Educational e-Portfolio Overview: Aspiring for the Future by Building on the Past

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Abstract

Education institutions are rethinking their approaches as the world adjusts to a new normal after the pandemic. The e-Portfolio, an emerging tool in education that suits the current context, was reviewed in the study to aspire for better future implementation. Numerous studies have broadly investigated e-portfolios' use in teaching, learning, or assessment. It has risen to prominence, becoming commonplace. To narrow down the considerable volume of research, develop new knowledge, and detect gaps in the existing literature, this study conducted a systematic review of existing literature on e-portfolio use in education. This approach synthesises secondary publications during the past decade. A keyword search of e-portfolio and reviews yielded 812 review papers. These articles were examined further to determine whether they met the predetermined criteria, and 12 review articles were identified. It was discovered that if successfully implemented, e-portfolios have promising benefits. Nevertheless, the implementation of e-portfolios also faces specific challenges. This article also synthesised the participants' perceptions of their e-portfolio experience. The focus of the paper is to offer implementation suggestions for practitioners. The diversity of technological e-portfolio platforms and related pedagogical frameworks were also discussed to inspire future implementation. Conclusions in this research advocate further longitudinal research into the pedagogical design of e-portfolio implementation.

Keywords: educational technology, e-portfolio, research synthesis, systematic review

As the world readjusts to a new normal in the aftermath of the global pandemic, educational institutions throughout the globe are considering alternate models for educational offerings. It is now crucial to go ahead and continue to take them up with enthusiasm, establishing new methods of functioning while honouring the principles of the past. As a digital learning tool to track the learning process, e-portfolios are flourishing in the areas of education, particularly in teaching, learning, and assessment. Under these circumstances, this study conducted a systematic review of the e-portfolio, discussed the current findings and emerging new knowledge, and further made implementation recommendations for future practitioners and further research.

Literature Review

Electronic portfolios, or e-portfolios, have grown in popularity since their early implementation in the 1990s. While they became mainstream during the first decade of the 21st century, a shift in focus from portfolio to e-portfolio has occurred in research and practice (Farrell, 2020). The term "portfolio" was first used to describe a compact container to convey an unstructured collection of documents and materials; it has developed over time from paper to electronic, from local networks to the worldwide web (Farrell, 2020).

An e-portfolio is a web-based interface that houses a portfolio (Bryant & Chittum, 2013). They have been referred to by multiple names, such as efolio, digital portfolio, web-based portfolio, and online portfolio (Scully et al., 2018). These terms indicate whether material is saved on a web-based platform or a mobile device. A web-based interface allows users to add to and modify their e-portfolios to be immediately accessible to others (Scully et al., 2018).

Multiple scholars have defined e-portfolios in various ways. Barrett (2007) comprehensively defines an e-portfolio, pointing out several characteristics: using electronic technology, allowing users to collect and arrange artefacts in multiple modalities, showing evidence, and being hyper-connected. Meyer et al. (2010) claimed that an electronic portfolio is a digital archive of visual and aural materials, including text, pictures, videos, and sounds. They may also serve as learning aids since, in addition to organizing material, they are created to assist a range of pedagogical procedures and assessment goals (Meyer et al., 2010). In addition, they argued that e-portfolios are the Information Age's equivalent of the artist's portfolio for students in that they not only summarise a student's creative accomplishments but also depict the process of achieving those accomplishments (Meyer et al., 2010). Lorenzo and Ittelson (2005, p. 2) stated that an e-portfolio is "a digitised collection of artefacts, including demonstrations, resources, and accomplishments that represent an individual, group, organisation, or institution." Haig et al. (2007) regarded an e-portfolio as a digital collection of personal data that explains and demonstrates a person's learning experiences and accomplishments. Building on prior studies, Balaban et al. (2013) stated that an e-portfolio is a personal digital record that enables formal, informal, and non-traditional learning that captures proof of accomplishments in the configuration of artefacts; learning reflection may be shared with whomever the owner has granted a licence. Some other definitions brought up different aspects of e-portfolio, such as self-evaluation (Morrison, 2003), learning reflection (Balaban et al., 2013), reacting to feedback (Siemens, 2004), assessment tools (Yang et al., 2017), and career passport (Clark & Eynon, 2009). Recently, an e-portfolio has been defined as an assortment to give evidence of the owner's experience, both teachers and learners, and as an instrument to collect assessments (Barak & Maskit, 2017).

e-Portfolio Emergence in Education

The gaining popularity of e-portfolios implementation in education stems from the development of educational technology. Policymakers, academics, and practitioners all acknowledge that technology has the capacity to significantly alter and enhance education (Meyer et al., 2010; Zimmerman & Tsikalas, 2005). Developments in web technologies have opened up new opportunities for educational experiences, including those for lifelong learning, leading to the recommendation that e-portfolios be used as Personal Learning Environments (PLE) (henceforth, PLE) or to represent one's digital identity of the twenty-first century (Barrett & Garrett, 2009; Meyer et al., 2010). As a multifunctional tool, an e-portfolio can provide beneficial prospects for incorporating technology into education; in addition to being the multimedia container, it also serves to improve students' learning experiences by putting the student at the centre of learning and supporting crucial metacognitive abilities like goal setting, strategy identification, and learning reflection (Meyer et al., 2010).

The growing adoption of educational technology for teaching and learning, especially in the context of PLE, enables the flourishing of e-portfolios in educational settings (Castañeda & Tur, 2020). As a learning method, PLE is inextricably linked to promoting the learners' agency via establishing circumstances and resources (Dabbagh & Castañeda, 2020). The notion of agency has been more prevalent in learning research and highlighted as a vital aspect of the educational process. In addition, PLE enables agency growth, according to Castañeda and Tur (2020). Among all PLE-related experiences, e-portfolios appear to play a significant function. As they spring up as potential tools for enforcing agency, e-portfolios have the potential to be unique resources for reflective practice, a relational resource for peer-to-peer support and dialogic learning, and contextual resource for learning-related decision-making (Buchem et al., 2020).

Apart from the rising popularity of PLE adoption in education, the advent of Self-Regulated Learning (SRL) has also boosted the usage of e-portfolios in education. Process e-portfolios are emphasised as a potential development strategy for SRL (Tur et al., 2022). The argument for SRL skills development has been connected to the concept of psychological ownership. Buchem et al. (2020) claim that psychological ownership in the context of learning and education is founded in SRL and has been seen as a crucial element in the development of metacognitive and critical thinking abilities. Diverse areas of study, including organisational development and leadership, education, and consumption patterns, have paid growing attention to psychological ownership (Buchem et al., 2020). e-Portfolios facilitate the development of psychological ownership in learners, which is advantageous in numerous ways: including being viewed as a positive resource for attitudes (e.g., higher commitment and responsibility), self-esteem, self-efficacy, motivation, accountability, performance, self-identity, self-identity, self-adjustment, accountability, sense of belonging, and citizenship (Buchem et al., 2020).

As an educational technology tool reflecting PLE, SRL, and psychological ownership, e-portfolio is flourishing in educational settings. In light of this, many governments globally, particularly western countries, have encouraged the adoption of e-portfolios in their educational policies (Hallam et al., 2008). Besides, educators at all levels employ e-portfolios in their pedagogical practice to facilitate teaching and learning, especially in higher education contexts (Farrell, 2020). Many universities or colleges actively create institution-wide e-portfolio projects to cover a student's college experience (Bryant & Chittum, 2013). As e-

portfolios are becoming increasingly prevalent at all levels of education, there is a rapidly expanding body of research. Therefore, it is essential to review what we already know about them. Under this circumstance, this study was created to review the existing secondary e-portfolio literature landscape to synthesise the existing research and further examine the implementation of e-portfolios in teaching, learning, or assessment.

Research Synthesis

This study adopted research synthesis, a method for systematically integrating data; it has emerged as an essential tool for organising, integrating, and summarising the booming research sector (Cooper, 2017). Research synthesis is the synthesis of existing knowledge and relevant research results; it incorporates and evaluates information from previous studies relevant to a given subject to increase its generalizability, applicability, and availability. (Wyborn et al., 2018). Researchers have begun to incorporate the syntheses due to the rise in systematic reviews (Polanin et al., 2017). Through the process of integration, the purpose of synthesis is to expand the generalizability and application of the results and to generate new knowledge. Synthesis is presented as a method that addresses the issue of "information overload" by producing products that enhance our comprehension of situations and distil substantial evidence for decision-making (Wyborn et al., 2018). Research findings have demonstrated that synthesis promotes the research world by fostering collaborative initiatives and generating new knowledge (Baron et al., 2017; Wyborn et al., 2018).

Traditionally, research synthesis reviews and meta-analyses of primary research and its findings. It can also be implemented in systematically reviewing secondary studies (Becker & Oxman, 2008), where the review is analysed rather than the primary study, providing another way to narrow down the large research volume and further generate comprehensive knowledge (Bastian et al., 2010). Typically, researchers use syntheses of secondary studies to develop new information and detect gaps in the existing large body of literature (Lipsey & Wilson, 2001; Pigott, 2012). Polanin et al. (2017) summarised that this method has multiple names: meta-meta-analysis, meta-synthesis, overview, an overview of reviews, review of reviews, second-order meta-analysis, tertiary review, and umbrella review.

As stated in the preceding section, the use of e-portfolios in education has thrived in both practice and academic research; many primary studies and reviews based on these primary studies have been conducted. Thus, the research synthesis of reviews was utilized to narrow it down, drawing on previous reviews and providing new knowledge for future research and practice. The following research questions were formulated to guide the study (Based on these overarching research questions, detailed research objectives were proposed under various categories with each research question):

RQ1: What are the classifications of e-portfolio and their functions?

- To analyse classifications of e-portfolios and categorize their functions

RQ2: How are e-portfolio implementations described in existing secondary literature?

- To synthesize the benefits of e-portfolio and the underpinning constraints in implementation.
- To identify stakeholders' perceptions on e-portfolios from the existing literature.
- To describe e-portfolio platforms/tools, and the underpinning educational frameworks.

RQ3: What are the implications and recommendations for future practitioners?

- To make recommendations for practitioners employing e-portfolios in education.

Method

The systematic review methodology was applied to answer the above-mentioned research objectives and further review the implementation of e-portfolios in teaching, learning, or assessment by scoping, synthesising, and analysing existing secondary studies (reviews). The paradigm for a systematic review proposed by Tawfik et al. (2019) was employed in this study. Besides, the updated version of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) reporting guidelines (Page et al., 2020) and systematic review tool Rayyan (Ouzzani et al., 2016) were utilised for data collection and screening.

This study conducted a preliminary search to discover relevant publications, confirm the validity of the research idea, and confirm that there are enough articles to complete its analysis before beginning the official systematic review procedure. Additionally, Tawfik et al. (2019) recommend that all phases of a systematic review be completed separately by two to three reviewers to guarantee data quality and accuracy. Considering this, two reviewers were engaged in all processes in this study.

Inclusion Criteria

The following inclusion criteria (see Table 1) were created to generate a selection of relevant publications that precisely address the research questions.

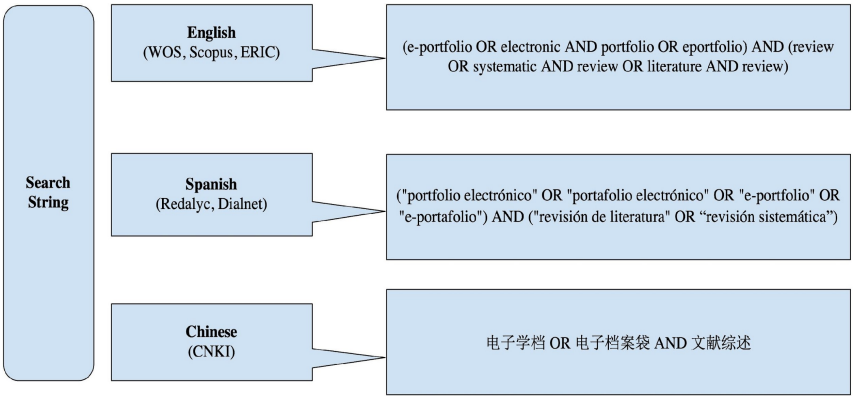
Table 1
Inclusion Criteria

Inclusion Criteria
Refer to e-portfolio
Secondary studies, including literature review and systematic review
In the area of education or educational technology
Written in English, Chinese, and Spanish
Papers published within the last decade (2011-2022)
Related to teaching, learning, or assessment

Search Parameter

This study aims to get a holistic view of secondary studies without the bias of English-only papers. Consequently, review papers were sought in three languages: English, Chinese, and Spanish. In the three languages, different variants of the following keywords were applied (boolean operators “AND” and “OR” were employed to divide the keywords): “e-portfolio”, “electronic portfolio”, “digital portfolio”, and “review”. Considering that different databases consist of academic papers in different languages, six academic databases covering these three languages were chosen: Web of Science (WOS), Scopus, ERIC, Redalyc, Dialnet, and China Academic Journals Full-text Database (also known as CNKI). The search strings depicted in Figure 1 were developed cooperatively by two researchers (see Figure 1).

Figure 1
The Search Strings

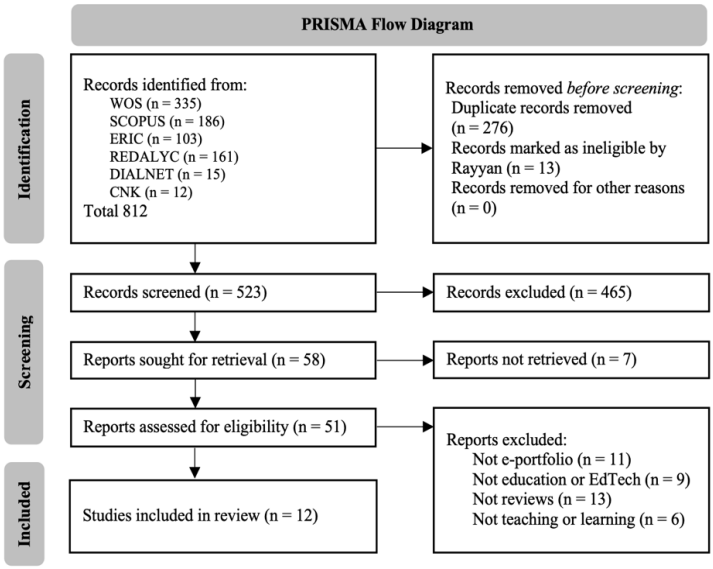


Data Selection and Extraction

Rayyan, a collaborative platform for performing systematic literature reviews (Ouzzani et al., 2016), was employed to extract results from the original search (n = 812). Rayyan flagged 13 papers as ineligible, and duplicates (n = 276) were automatically excluded from the total. Two researchers then conducted title and abstract screening and examined papers (n = 523) using the previously agreed-upon inclusion criteria (see Table 1). It is noted that additional duplicates that Rayyan did not remove were still identified at this phase. In this screening phase, 465 papers were excluded by the researchers.

After the title and abstract screening process, 58 reports were sought for retrieval. However, seven of them were not retrieved. Before finalising the papers, the researchers downloaded the full text and evaluated the 51 papers for eligibility based on the previously mentioned criteria, 39 were excluded, and the final selection was 12 review papers. Figure 2 depicts the entire selection and extraction procedure. Among the 12 publications included in this study, four are written in Chinese from the CNKI database, eight are in English, and no secondary studies in Spanish fully match the selection criteria.

Figure 2
PRISMA Flow Diagram



Analytical Procedures

For all 12 chosen papers, the content analysis approach was utilised, and the research questions previously presented directed the analysis for the quality-of-study review. After selecting the articles that match the inclusion criteria, they were accessed, read, and evaluated. At this stage, data collection was carried out using an instrument created ad-hoc using Google Forms. The researchers validated the form through a pilot implementation to ensure its unambiguity and unify the procedures for analysing and collecting qualitative evidence.

The findings in the articles were categorised based on the research questions. In each inquiry theme, there are detailed objectives to guide the analysis. Then, a qualitative analysis was performed, and the texts were retrieved and contrasted between recurring themes, considering the various scenarios that appeared in the reviews in which e-portfolios were implemented in teaching, learning, or assessment.

Findings

Findings from the retrieved data analysis are presented in the following themes: general information, classification of e-portfolios, benefits and constraints, participants' perceptions, educational and technological frameworks, and recommendations for implementation.

General Information

Before addressing the research questions, the search results were classified into the following general aspects: country and educational context, research methodology, and inquiry theme (this section is only about the general information, the findings corresponding to specific research questions are exhibited, and discussed in subsequent sections). The general retrieved information is displayed in Table 2.

In this study, we intend to diversify the country context, reduce the constraints of not being inclusive, and improve generalizability. Thus, review studies in different languages (English, Chinese, and Spanish) were included in the initial search; the final selections were mainly in English (n = 8), and some were in Chinese (n = 4). Also, the chosen papers cover a wide range of countries: Canada, the USA, the Netherlands, Indonesia, Malaysia, Ireland, Australia, the UK, and China.

Regarding the research methodology, most of the selected reviews adopted a systematic review approach (n = 7); one was a systematic scoping review, and the other conducted a meta-analysis. Some selected papers employed the traditional narrative review method (n = 3), and some utilised Cite Space II to visualise patterns and trends in their bibliometric mapping reviews (n = 2). The search results also reflected that those systematic reviews account for the vast majority of the bibliometric review papers on e-portfolios in education.

Regarding educational level, it was uncovered that some of the existing review papers are contextualised in higher education; some are general reviews without a specific context. None of the review studies primarily discussed the implementation of e-portfolios in K-12 education. Besides, within the area of higher education, it has been found that there is one review article that has a specific focus on teacher education (Harun et al., 2021). Furthermore, various themes were identified among the 12 review papers (See Table 2). The

themes cover the areas of teaching, learning, assessment, digital ethics, implementation, research summary, and research trend.

Table 1
General Information about the Papers Included in the Study

Author / Date	Context	Educational Level	Method	Theme
Harun et al. (2021)	Malaysia	Higher Education: Teacher Training	Systematic review	Pedagogical affordances of e-portfolio
Segaran & Hasim (2021)	Malaysia	Not specified	Systematic review: meta-analysis	Self-regulated learning
Scully et al. (2018)	Ireland	Higher Education	Narrative review	Learning e-portfolio in higher education
Wilson et al. (2018)	Australia	Higher Education	Scoping review	Digital ethics in using of e-portfolio
Beckers et al. (2016)	Canada; USA; Netherlands	Not specified	Systematic review	Self-directed learning
Rahayu et al. (2016)	Indonesia; USA	Not specified	Systematic review	E-portfolio definition, model, type and system
Liang et al. (2016)	China	Not specified	Mapping Review (CiteSpace II)	Progress and trend on e-portfolio research in China
Dai & Jiang (2016)	China	Not specified	Mapping Review (CiteSpace II)	Research on e-portfolio assessment
Rahayu & Sensuse (2015)	Indonesia	Not specified	Systematic review	Critical success factor (CSF) for implementation E-portfolio model
Wang & Xu (2014)	USA, Australia, UK	Not specified	Narrative review	Progress and trend on e-portfolio research globally
Bryant & Chittum (2013)	USA	Higher Education	Systematic review	Evidence for e-portfolios' impact on learners' outcomes
Zhang (2011)	China	Not specified	Narrative review	Research summary of e-portfolio in China

The overall findings of the reviewed secondary literature broadly discussed the use of e-portfolio in education, specifically in teaching, learning, or assessment. The following discussions addressed the research questions and objectives based on the findings.

Classifications of e-Portfolio

The reviewed papers classify e-portfolios in diverse ways; the synthesised classifications of e-portfolios in the selections are shown in Table 3. It is noteworthy that translations from Chinese to English are carefully handled to make sure the term is consistent; also, synonyms were combined to compare better, synthesise, and further visualise the data to create a comprehensive overview of the categories (e.g., "collection" and "dossier"; "assessment" and "evaluation"; "presentation" and "showcase").

Table 3
Classification of e-Portfolio

Author / Date	Classification of e-portfolio
Beckers et al. (2016)	personal development, learning, collection/dossier, reflective
Rahayu et al. (2016)	collection/dossier, showcase/presentation, development, recognition
Rahayu & Sensuse (2015)	NA
Harun et al. (2021)	reflection, assessment/evaluation, teaching, learning, job-search
Scully et al. (2018)	showcase/presentation, development; assessment/evaluation
Wilson et al. (2018)	process tracking, showcase/presentation, assessment/evaluation
Bryant & Chittum (2013)	process tracking, collection/dossier, showcase/presentation, learning, teaching
Wang & Xu (2014)	NA
Liang et al. (2016)	showcase/presentation, assessment/evaluation, learning
Dai & Jiang (2016)	NA
Zhang (2011)	assessment/evaluation, showcase/presentation

e-Portfolios' Benefits and Constraints

The reviewed articles extensively discussed the advantages and disadvantages of e-portfolios in education, further pointing out some key issues that need to be considered and well addressed by practitioners.

Table 4 illustrates the synthesis of the positive effects that an e-portfolio can bring to education. More than half of the selections (n = 7, 58.3%, respectively) agreed that an e-portfolio could facilitate self-regulated learning, self-reflection, and self-evaluation; it also benefits inter-curricular knowledge and 21st-century skills development. The effectiveness of e-portfolios in promoting engagement, interaction, communication, and collaboration is also widely agreed upon (n = 6, 50%). Furthermore, the chosen papers also refer to the following values of e-portfolio: flexible and easy to access and use, prompting personal/professional development and lifelong learning, the possibility of tracking the learning process, motifs for learners, network building, enabling diverse assessments and feedbacks, potential use for

employment, facilitate teaching and learning, addressing technological skills, and the inclusion of multimedia (See Table 4).

Table 4
Benefits of e-Portfolios

Benefits of e-portfolio	n	%
Support self-regulation and develop self-directed learning (SDL) skills	7	58.3%
Address cross-curricular knowledge and 21st-century skills	7	58.3%
Encourage self-reflective learning, facilitate self-reflection and self-evaluation	7	58.3%
Nurture engagement, facilitate interaction, communication, and collaboration	6	50.0%
Flexibility and accessibility	5	41.7%
Facilitate personal/professional development and life-long learning	5	41.7%
Visualize learning; enable learners and educators to track the learning progress	5	41.7%
Motivate learners	4	33.3%
Strengthen social networks, facilitate building an online community, and enhance communication	4	33.3%
Enable learners to have feedback from peers and teachers	3	25.0%
Optimize learning outcomes	3	25.0%
Support educators regarding teaching and evaluation	3	25.0%
Easy to navigate and use: easy to keep/organize/arrange information	3	25.0%
Potential use for employment, enhance future employment prospects	3	25.0%
Demonstrate the technical skills and create an extensive digital footprint	2	16.7%
Emphasize process-based, authentic, and diversified assessment	2	16.7%
Enable learners to gather evidence of broad skills and competencies	1	8.3%
Possibility to incorporate multimedia	1	8.3%
Benefit information sharing and retrieval	1	8.3%
Embody student-centeredness	1	8.3%
Help with formulating study plans more purposefully	1	8.3%

Even though the benefits of e-portfolio inclusion in education are clear, there are also underpinning constraints; various issues should be addressed to reach its full potential and better implement e-portfolio in teaching and learning. The detailed findings are exhibited in Table 5.

Table 5
Constraints/Issues Need to be Addressed in e-Portfolio Implementation

Constraints/issues need to be addressed	n	%
Learners' uncertainty, concerns, and reluctance due to relatively intense workload and challenges in comprehending processes	3	25.0%
There was a shortage of support (technological skills, internet issues, structural aid)	3	25.0%
Digital ethics: issues of privacy, confidentiality, consent, copyright and intellectual property when they are used in the classroom	3	25.0%
Lack of interaction; has constraints in peer evaluation and collaborative learning	2	16.7%
Some platforms/tools are not user-friendly and difficult to navigate	2	16.7%
Lack of originality and creativity: many of the current options for software platforms are too standardized	2	16.7%
Heavily dependent on participants' skill and creativity	1	8.3%
Creating an e-portfolio can be time-consuming and challenging	1	8.3%
There is a conflict between the learning portfolio's developmental (process) and evaluative (product) conceptual frameworks	1	8.3%
Its reflective practice is limited in depth and flexibility	1	8.3%
Lack of motivating function, scalability, sustainability, adoption, interoperability, etc.	1	8.3%
Some software applications fail to integrate e-portfolio educational aims of stress reflection, self-reflection, and participation	1	8.3%
Skepticism about the spread of innovation	1	8.3%
Issues of accountability	1	8.3%

Participants' Perception

As the majority of the chosen secondary papers are reviews of empirical research, some of them provide the perspectives of participants based on a synthesis of the experimental investigations. The paper gathered, analysed, and summarised the results and arguments of the participants' perspectives from the empirical studies in the retrieved reviews. The following findings were obtained.

In general, participants' perceptions of e-portfolio implementation were positive in most publications. Bolliger and Shepherd (2010) found that a large proportion of participants (85%) felt that e-portfolios boosted their motivation to study, and many agreed with words like "assisted me in reflecting" and "helped me evaluate my own progress" (p. 304). Similarly, most of the participants (learners) in Wakimoto and Lewis' (2014) study found that e-portfolios could help them reflect on their abilities. The portfolios offered them insight into the developmental aspect of becoming a professional. Notably, the learners regarded the quality of this peer review process as vital to the e-portfolio program's success. The students also highlighted the significance of the rubrics used to examine and provide comments on each other's work (Wakimoto & Lewis, 2014).

Not all perceptions are positive. Some practitioners think developing an e-portfolio can be time-consuming and laborious (De Jager, 2019; Harun et al., 2021; Zhong & Hartsell, 2015), or the participants might be uncertain about using an e-portfolio (Chung & Kim, 2010;

Oakley et al., 2014). Besides, Razavi and Iverson (2006) claimed that younger learners thought themselves to be clustering information into specific areas and made decisions about sharing based on the sensitivity of the data. However, it is debated that students' views of their learning provide few details (Bryant & Chittum, 2013); questionnaires and interviews are simply a more roundabout technique to measure students' attitudes regarding e-portfolio. It is impossible to say whether individuals who had negative feelings about an e-portfolio's effect on their learning were influenced by defects in the programme or issues in its application (Bryant & Chittum, 2013).

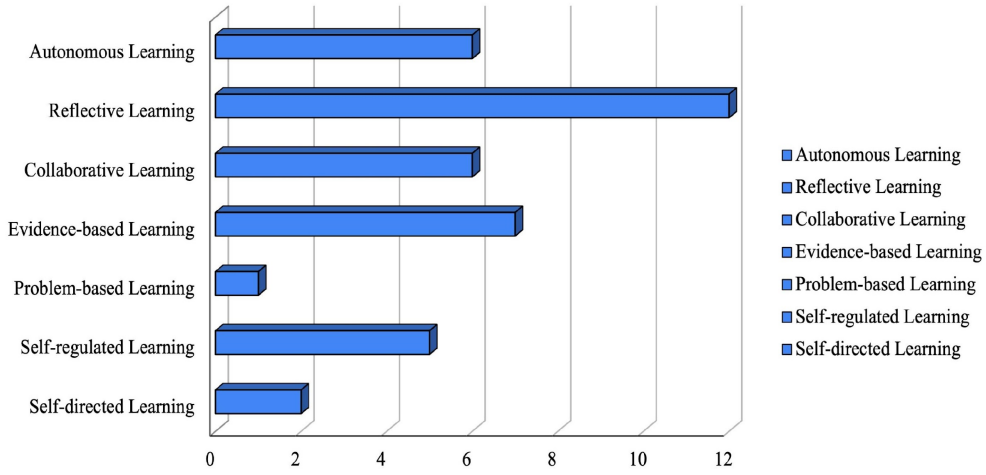
Some selected review articles also documented a shift in participants' perspectives. According to Wang and Xu (2014), participants who participated in a study shifted their attitudes from negative to positive about e-portfolios. They believed the e-portfolio was just a job-search tool initially, and they thought it was tedious and time-consuming to develop, needing the help of teachers and classmates. They also believed that the application's main goal was to achieve graduation requirements. Later, the participants thought the e-portfolio was a collection of items to demonstrate personal and professional improvement, allowing them to explore answers to problems via cooperation and ongoing reflection during the construction phase. This case is a reminder that how the e-portfolio is implemented will influence the attitude change of participants. According to Chye et al. (2013), participants' intrinsic motivation may influence favourable attitudes toward e-portfolio use. In practice, educators should use appropriate ways to motivate learners and optimise their learning experiences.

Lewis (2017) stated that incorporating constructivist learning and social pedagogy capabilities into e-portfolio implementation is crucial. In this way, learners perceive a more genuine learning experience when course designers and teachers strongly understand a learning portfolio's processes.

e-Portfolio and Educational Frameworks

The chosen articles referred to various educational frameworks; seven terms were identified through data retrieval, computing, and visualisation (see Figure 3). Among these frameworks, reflective learning is the most mentioned term, and evidence-based learning is the second most cited. Autonomous learning and collaborative learning are also widely discussed. Moreover, the papers talked about self-directed learning and self-regulated learning.

Figure 3
Educational Frameworks Related to e-Portfolios Implementation



e-Portfolio Platforms/Tools

Most of the reviewed papers mentioned the e-portfolio platforms/tools, but few discussed them in detail. PEARL, Pebblepad, Taskstream, and Elgg are the most mentioned platforms; LinguaFolio, Netfolio, STEPP, WIFI, and some Google platforms (Google Map, Google Sites, Google Earth) are also widely discussed. Other tools/platforms such as Moodle, Factline, Drupal ED, Behance, MOOC, Sakai, ASP, WordPress, NET, Factline, and Mahara are also mentioned in some reviewed papers.

Overall, some trends can be observed:

- The usage of specific e-portfolio tools (e.g., Mahara)
- The development of environments owned by institutions (e.g., ePearl)
- The use of Virtual Learning Systems (VLS) (e.g., Moodle)
- The usage of social media (e.g., blogs)

Implementation Recommendations

To offer synthetic guidance for implementing e-portfolios, the practical recommendations from the review papers were incorporated into four levels concerning the stakeholders of e-portfolio implementation: institutional level, educator level, learner level, and platform level (see Table 6).

Table 6
Recommendations for e-portfolio implementation

Institutional Level	Educator level	Learner Level	Platform Level
Making e-portfolios part of the educational process (e.g., implementing school-wide) (Beckers et al., 2016) Offering training for both the educator and learner (technology, ethics, etc.) (Beckers et al., 2016) Providing pedagogical and technical professional development in a formal setting (Beckers et al., 2016; Scully et al., 2018) Aligning e-portfolio with curriculum (Beckers et al., 2016)	Providing frequent coaching to their students (Beckers et al., 2016). Motivate students in using e-portfolio (Beckers et al., 2016; Wang & Xu, 2014). Considering the opinions of more than one evaluator while evaluating (Gencel, 2017; Harun et al., 2021). Integrating peer assessment (Harun & Jhee, 2012; Harun et al., 2021). Using e-portfolios as formative assessments with a long-term goal (Harun et al., 2021). Scaffolding Explicitly (Scully et al., 2018; Wilson et al., 2018). Giving students guidance and practice with reflective practice, especially writing reflection (Harun et al., 2021; Scully et al., 2018). Giving students sufficient time (Scully et al., 2018). Giving students formative feedback	Setting goals, analyzing tasks, implementing planning, having primary goals in mind (Scully et al., 2018; Harun et al., 2021) Self-evaluating the e-portfolio assignment in order to see what they have accomplished over time (Beckers et al., 2016; Harun et al., 2021). Avoiding a descriptive level of textual reflection without any more profound insight (Harun et al., 2021). Delving into the technological tools and applications that can aid in the creation of an e-portfolio (Harun et al., 2021; Scully et al., 2018). Strengthening self-regulation and self-evaluation (Beckers et al., 2016; Scully et al., 2018). Collecting and choosing information efficiently (Rahayu & Sensuse, 2015).	Building interactive and conversational e-portfolios (Wang & Xu, 2014). Optimising user characteristics, infrastructure, system quality, community, and service quality (Rahayu & Sensuse, 2015). Building comprehensive e-portfolios platforms with the traits to motivate users (Wang & Xu, 2014). Improving readability, usability, and accessibility (Rahayu & Sensuse, 2015). The process of e-portfolio creation should be facilitated rather than interrupted by technological platforms (Scully et al., 2018). Build a flexible and scalable social learning platform (Liang et al., 2016)

(Scully et al., 2018).

Engaging students in e-portfolio design (Harun et al., 2021; Scully et al., 2018).

Engaging in reflection and using reflective writing (Harun et al., 2021).

Utilising feedback from teachers and peers for improvement (Harun et al., 2021).

Offering continuous support (Scully et al., 2018)

Dual goal orientation: process and product (Scully et al., 2018)

Collaborating to develop a set of guidelines and procedures that include privacy laws that protect user information, visuals, personal reflections, etc (Cowper & Crompton, 2010; Fisher & Hill, 2017; Wilson et al., 2018).

Discussion

Data collected shows the heterogeneity of e-portfolio designs, in line with the experience by Roco and Barberà (2022), and the results presented in this study show a great variety in terms of design, aims and platforms. Thus, in order to answer the research questions, the following findings-based discussion is presented: categorization of e-portfolios, advantages and restrictions, participants' attitudes, educational frameworks, and implementation suggestions.

Multiple scholars have defined e-portfolio in various ways; the most cited scholar in the selected reviews is Helen C. Barrett. Grounding on the existing definition, this paper proposed a synthesized description of an e-portfolio: an e-portfolio is a comprehensive electronic collection of multimodal artifacts as learning evidence that can be used in teaching, learning, assessment, and showcasing; it illustrates skills development, focusing on the learning process, progress, and achievement. It requires self-regulation, self-reflection, and self-evaluation. Besides, it was discovered that scholars classified e-portfolios into different types: dossier, showcase or presentation, assessment, and learning-tracking (Beckers et al., 2016; Bryant & Chittum, 2013; Rahayu et al., 2016; Scully et al., 2018; Wilson et al., 2018; Mathur & Mahapatra, 2022). It argued that the classifications of different functions of e-portfolios are not isolated; instead, they are interconnected, and in education, they serve as multi-dimensional tools in various aspects. Also, a wide range of participants' views (both positive and negative) regarding the actual practice of e-portfolio implementation was disclosed (Bolliger & Shepherd, 2010; De Jager, 2019; Harun et al., 2021). It was also revealed that the participants' attitudes could be changed if the e-portfolio was employed appropriately and effectively (Wang & Xu, 2014). From the assessed data on the e-portfolio classification, we identified that e-portfolios have the following potential functions: boost learning, reflection, and self-development; they can also be employed in teaching, assessment, presentation, or even for recognition. The most mentioned types and functions of e-portfolio are assessment, learning, showcase, and dossier, followed by development e-portfolio and teaching e-portfolio. The findings resonate with Meyer et al. (2010)'s argument. According to them, e-portfolios serve three general purposes: process, showcase, and

assessment; they may be created as process portfolios that support the ways in which embedded structures and strategies help users learn. Process portfolios are instruments for managing learners' own learning. They are intended to promote self-improvement, personal development, and a dedication to lifelong learning (Meyer et al., 2010).

Regarding e-portfolios' benefits, it is widely accepted that the e-portfolio might foster a variety of factors, including self-regulated learning, self-reflection, self-evaluation, inter-curricular knowledge growth, and the development of 21st-century skills (Sutarno et al., 2019), such as collaboration skills, self-management skills, technological skills. These aspects demonstrate that e-portfolio is a 'practise of governance', as a deliberate activity designed to shape students' professional and personal behaviour using tactics that leverage students' ambitions, aspirations, and interests (O'Brien et al., 2014). E-portfolios may facilitate attempts at knowledge construction by facilitating reflection, refinement, conferencing, and other self-regulatory activities, which are crucial for lifelong learning and learning how to learn (Meyer et al., 2010; Roberts, 2018; Salazar & Arévalo, 2019). Furthermore, e-portfolios are excellent for cataloguing and organising learning resources and clearly illustrate the learner growth process; they can also allow remote access, promoting learning at any time and any place and facilitating feedback from classmates, parents, and instructors (Barrett, 2009; Meyer et al., 2010). According to Wade, Abrami, and Sclater (2005), e-portfolios are associated with students' capacities to self-regulate their learning and increase the development of crucial educational skills and abilities, particularly literacy skills. When students use e-portfolios, they undertake more ownership of their education, have a better awareness of their strengths and weaknesses, and develop the ability to create objectives (Meyer et al., 2010), which eventually is about autonomous learning and agency (Whitney et al., 2021). Apart from these aspects, e-portfolios also offer other advantages, including being flexible and straightforward to access and use, recording the learning process, network development, allowing for a variety of evaluations and feedback, possibilities for employment, and multimedia integration. Also, e-portfolios were seen as a flexible and straightforward tool to access and use, recording the learning process and network development, allowing for various evaluations and feedback, possibilities for employment, and multimedia integration (Beckers et al., 2016; Harun et al., 2021; Liang et al., 2016; Scully et al., 2018; Wilson et al., 2018)

However, there are also constraints on implementing e-portfolios, such as platforms' accountability, usability, reliability, scalability, sustainability, and interoperability (Bryant & Chittum, 2013); participants' uncertainty, reluctance, and unfamiliarity (Harun et al., 2021); lack of technical support and scaffolding for participants (both educators and learners) (Scully et al., 2018). Particularly, the following key concerns need to be well addressed: the issue of digital ethics, including privacy, confidentiality, consent, copyright, and intellectual property (Wilson et al., 2018).. According to Wilson et al. (2018), the new potential to utilise e-portfolios in online social pathways increases student engagement and accessibility of use. Nevertheless, they can also raise ethical problems specific to the virtual environment, such as privacy, confidentiality, and data protection (Denton & Wicks, 2013; Kirkham et al., 2010; Tan, 2011). These concerns need to be addressed to effectively employ e-portfolios in educational practice.

The widespread of new educational concepts offers opportunities for e-portfolio integration. The retrieved review papers also disclosed that various educational frameworks had been associated with e-portfolios' implementation, such as reflective learning, evidence-based learning, autonomous learning, collaborative learning, self-directed learning, and self-

regulated learning (Beckers et al., 2016; Bryant & Chittum, 2013; Harun et al., 2021; Liang et al., 2016; Rahayu et al., 2016; Rouco & Barberà, 2020, Scully et al., 2018; Wilson et al., 2018).Although e-portfolios are implemented under a wide variety of educational frameworks and learning theories, there are no models to address them. Even though self-regulated learning is commonly cited and analysed (López-Crespo et al., 2022), there are no references about how teachers should support students' cognitive skills. Likewise, collaborative learning is frequently mentioned. Zubizarreta (2009) suggested a theoretical model that highlighted the relationship between students and teachers; however, there are no designs that address such a collaboration. To address these gaps, the paper calls for more research on pedagogical or learning task design, particularly collaborative co-design models implementing e-portfolios in teaching and learning.

Besides, it is striking that social media, particularly blogs (Marín, 2020), have increased uptake for e-portfolio aims but do not seem to have such a prominent role in the reviews. In the context of social media research, the open and networked characteristics have been claimed as transformational for the e-portfolio style (Cambridge, 2010; Tur & Urbina, 2014). Furthermore, under the PLE (Personal Learning Environments) approach, e-portfolios have been claimed as one of the most agentic proposals in which learners deploy individual, relational, and contextual resources (Castañeda & Tur, 2020). Highly related, Rouco and Barberà argued the relationship of blog-based e-portfolio for networked learning (2022), which might allow further collaboration for learning. In light of this overview, there is a lack of research on e-portfolios in social media and PLEs and for students' agency, which should be addressed in future research.

It was also uncovered that the current review mainly focuses on higher education or post-secondary education; more research on e-portfolios in other educational contexts (e.g., K-12 education) is needed. Helen Barrett, one of the most well-known researchers in the field of e-portfolios, notes that the empirical study is quite restricted and focuses more on the construction of teaching portfolios than on K-12 student portfolios (2009). Besides, this paper advocates collaborative learning and interaction while implementing an e-portfolio. Peer and teacher-student collaboration should be strengthened to reduce the pressure of independently making e-portfolios and thus ease the uncertainty and reluctance of using e-portfolios. The research gap in collaborative pedagogical design on e-portfolio implementation was noticeable. No selected papers refer to reviewing how e-portfolios are implemented in a specific pedagogical design or employed in collaborative learning tasks; this area requires more studies, particularly reviews, for further investigation. Besides, there is a noticeable vacant area for reviewing studies on e-portfolio tools or platforms.

In the post-pandemic stage, e-portfolios are rising in various educational settings. To maximise the efficacy of e-portfolio use, the findings from the research synthesis suggest that all stakeholders should take actions, address the challenges and concerns, and cooperate in e-portfolio implementation. Detailed recommendations from the retired reviews were categorised for policymakers and practitioners in this paper. These suggestions could be a referential guideline for future e-portfolio implementation or policymaking. For institutions, providing training for educators and students is a significant action that will affect the users' technological skills, which are crucial in utilising an e-portfolio (Scully et al., 2018; Wilson et al., 2018). They all need to incorporate e-portfolios into their curriculum and make school policies for implementing e-portfolios (Beckers et al., 2016). Besides, they all need to look for suitable platforms and invest in building on their intuitional-level e-portfolio to protect school users' information (Rahayu & Sensuse, 2015). For teachers, e-portfolios can be

employed in daily teaching, formative and even summative assessments; teachers also need to offer constructive feedback to help students optimise their e-portfolio learning outcomes (Harun et al., 2021; Wilson et al., 2018). Simultaneously, to keep students motivated. When it comes to students, who are critical e-portfolio users, they need to utilise e-portfolio tools to track their learning and facilitate self-evaluation and reflection (Bryant & Chittum, 2013; Harun et al., 2021; Rahayu et al., 2016; Scully et al., 2018). Consequently, they become self-regulating and self-directing autonomous learners. As for the e-portfolio/tools, providers need to increase their usability, functionality, and readability to help users achieve better results; in particular, collaboration functions should be added (Liang et al., 2016; Wang & Xu, 2014).

Conclusion

This study aimed to comprehensively understand secondary research without being limited to English-only publications, potentially reducing cultural bias. Thus, English, Chinese, and Spanish review articles were searched, and papers from various backgrounds were included. The present study was designed to cover both extended research periods and contexts. It is based on the reviews of the last decade when e-portfolios became mainstream. Since only reviews are included, the number of the chosen publications is limited. Besides, we acknowledge that the study's main limitation is the search string. Intending to include unequivocal conceptions of e-portfolio that could work across languages and contexts, we only focused on the most straightforward terms. However, this could have emerged as a limitation of the study.

To conclude, e-portfolios are part of a new generation of Web 2.0 communication and educational technology. The immediate destination of e-portfolios may be found in this new, user-generated world, where an attitude of participation, cooperation, and sharing dominates (Knobel & Wilber, 2009). At present, the individual implementing e-portfolio is being made available to a larger audience, particularly in the area of education. We acknowledged the value of existing secondary research over the past decades on e-portfolio use in education and reviewed them. Through systematic reviews of secondary studies, the paper discusses the e-portfolios' definitions, functions, strengths, weaknesses, opportunities, and relevant educational frameworks. The following research gaps were identified: lack of studies on e-portfolio in K-12 education; few current studies investigating e-portfolio implementation in a collaborative (co-design) mode; and more research are needed in employing social media and PLEs in e-portfolio implementation for student agencies. Based on the overview, recommendations are made for the policymakers and stakeholders to use e-portfolio in education better.

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