, challenges, and practical implementation strategies have been critically explored. The following discussions are made to leverage e-portfolios in educational practices for the post-pandemic era.

BIBLIOMETRIC INSIGHTS ON E-PORTFOLIO USE AMIDST COVID-19

The bibliometric analysis and thematic synthesis of recent empirical studies on e-portfolios in higher education reveal an international academic effort to grasp their function during the COVID-19 pandemic. The emphasis on student experiences and perspectives, particularly in the context of emergency remote learning, highlights the importance of learner-centered research. The use of qualitative approaches in the studies indicates a desire for an in-depth understanding of e-portfolio adoption and its impact on learning.

The research's geographic diversity suggests that e-portfolios have worldwide importance, highlighting the necessity for flexible teaching tools across different cultural contexts. Thematic findings show that e-portfolios are used in various ways, including as assessment tools, supporting practicums, and facilitating collaborative and self-directed learning. This indicates their ability to develop innovative teaching techniques and increase learner engagement. Integrating Learning Management Systems and using e-portfolios in project-based learning demonstrate their adaptability and importance in the changing educational landscape.

ADVANTAGES, CONCERNS, AND CONTINUED RELEVANCE

E-portfolios have been leveraged as dynamic tools to improve student engagement, improve their metacognitive skills, foster professionalism, and develop 21st-century skills (Ismailov & Laurier, 2021; Modise, 2021; Mudau & Modise, 2022; Rodriguez et al., 2022). The self-regulated, autonomous nature of e-portfolios has shown evidence in empowering students to take ownership of their learning, a shift that aligns with the contemporary educational paradigm favoring student-centered learning (Devarajoo, 2020; Domene-Martos et al., 2021). Prior research, both before (Barrett, 2009) and after the COVID-19 pandemic (Whitney et al., 2021; Zhang & Tur, 2022), supports these findings. Although e-portfolio use is typically viewed as an individual and self-directed learning method, collaboration is vital in the implementation process (Tur & Urbina, 2016). Zubizarreta (2009) identified collaboration as one of the essential e-portfolio development processes. Effective teamwork in e-portfolio practice may maximize its benefits and maximize students' knowledge development. Compared with e-portfolio research prior to the pandemic (Zhang & Tur, 2022), the reviewed e-portfolio studies during the pandemic mainly highlight the benefits of e-portfolios in facilitating online collaboration, self-regulated learning, and autonomous learning, which are particularly relevant in remote learning contexts.

Despite the recognized advantages, the e-portfolio implementation's concerns and challenges during the pandemic are also identified. Technical difficulties, lack of familiarity and common knowledge, and insufficient pedagogical support are among the primary hurdles (Abuzaid et al., 2021; Modise, 2021; Mudau & Modise, 2022; Viscarret et al., 2022). Overwhelming workloads and increased working time might be caused by these issues, hindering the effectiveness of e-portfolios (Viscarret et al., 2022). These concerns stem from insufficient guidance and support from teachers and learning peers. In a post-COVID-19 context, addressing these issues is paramount for optimizing the use of e-portfolios. Institutions must provide ongoing technical support and develop training modules that enhance faculty and student proficiency in using e-portfolios (Abuzaid et al., 2021; Modise, 2021; Viscarret et al., 2022). Educators should establish clear guidelines and rubrics and communicate them to students directly during the introduction and coaching sessions (Ismailov & Laurier, 2021; Modise, 2021; Viscarret et al., 2022). Furthermore, teachers can scaffold the e-portfolio creation process by using examples and templates with clear descriptions (Miyoshi et al., 2021; Modise, 2021; Viscarret et al., 2022).

In contrast with insufficient teacher support, another issue related to collaboration is that some teachers excessively monitor the learners' e-portfolio implementation journey (Viscarret et al., 2022). Consequently, the students are demotivated, and their learning agency is constrained. The balance between guidance and autonomy remains delicate. Educators should avoid micromanaging the e-portfolio process to prevent stifling student agency, which is foundational for self-directed learning (Viscarret et al., 2022). Instead, educators should serve more as facilitators, offering structure while allowing students the freedom to explore and express their learning journey and offering consistent and constructive feedback throughout learners' e-portfolio learning journeys (Modise, 2021; Viscarret et al., 2022).

E-PORTFOLIO SYSTEM IMPROVEMENT

Another widespread criticism is that current e-portfolio systems are still underdeveloped; well-developed systems and technologies should be implemented to maximize the practical use of e-portfolio (Miyoshi et al., 2021; Modise, 2021). In the post-pandemic landscape, investing continuously in e-portfolio technologies is essential to ensure they remain current, accessible, and effective for various learning activities. This aligns with the historical development of e-portfolios in higher education, which has seen a steady integration of compatible concepts, new technologies, and pedagogical approaches (Farrell, 2020).

In the context of e-portfolios, system improvements are recognized as essential for enhancing the functionality and user experience of e-portfolio platforms. These improvements include technological upgrades and enhancements aimed at making e-portfolio platforms more effective, efficient, and user-friendly, which are crucial for their adoption and sustained use (Shroff et al., 2011). The integration of e-portfolio systems into the wider educational technology ecosystem is equally important, as it allows for compatibility and interoperability with other digital tools such as learning management systems (LMS), digital assessment platforms, and collaboration tools. This integration facilitates a more cohesive and streamlined learning environment where various applications work in unison, thereby simplifying the educational process for both students and educators.

COMPREHENSIVE UTILIZATION OF E-PORTFOLIOS

The study also highlighted e-portfolio's multifunctional role in the following areas based on reviewed empirical research: reflection and feedback, assessment, learning evidence collection, and showcasing. To realize the full potential of e-portfolios in teaching and learning, educators should implement these aspects of e-portfolios comprehensively. To maximize these benefits, educators should integrate e-portfolios to promote higher-order thinking and critical reflection. By providing reflection templates and guidance, educators can support students in deepening their self-reflection skills (Miyoshi et al., 2021; Modise, 2021; Mudau & Modise, 2022; Viscarret et al., 2022). Furthermore, it is critical to emphasize the significance of e-portfolios as evidence of learning and to actively gather multimodal artifacts such as discussion forum participation, podcasts, social media postings, and other multimedia content (texts, pictures, and audio) (Mudau & Modise, 2022).

The reviewed papers also addressed the fact that e-portfolios may also be used cross-disciplinarily; educators should support the integration of e-portfolios across various disciplines and include all faculty to help students progress (Viscarret et al., 2022). The cross-disciplinary potential of e-portfolios is an avenue that holds promise for broadening the scope of their application. Post-pandemic, educators across all disciplines should consider how e-portfolios can be tailored to their specific learning objectives and outcomes, fostering a more holistic educational experience that prepares students for the interdisciplinary nature of the professional world.

POST-PANDEMIC RECOMMENDATIONS

As the educational area emerges from the shadow of the pandemic, the utility of e-portfolios extends beyond the immediate crisis response. They represent a crucial component of the evolving higher education landscape, which seeks to integrate the flexibility and accessibility gained through past experiences into enduring educational practices. This shift prompts reevaluating educational strategies to ensure they are well-suited for a post-pandemic world where remote learning has altered expectations and preferences (Zhang & Tur, 2022; Ismailov & Laurier, 2021) and in which collaboration among teachers and peers has been observed as a key element in successful educational experiences (Kajamaa et al., 2019).

The systematic review of the literature has provided a broad outline of these elements, offering substantial insights into the role of e-portfolios in a post-COVID-19 educational context. Based on the lessons learned during the COVID-19 pandemic, future educational practice with e-portfolios may consider addressing the following recommendations.

Collaborative Feature

Post-pandemic, the demand for e-portfolio learning, particularly the collaborative features, will likely persist as the nature of teaching and learning continues to shift towards more digital, autonomous, and collaborative frameworks. The collaborative aspects of e-portfolio usage, which have enhanced communication and teamwork skills, remain critical as these are core competencies in virtually any field (Tur & Urbina, 2016). The ability of e-portfolios to maintain a sense of community and collaboration in a digital space is a lesson from the pandemic that holds enduring value. However, there is still a need to address collaboration through a systematic design in which roles and tasks are described for all stakeholders, such as teachers, students, and peers. Further approaches to collaboration on e-portfolios could be systematized through a learning co-design strategy, as suggested in previous work (Zhang & Tur, 2023a, 2023b), and under Open Educational Practices (OEP).

System optimization

In response to the identified need for advancements in e-portfolio systems, several key areas for enhancement have been delineated:

- User Experience: Optimizing the interface's accessibility and intuitiveness for all technological ability levels. This could entail making the platform more user-friendly for mobile devices and streamlining navigation.
- Security and Privacy: Strengthening data security protocols to secure sensitive student data is critical, considering the private nature of e-portfolio material.
- Customization: Enabling e-portfolios to be more individually tailored to each user's desires and preferences and the particulars of various courses or fields.
- Interactive and collaboration feature: This includes tools for peer review, feedback, and evaluation to create a more responsive and interactive learning environment, integrating multimodal materials, chat, and discussion boards as means of promoting group projects and cooperation inside e-portfolios as well as social and open platforms. This feature would enhance the participation of the diverse stakeholders from a learning co-design approach.
- Interoperability with LMS: Ensuring e-portfolio systems can effortlessly share information with learning management (LMS) platforms to facilitate a smooth transition between assignments and course materials.
- Analytics: Using data analytics to offer user behavior and advancement perceptions, which can guide instructional tactics and facilitate individualized learning pathways.

Pedagogical practice

Post-pandemic, it is crucial to maintain the momentum of e-portfolio usage, not just as a response to a crisis but as an integral component of modern pedagogy. Teachers should continue to be innovative in their approaches, encouraging students, emphasizing positive elements, engaging students by choosing the right platform, and employing innovative techniques to keep learners motivated during the e-portfolio use process (Ismailov & Laurier, 2021; Mudau & Modise, 2022; Rodriguez et al., 2022; Viscarret et al., 2022). To further facilitate this, the following strategies for interdisciplinary e-portfolio integration are proposed:

- Adaptable e-portfolio-use paradigm: Creating e-portfolio implementation frameworks with templates and guidelines that can be customized to meet different learning objectives and used in various disciplines.
- Interdisciplinary projects: Promoting e-portfolios to record interdisciplinary projects in which students collaborate and provide their perspectives.
- Faculty collaboration: Encouraging faculty members to collaborate across departments to exchange best practices and create integrated e-portfolio tasks or projects that cut across several academic fields. A learning co-design approach would facilitate the participation of diverse teachers' roles by defining the phases and tasks where their collaboration is expected.
- Professional development: Providing educators across disciplines with the tools and training to successfully integrate e-portfolios into their instruction and recognize their advantages in various settings.
- Open Educational Practices: Going beyond open access and open content, e-portfolio should promote Open Educational Practices, which are polyhedral but share characteristics like challenging teaching and learning processes (Cronin, 2017; Cronin & MacLaren, 2018; Koseglu & Bozkurt, 2018).

CONCLUSION

This study aimed to comprehensively overview empirical studies without restricting them to English-only papers, potentially reducing biases. Thus, empirical papers in three languages, including English, Chinese, and Spanish, as well as publications from various country backgrounds, were investigated. Most empirical studies reviewed focused on e-portfolios in virtual emergency learning during the COVID-19 pandemic. They were used for assessment and to promote learner engagement, self-regulated learning, and collaboration. The e-portfolio practices during the COVID-19 pandemic were investigated, and the implications for future implementation were provided. Given that only COVID-19-pandemic-related research is included, we acknowledge that the study's primary limitation is the limited number of chosen papers.

In conclusion, the study acknowledged and analyzed the significance of empirical studies conducted over the past three years regarding the application of e-portfolios in addressing the COVID-19 pandemic. By synthesizing and assessing empirical studies, a complete analysis of the benefits and challenges, designs, and systems of e-portfolios and implementation suggestions are provided. As we transition to post-pandemic modalities, it is incumbent upon educators and institutions to embrace the lessons learned and to continue refining e-portfolio practice to cater to the emergent needs of a diverse student population. Emphasis should be placed on developing scalable, sustainable e-portfolio models that are adaptable to varying contexts and can withstand future disruptions. Implementing the recommendations could potentially result in e-portfolio evolution, which calls for further research to examine the impact.

DATA ACCESSIBILITY STATEMENT

All data generated or analyzed during this study are included in this published article.

ETHICS AND CONSENT

Not applicable. This systematic review manuscript did not involve direct research on human participants or animals; hence ethical approval and participant consent were not required.

It relies solely on data analysis from previously published studies, where each study was responsible for obtaining its own ethical clearances and consents.

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COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS (CRediT)

Peng Zhang: Conceptualization, methodology, formal analysis, investigation, data curation, visualization, writing—original draft preparation, writing—review and editing; Gemma Tur: Conceptualization, supervision, writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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