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Co-design in electronic portfolio for learning: pilot validation of the Co-PIRS Model

Codiseño en portafolios electrónicos para el aprendizaje: validación piloto del Modelo Co-PIRS

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Abstract

This study performs a pilot validation of the Co-PIRS model., a co-design paradigm for integrating e-portfolios into learning environments and addressing students' agency, organizing roles into four phases. This paper examines the model's effectiveness by exploring learners' satisfaction with the co-design approach, their evaluation of each Co-PIRS phase, and their suggestions for modifications, using an ad hoc questionnaire adaptation. The research utilizes a mixed-methods design, incorporating quantitative statistical analysis to explore students' satisfaction with multiple factors in the learning process, descriptive quantitative data about students' evaluation of each phase regarding coherence, adequacy, and clarity, and participants' qualitative feedback to refine the model. The results show that there is a positive correlation between students' satisfaction, motivation, dedication, and evaluation, and there is a negative correlation between students' satisfaction with teacher instruction clarity and the perceived usefulness of materials. Suggestions by students are mainly for eliminating tasks in each phase. The study offers a pilot validation of the model and reflects on the implications for educational research, policy-making and practices, which may further contribute to instructional design and educational innovation.

Keywords: *e-portfolio, electronic portfolio, co-design, learning design, learner's agency*

Resumen

Este estudio realiza una validación piloto el modelo Co-PIRS, un paradigma de codiseño para integrar e-portafolios en entornos de aprendizaje, que organiza los roles en cuatro fases. Se examina la efectividad del modelo explorando la satisfacción del alumnado con el enfoque de codiseño, su evaluación de cada fase del Co-PIRS y sus sugerencias para modificaciones usando un cuestionario adaptado ad-hoc. La investigación utiliza un diseño de métodos mixtos, incorporando un análisis estadístico cuantitativo para explorar la satisfacción del estudiantado con múltiples factores en el proceso de aprendizaje, datos cuantitativos descriptivos sobre la evaluación de cada fase en cuanto a coherencia, adecuación y claridad, y feedback cualitativo para refinar el modelo. Los resultados muestran que existe una correlación positiva entre la satisfacción, la motivación, la dedicación y la evaluación del alumnado, aunque existe también una correlación negativa entre la satisfacción del alumnado con la claridad de las instrucciones del profesor y la utilidad percibida de los materiales. Las sugerencias del alumnado son principalmente para eliminar tareas. El estudio ofrece una validación piloto del modelo y reflexiona sobre las implicaciones para la investigación, políticas y prácticas educativas, que pueden contribuir al diseño y la innovación educativa.

Palabras clave: *e-portafolio, portafolio electrónico, codiseño, diseño de aprendizaje, agencia del estudiante*

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1. INTRODUCTION

Student agency, collaborative learning, and reflective practice have been brought to the forefront of education with the development of technological advances in education. One of the developments that have significantly impacted learning environments is the advent of electronic portfolios or e-portfolios as dynamic learning instruments. It has been extensively documented that they have an effect on student engagement, self-directed learning, and assessment, demonstrating their capacity to transform learning experiences and outcomes (López-Crespo et al., 2021) and, more recently, students' agency (Zhang & Tur, 2023a). Despite the recognition of e-portfolios as a catalyst for educational advancement, the full extent of their benefits, particularly when integrated within a co-designed learning framework in which close collaboration between teachers and students is well defined, is yet to be fully explored.

1.1. E-portfolio implementation in education

E-portfolios are gaining recognition for their role in enhancing student engagement, self-directed learning, and innovating assessment practices, as discussed by multiple scholars (López-Crespo et al., 2022; Mudau, 2022; Muin et al., 2021; Wang & Wang, 2012). Their importance in improving student self-efficacy and engagement, crucial for academic success, was emphasized by López-Crespo et al. (2021). Furthermore, e-portfolios contribute to better metacognitive skills and deeper concept understanding (Lukitasari et al., 2014), with Mudau (2022) highlighting their utility in open-distance e-learning for fostering student-centered learning via authentic assessments.

Ngui et al. (2020) highlighted the transformative role of e-portfolios in fostering interactive and student-centered learning, a sentiment echoed by Wang & Wang (2010) who noted their contribution to integrating technology and critical thinking in education. López-Crespo et al. (2021) and Khalid et al. (2015) recognized e-portfolios for enhancing student self-efficacy, engagement, and reflection. Recent discussions by Buchem et al. (2020) have expanded the focus to include e-portfolios as tools for promoting student agency.

Research on e-portfolios has mainly targeted higher education, with their role in K-12 emerging as a new frontier (Chang & Kabilan, 2022). Despite their established presence in higher education, challenges such as educator reluctance, technical issues, privacy concerns (Cheng, 2022), and the need for continuous support hinder broader adoption (López-Crespo et al., 2021; Vance et al., 2013). Collaboration is a core process that allows for addressing feedback and supporting learning, as stated in early research by Zubizarreta (2009).

Co-design in education is a collaborative method where students, educators, and other stakeholders jointly shape learning experiences and curricula, fostering equal partnerships and dialogue (Aldridge & Bianchet, 2022). It involves diverse participants in creating educational innovations, and enhancing personal connections among students and between students and educators (Brown et al., 2021; Lam, 2020). This approach not only democratizes the design process by incorporating various perspectives (Vezzoli et al., 2020) but also plays a crucial role in the ongoing evaluation and refinement of educational practices, ensuring they resonate with the actual experiences of learners and teachers (Michos et al., 2017).

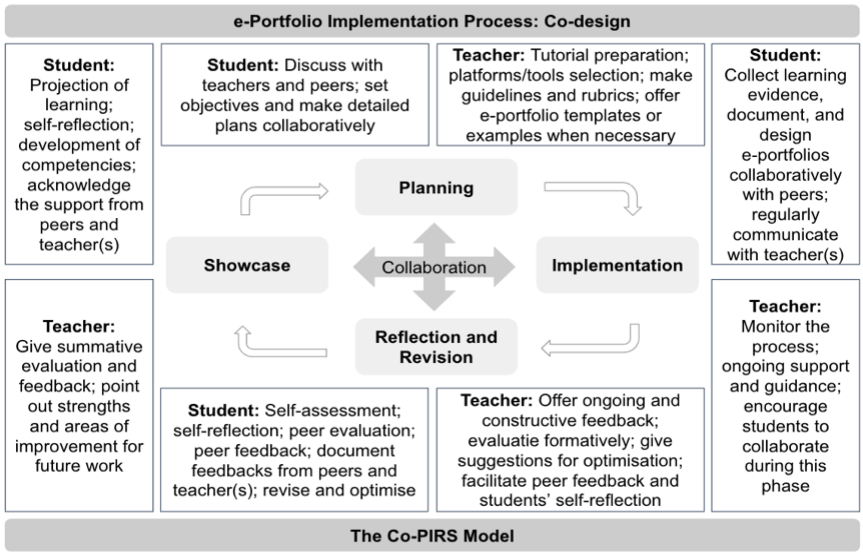
The scope of co-design extends to various educational innovations, including digital learning (Adachi et al., 2022), blended learning (Albó et al., 2021), narrative digital game-based learning (Breien et al., 2022), and academic agency (Villatoro & de-Benito, 2022).

1.2. The Co-PIRS model: e-portfolio co-design enacting students' agency

Zhang and Tur (2023 b,c) introduced the Co-PIRS model, a co-design framework for e-portfolio learning to enhance student agency. Initially conceptualized as a collaborative learning approach, it evolved into a detailed framework guiding e-portfolio implementation through joint efforts of students and educators, incorporating elements of student agency as outlined by Jääskelä et al. (2017; 2020). Drawing from Zubizarreta's (2009) collaborative and mentoring strategies, the Co-PIRS model fosters a partnership between learners and educators in e-portfolio development and use. It extends to include sociocultural aspects of student agency, integrating peer and material support into the e-portfolio process. The model is structured around four key phases: Planning, Implementation, Revision and Reflection, and Showcase, embedding agency elements within a co-design collaboration between students and teachers. Zhang and Tur argue that the Co-PIRS model promotes more engaging and effective e-portfolio practices, emphasizing the importance of user validation for quality assurance (see Figure 1).

Figure 1

The Co-PIRS model (Zhang & Tur, 2023c, p. 88)



This paper aims to pilot validate and refine the Co-PIRS model to verify its effectiveness in authentic learning environments by investigating learners' satisfaction with the co-design approach in e-portfolio learning, their evaluation of each phase, and modification and revision suggestions. The three research questions were posed, serving as the focal points of our study:

- RQ1: To what extent does self-perceived satisfaction correlate with motivation and dedication among students engaged in the e-portfolio co-designed learning journey?
- RQ2: What is the impact of students' perceptions of teachers, learning design, and e-portfolio tools on their satisfaction levels?

- RQ3: What are the students' evaluations of the coherence, adequacy, and clarity of each phase of the Co-PIRS model, and what revisions or modifications do they suggest?

Through the provision of empirical evidence regarding the practicality and effectiveness of the Co-PIRS model, this study contributes to the ongoing dialogue concerning e-portfolio implementation and co-design learning. The goal of the study is to establish a connection between pedagogical practice and theoretical frameworks by examining the experiences and perspectives of students regarding the practical implications of co-design in e-portfolio learning.

2. METHOD

The research utilizes a mixed-methods approach, primarily quantitative, featuring statistical correlations and descriptive analyses, complemented by qualitative components to enhance the pilot validation of the Co-PIRS model. Regarding the validation phase, this study employs the Sarabia and Alconero (2019) model and initiates with a pilot test involving a preliminary group of participants. This initial step is designed to pave the way for a subsequent, more comprehensive validation phase, which will incorporate more sophisticated statistical techniques, including Exploratory and Confirmatory Factor Analysis, on an expanded sample size.

2.1. The Instrument

2.1.1. Instrument development

An ad hoc questionnaire, adapted from Negre-Bennasar et al. (2023), was used to evaluate the Co-PIRS model, focusing on the coherence, adequacy, and clarity of its phases and associated tasks. The questionnaire begins with a consent form, followed by sections that collect general participant data and assess satisfaction with the e-portfolio experience, offering insights into the model's impact from the learners' perspective. It then specifically examines the Co-PIRS model, evaluating its coherence, adequacy, and clarity to understand its effectiveness and alignment with educational objectives. An open-ended section allows for participant feedback on potential model improvements, providing valuable insights for future enhancements.

2.1.2. Reliability

The satisfaction scale used in this study demonstrated high reliability, as evidenced by a Cronbach's Alpha of .909. This indicates that the items on the scale consistently measure the same underlying concept of learner satisfaction, implying that the questionnaire is a reliable measure of learner satisfaction.

2.1.3. Validity

To ensure the content validity of our survey, we adopted a collaborative development process, involving two researchers and subject matter experts who reviewed and refined the questions, drawing on a validation study by Negre-Bennasar et al. (2023) to ground our instrument in proven research while tailoring it to our specific needs. For face validity, we aimed to make the

survey visibly relevant to measuring learner satisfaction, piloting it with a small group of 5 students not involved in the study to identify and rectify any confusing elements. We prioritized simplicity and clarity in question design and offered the survey in both English and Chinese to accommodate all participants, enhancing accessibility and understanding.

2.2. Participants

The study involved thirty-nine 10th and 11th graders from a Hong Kong private school, following an international curriculum and serving upper-middle socio-economic families. Due to incomplete responses, the sample was narrowed to thirty-six students, aged 15-17, comprising eleven females and twenty-five males. These participants, all experienced in e-portfolio use, voluntarily engaged in a semester-long co-design e-portfolio learning journey in their Chinese language class, offering critical insights into the Co-PIRS model's effectiveness.

2.3. Data Collection

Data collection began on-site at the school five months into the academic year, during the last class before the midterm break. Students received a detailed briefing on the study's goals and processes, with an emphasis on the voluntary nature of their participation and their right to withdraw at any time. To ensure informed responses, a comprehensive review of the Co-PIRS model was provided, aimed at reinforcing understanding and encouraging reflective engagement with the co-designed e-portfolio learning experience. With consent obtained, the survey was distributed electronically via Google Forms, with students using their school-issued MacBooks for access. This method streamlined data collection, allowing for prompt, organized responses in a controlled environment, and ensured respondent anonymity, facilitating the effective gathering and analysis of data.

2.4. Data Analysis

The collected data was analyzed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) version 29. Excel served as the primary tool for organizing and visualizing descriptive statistics, and SPSS was used for inferential statistical analysis.

Excel was implemented to look at the satisfaction-related data distribution through line graphs and bar charts. SPSS 29 was used for correlation analysis. After confirming the non-normal distribution of variables through preliminary tests (Sig. values < 0.001), Spearman's correlation was chosen due to its suitability for non-parametric data. This method analyzed the relationships between variables like student satisfaction, motivation, and dedication within the e-portfolio learning context, including perceptions of teachers, learning design, and tools.

3. RESULTS

The findings exhibit the following sub-sections to address the three research questions.

3.1. RQ1: Students' satisfaction, motivation, and dedication

The study found a perfect correlation between motivation and dedication, suggesting students view these aspects nearly identically. Additionally, a significant positive correlation between satisfaction and both dedication and motivation indicates that higher satisfaction is linked to increased motivation and dedication. According to Figure 2, all participants rated their satisfaction, motivation, and dedication above 3 on a 5-point Likert scale, reflecting overall positive perceptions of the e-portfolio learning experience.

Table 1

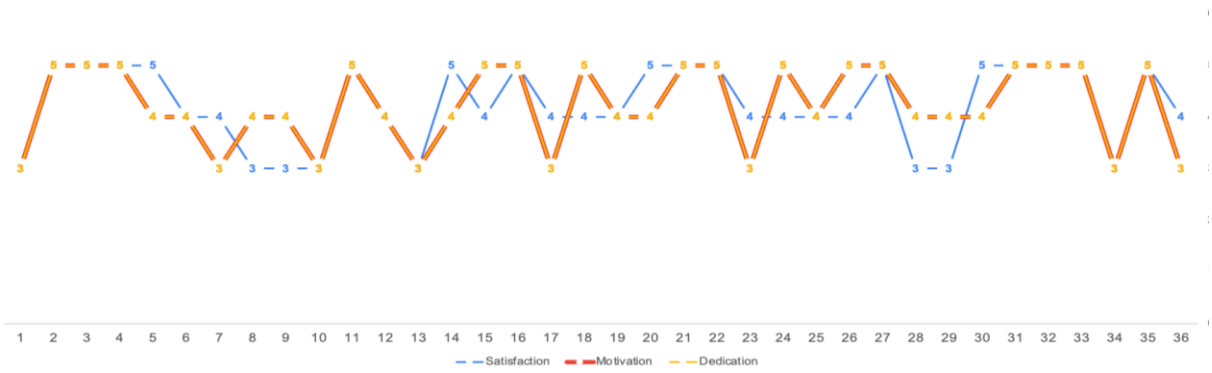
Correlations satisfaction, motivation, dedication

			Satisfaction	Motivation	Dedication
Spearman's rho	Satisfaction	Correlation Coefficient	1.000	.648**	.648**
		Sig. (2-tailed)	.	<.001	<.001
		N	36	36	36
	Motivation	Correlation Coefficient	.648**	1.000	1.000**
		Sig. (2-tailed)	<.001	.	.
		N	36	36	36
	Dedication	Correlation Coefficient	.648**	1.000**	1.000
		Sig. (2-tailed)	<.001	.	.
		N	36	36	36

**Correlation is significant at the 0.01 level (2-tailed)

Figure 2

Data distribution satisfaction, motivation, dedication



3.2. RQ 2: Students' satisfaction and its components

3.2.1. Teacher

The study explored the impact of teacher-related factors on student satisfaction, focusing on four key areas (Table 2):

- Teacher Attitude and Encouragement: A significant moderate positive correlation was found, indicating that positive teacher attitudes and encouragement are linked to higher student satisfaction. This suggests that a supportive teacher demeanor can positively affect learner contentment.
- Teacher Instruction Clarity: A non-significant negative correlation with student satisfaction was observed, suggesting that instruction clarity alone may not be a strong determinant of student satisfaction. This indicates that other factors might play a more crucial role in influencing satisfaction levels.
- Teachers Foster Participation: A strong positive correlation highlighted the significant impact of teachers promoting participation on student satisfaction. This emphasizes the value of interactive and engaging teaching methods in enhancing student contentment.
- Teacher Evaluation and Feedback: A significant moderate positive correlation was found, indicating that constructive feedback and fair evaluation are important to students and positively influence their satisfaction with the learning experience.

Table 2

Correlations_teacher related factors

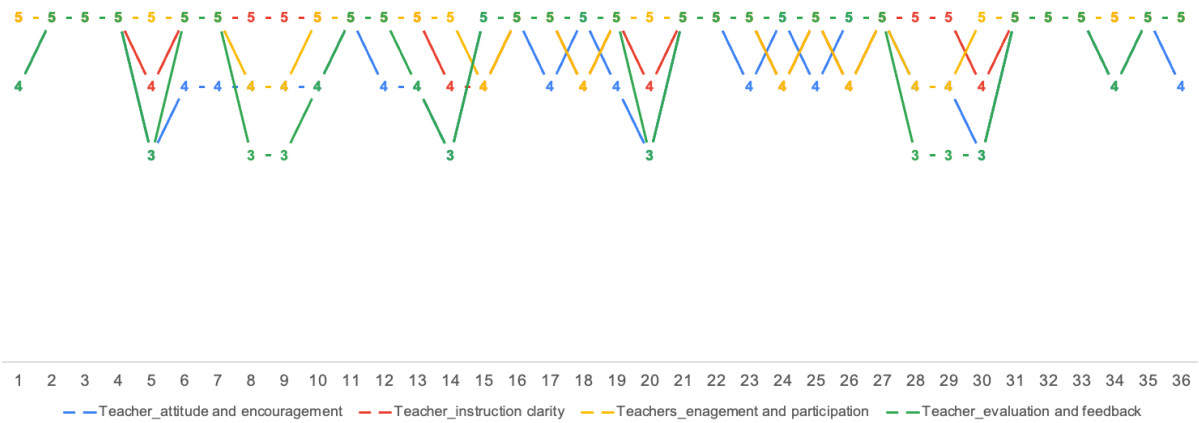
			Satisfaction	Attitude and encouragement	Instruction clarity	Foster participation and engagement	Evaluation and feedback
Spearman's rho	Satisfaction	Correlation Coefficient	1.000	.385*	-.166	.498**	.367*
		Sig. (2-tailed)	.	.020	.333	.002	.028
		N	36	36	36	36	36

**Correlation is significant at the 0.05 level (2-tailed)*
***Correlation is significant at the 0.01 level (2-tailed).*

Based on the descriptive data (see Figure 3), teachers' instruction clarity and encouragement for engagement and participation are highly valued, with a rating of 4-5 out of the 5 Likert scale. This emphasizes the importance of teachers' influence on students' sense of engagement. Also, the participants valued the teacher's attitude and encouragement. Compared with other factors, teacher's evaluation and feedback appeared to have a few 3, lower than other components; this implies that teachers' ongoing assessment and feedback should be further addressed.

Figure 3

Data distribution_teacher related factors



3.2.2. Learning design

The analysis of student satisfaction in relation to learning design revealed (see Table 3):

- Materials Usefulness: Exhibited a slight negative, but insignificant correlation, suggesting materials' utility might not strongly affect satisfaction.
- After-classroom Activities: Showed a moderate positive correlation, indicating their positive impact on satisfaction.
- Workload Adequacy: Had a positive but non-significant correlation, implying workload perceptions might not greatly influence satisfaction.
- Learning Activities: Demonstrated a moderate positive and significant correlation, highlighting their importance in enhancing satisfaction.

Table 3

Correlations_learning design-related factors

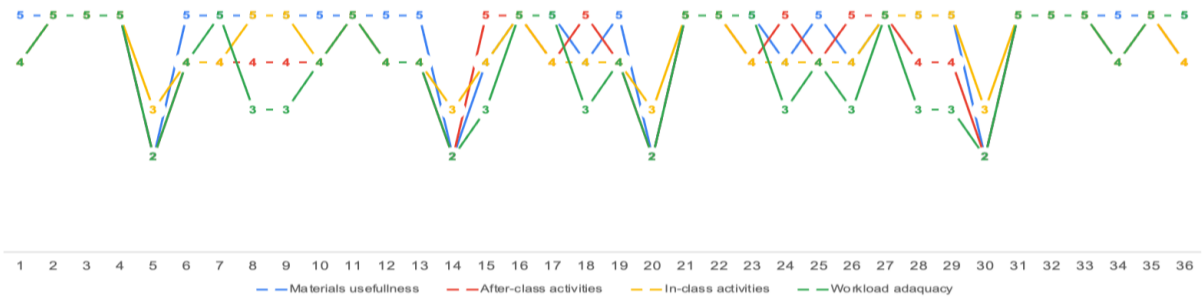
			Satisfaction	Materials usefulness	Usefulness of after classroom learning activities	Workload adequacy	Learning activities
Spearman's rho	Satisfaction	Correlation Coefficient	1.000	-.207	.385*	.190	.371*
		Sig. (2-tailed)	.	.225	.020	.266	.026
		N	36	36	36	36	36

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

In Figure 4, the descriptive data entails that the students are satisfied with in-class activities overall, with all participants rating over 3. Some students rated 2 for workload adequacy, indicating they perceive the workload to be insufficient or too much. Several students also rate the usefulness of materials and after-class activities as 2, but most rates are 4-5.

Figure 4

Image caption



3.2.3. Tool utilization: e-portfolio

The analysis of ePortfolio components indicated their significant impact on student satisfaction, with each aspect interlinked to enhance the educational experience (Table 4). The ePortfolio's utility as a learning aid showed a moderate positive correlation, suggesting that students find it a valuable tool, thereby increasing their satisfaction. Furthermore, the assessment and evaluation functions within the ePortfolio demonstrated a very strong positive relationship with satisfaction, underscoring the importance of effective evaluation methods in the educational journey. Most notably, the role of the ePortfolio in knowledge and skills development was highlighted by an extremely strong positive correlation, pointing to its critical influence in enriching students' learning outcomes and overall satisfaction with their educational experience.

Table 4

Correlations_e-portfolio related factors

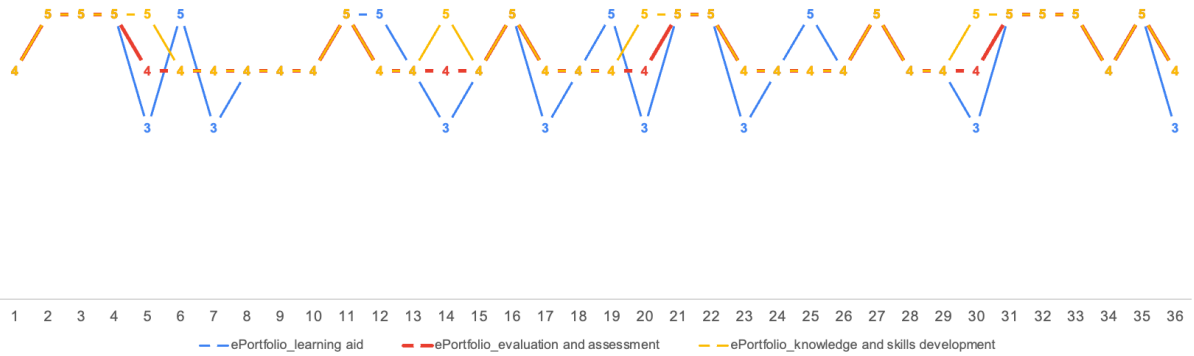
			Satisfaction	Learning aid	Assessment and evaluation	Knowledge/skills development
Spearman's rho	Satisfaction	Correlation Coefficient	1.000	.362*	.732**	.926**
		Sig. (2-tailed)	.	.030	<.001	<.001
		N	36	36	36	36

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 5 demonstrates that all participants scored 3 and above for their satisfaction with the e-portfolio as a learning tool. Particularly on assessment, evaluation, and skills and knowledge development, with all participants rating 4 or 5. The participants also approve E-portfolios used for learning aids, but some rate it 3. This indicates that the e-portfolio's function as a learning aid can be further addressed.

Figure 5

Data distribution-portfolio related factors



3.3. RQ 3: Validation and suggestions

This section presents the findings from the evaluation of the Co-PIRS model's implementation, focusing on the assessment of specific actions within each phase of the model. The evaluation criteria were centered on three key aspects:

- Coherence: how well the actions within each phase were interconnected and aligned with the objectives of that particular phase of the e-portfolio implementation.
- Adequacy: how well the actions were tailored to fit the context and conditions of the process during the respective phase of e-portfolio utilization.
- Clarity: in relation to the ease of understanding the actions to be taken in this phase of the implementation.

The suggestions for elimination, modification, and inclusion from the participants are also included in the following sections.

3.3.1. Planning Phase

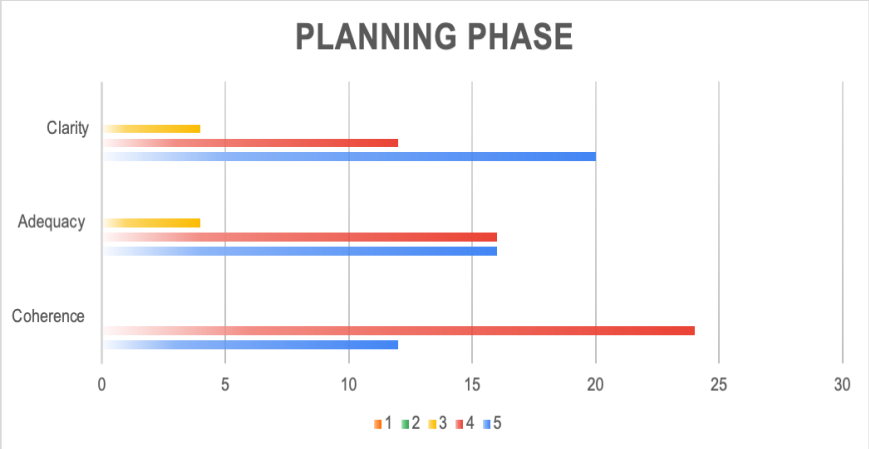
Figure 6 indicates participants' rating on the coherence, adequacy, and clarity of the tasks on the planning phase of the Co-PIRS model.

- Coherence: Majority of participants (24) rated Coherence at 4, indicating that the actions were well-connected and aligned with the objectives of the Planning phase but might benefit from minor improvements. A notable number of participants (12) felt the Coherence deserved the highest rating (5), suggesting excellent interconnection of actions within this phase.

- Adequacy: Ratings were evenly split between 4 and 5 (16 responses each), indicating that most participants found the actions to be well-tailored to the project's conditions during the Planning phase. A small number (4) rated Adequacy at 3, suggesting that while generally adequate, there could be room for better customization.
- Clarity: Clarity received the highest number of top ratings (20 for 5), showing that most participants found the actions to be clearly understandable. Fewer participants (12) rated it at 4, with a very small group (4) giving it a 3, indicating a slight need for improved clarity.

Figure 6

Coherence, adequacy, and clarity_Planning



According to Table 5, almost half of the participants (n=17, 47%) wanted to eliminate some tasks in the Planning phase, including Discuss with teachers (Students' actions) and Discuss with peers (Students' actions). They further stated that planning and objectives-setting should be more independent. Some students intended to modify some actions (n=13, 36%), such as Platform/tools selection (Teachers' actions), which is highlighted by multiple students; one students claimed "I am not satisfied with the platform that I am using at the moment". Also, Make detailed plans collaboratively (Students' actions) were suggested to be modified, the students stated "having some thoughts is fine, no need to have detailed plan at the very beginning".

Regarding the items to be included, two students (6%) recommended adding a modelling component before some complicated tasks, in the teachers' action.

Table 5

Participants' suggestion_Planning

Actions	Frequency	%
Elimination	17	47%
Modification	13	36%
Inclusion	2	6%

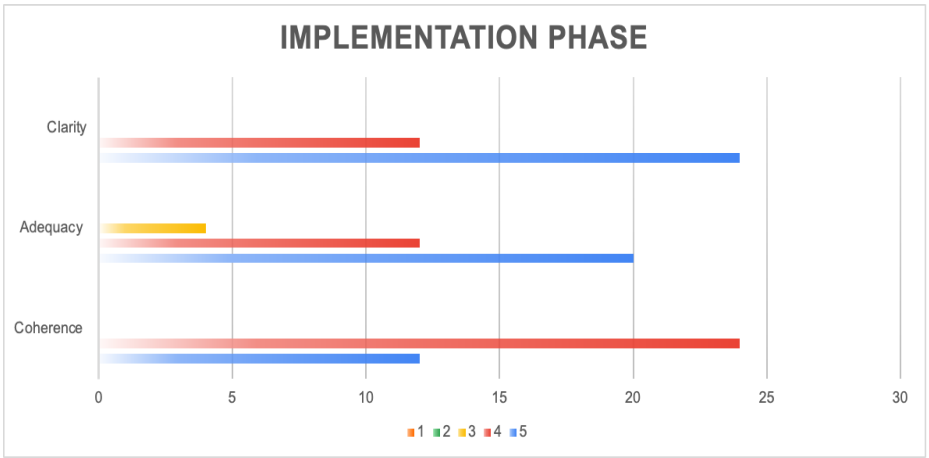
3.3.2. Implementation phase

The evaluation of the implementation phase is shown in Figure 7.

- Coherence: Ratings are identical to the Planning phase for the top two tiers (12 for 5 and 24 for 4), indicating a consistent perception of logical consistency and alignment during the Implementation phase.
- Adequacy: Adequacy received more top ratings (5) in this phase (20 responses), suggesting that the actions were seen as more tailored to the process conditions compared to the Planning phase. Like Planning, some room for improvement is indicated by the 16 responses at a 4 and the 4 responses at a 3.
- Clarity: Clarity is rated highest among the three aspects in this phase (24 for 5), implying that the actions to be taken were most understandable during the Implementation phase. Consistent with Planning, a smaller number of participants rated Clarity at 4 (12 responses), and none rated it below 3.

Figure 7

Coherence, adequacy, and clarity_Implementation



It is observed that some students expressed their feedback on eliminating (n = 7, 19%) and modifying (n = 10, 28%) some action in this phase. Several students wanted to remove the action of Document and design e-portfolios collaboratively with peers (students' action) since they prefer to do it themselves. The action of encouraging students' autonomy by guiding the

use of learning materials and resources (teachers' action) was also emphasized in students' comment since some of believe that "students' autonomy is far from enough."

For task inclusion suggestions, one student recommended adding the action of enabling students' to choose the tasks to record on e-portfolios, since some prefer electronic tasks, some prefer paper-pen-based work.

Table 6

Participants' suggestion_Implementation

Actions	Frequency	%
Elimination	7	19%
Modification	10	28%
Inclusion	3	8%

3.3.3. Reflection and Revision phase

Figure 8 demonstrates the assessment of the Reflection and Revision phase in terms of clarity, adequacy, and clarity.

- Coherence: The highest ratings (5) increased slightly (17 responses) compared to the previous phases, indicating better alignment of actions within this phase. There is a slight increase in the number of 3 ratings (6 responses) suggesting a few participants found some actions less coherent.
- Adequacy: Adequacy remained high with the majority rating it at 5 (19 responses) and 4 (13 responses), but there was one response at 2, indicating a single concern regarding the fit of the actions.
- Clarity: Clarity ratings are similar to Adequacy with a high level of agreement (18 for 5 and 15 for 4), but again, there are a few responses at 3, signaling a need for minor improvements in understanding.

Figure 8

Coherence, adequacy, and clarity_Reflection and Revision

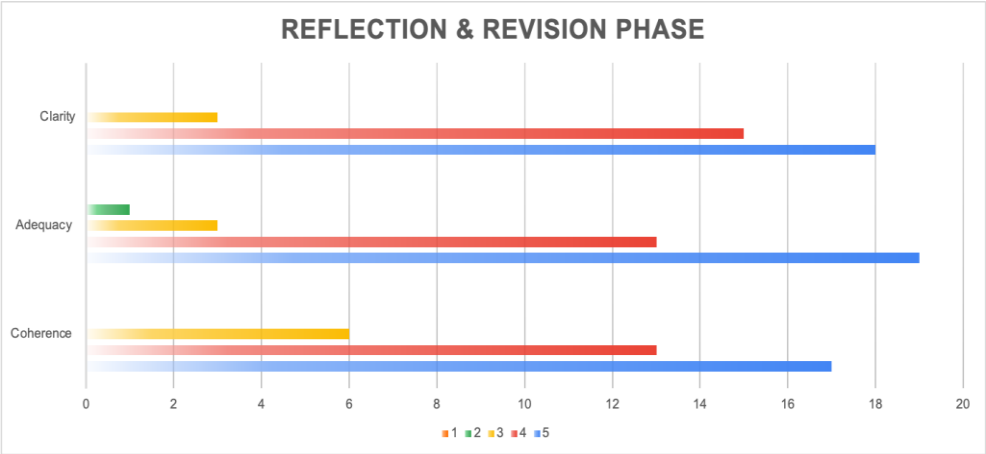


Table 7 portrays the participants' suggestions on the Reflection and Revision phase. There is no mention of including additional actions. Eleven students (31%) and eight (22%) would like to modify and eliminate some actions, respectively. Peer evaluation (students' action) was mentioned by multiple participants to be removed. They think peer feedback is good enough and that peer evaluation is unnecessary since this may affect their mark. For modification, Revising and optimizing (students' action) were most emphasized; some students stated, "I don't think revising is necessary; it is too much work. Reflection is enough."

Table 7

Participants' suggestion_Reflection and Revision

Actions	Frequency	%
Elimination	8	22%
Modification	11	31%
Inclusion	0	0

3.3.4. Showcase phase

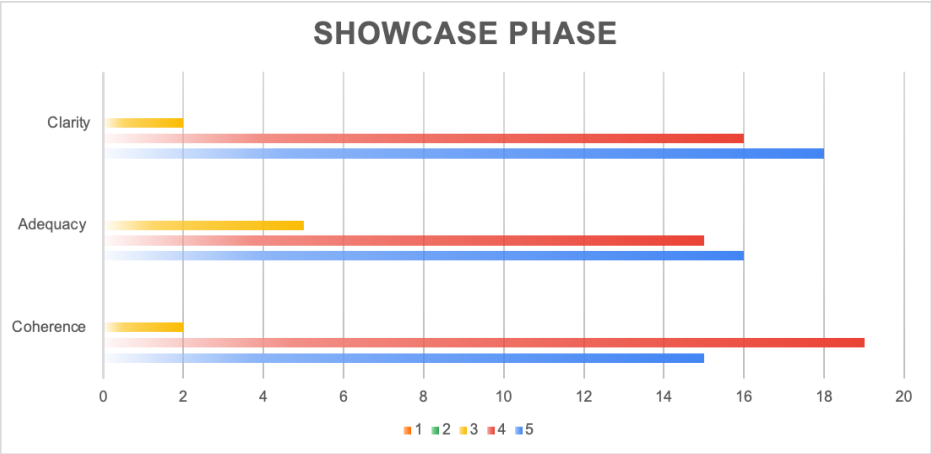
The rating of the Showcase phase is depicted in Figure 9.

- Coherence: Coherence ratings remain high, with more responses at 4 (19) than 5 (15), suggesting consistent but not perfect alignment. A small number of participants rated it at 3 (2 responses), indicating minor inconsistencies.
- Adequacy: Adequacy ratings are quite balanced across the top two tiers (16 for 5 and 15 for 4), with a slight increase in the number of 3 ratings (5 responses), suggesting some actions were less tailored than others.
- Clarity: Clarity is perceived slightly better than Adequacy, with a higher number of top ratings (18 for 5) and an equal number of 4 ratings (16), indicating clear understanding

for most participants. Only a couple of participants rated Clarity at 3, hinting at the need for marginal enhancements in articulation.

Figure 9

Coherence, adequacy, and clarity_Showcase



The students' feedback on the actions in the Showcase phase is shown in Table 8. There was one comment on additional inclusion (3%); the student did not mention what to include. Seven students (19%) would like to remove the Self-reflection (students' action) and Acknowledge the usefulness of learning materials and resources for future learning (students' action) actions since they believe it is repetitive with the previous phase. One claimed, "This can be part of the reflection."

Nine participants suggested modifying some actions, including Giving summative feedback (teacher's action) and Summative evaluation (teacher's action). Some said, "I am figuring out how to work on this with e-portfolio," since they believe that e-portfolio learning is formative learning with ongoing formative assessments.

Table 8

Participants' suggestion_Showcase

Actions	Frequency	%
Elimination	7	19%
Modification	9	25%
Inclusion	1	3%

Overall, the data reveals that the Co-PIRS model was well received throughout all phases, with the highest ratings consistently given to Clarity. This indicates that the participants considered the actions easy to understand. Strong ratings were also given to Coherence and Adequacy. However, there are indications that specific elements of the model could be enhanced to align and customize the actions with the conditions and objectives of the model more precisely. The model could be improved to maximize its efficacy, as indicated by the few 3 ratings spanning various phases and aspects. Besides, the students suggested eliminating, modifying, or adding

some actions. Those suggestions guide the further update of the Co-PIRS model to make it more concise and streamlined. The updated model is described in the Discussion section.

4. DISCUSSION AND CONCLUSIONS

The Co-PIRS model pilot validation study contributes to understanding e-portfolio learning, particularly the interplay between co-design practices and learner experiences. This discussion reflects on the study's findings, focusing on students' satisfaction, motivation, commitment, and the impact of teacher-related factors, instructional design, and e-portfolio tool implementation. Additionally, it addresses the Co-PIRS model refinement implications.

4.1. Interrelation of Satisfaction, Motivation, and Dedication

The study reveals a perfect correlation between motivation and dedication and their significant positive correlation with satisfaction. It underlines a foundational principle in educational psychology: the intrinsic link between learners' emotional states and their engagement and perseverance in learning tasks (Ryan & Deci, 2000). The findings suggest that students are simultaneously motivated when dedicated to their e-portfolio learning journey, which is consistent with the literature linking motivation and dedication as parallel constructs in educational experiences (Schunk et al., 2014). Furthermore, the significant positive correlation between satisfaction and dedication, as well as satisfaction and motivation, highlights the importance of satisfaction as a driver for student engagement, aligning with Ryan and Deci's (2000) previous publication on self-determination theory, which states that satisfaction of basic psychological needs enhances motivation and engagement. The high levels of satisfaction reported by participants in co-designed e-portfolio learning environments suggest that such settings may effectively meet these psychological needs, thereby enhancing motivation and dedication.

4.2. Students' Satisfaction and Teacher-related Factors

The findings on teacher-related factors and student satisfaction shed light on the teacher's role within the Co-PIRS framework, suggesting that teacher encouragement and positive attitudes moderately enhance student satisfaction, aligning with Göktaş and Kaya's (2023) emphasis on the importance of teacher-student relationships. Surprisingly, a negative correlation between instruction clarity and satisfaction challenges conventional beliefs about the value of clear instruction, posited by Fendler et al. (2016). This might indicate that in a co-design environment, where student agency is prioritized, overly directive instruction could feel restrictive, hinting at the need for a balance between clear guidance and learner autonomy. The positive impact of teacher-facilitated participation on satisfaction further highlights the importance of active learning, resonating with Campen et al. (2023), who underscore the value of teacher feedback in enhancing the educational experience.

4.3. Students' Satisfaction and Learning Design

The negative correlation between material usefulness and student satisfaction contradicts common beliefs about material quality impacting satisfaction (Pham et al., 2019), suggesting a misalignment with students' goals or co-design needs, emphasizing the importance of material relevance. The positive correlation between after-classroom activities and satisfaction supports the idea that practical application enhances engagement (Doo, 2021), highlighting the value of experiential learning outside the classroom. The lack of strong correlation between workload adequacy and satisfaction implies students prioritize assignment quality over quantity (Khonamri & Pavlíková, 2020), suggesting the significance of assignment relevance. The positive relationship between engaging learning activities and satisfaction points to the necessity of activities that promote deep understanding and reflection (Sølvik & Glenna, 2022), stressing the importance of interactive and meaningful activities in the learning process.

4.4. Students' Satisfaction and e-Portfolio

The e-portfolio's positive impact on learning aid satisfaction underscores its value in enhancing student engagement by facilitating reflection and progress tracking (Ismailov & Laurier, 2021). Its strong correlation with assessment satisfaction highlights the importance of personalized feedback through e-portfolios, promoting a more engaging learning experience (Muin et al., 2021). Furthermore, the significant link between e-portfolios and knowledge and skills development satisfaction emphasizes their role in visualizing learning progress, crucial for student fulfillment (Jääskelä et al., 2017).

4.5. Co-PIRS Model Refinement

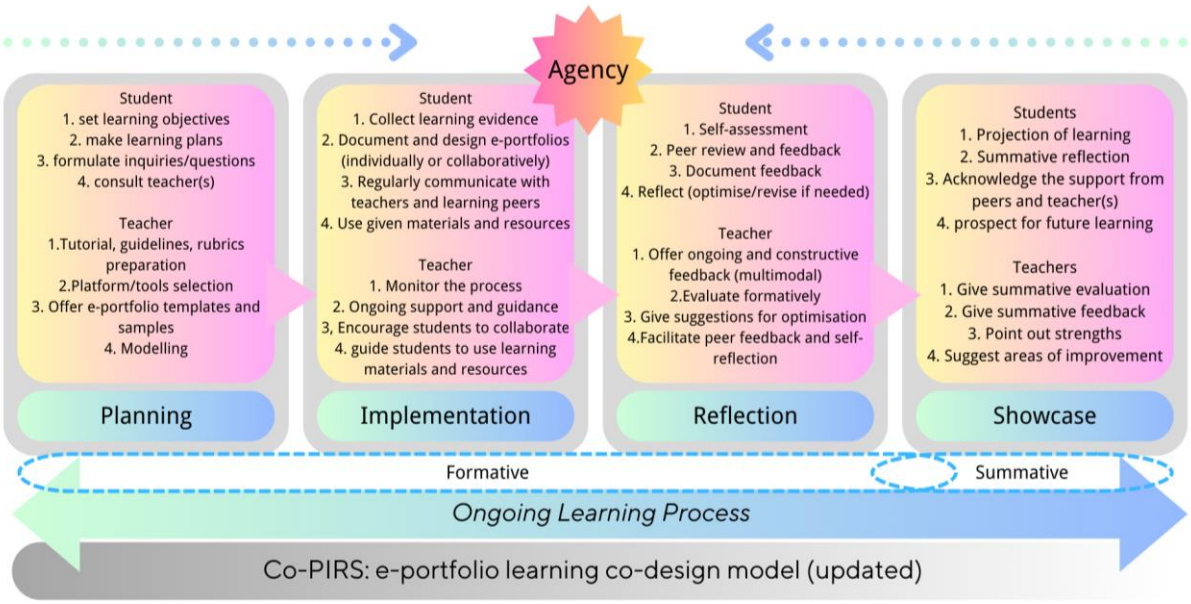
Feedback on the Co-PIRS model indicates high overall satisfaction but identifies areas for improvement to enhance its flexibility and adaptability. Participants suggest streamlining actions, simplifying language, and offering clear explanations to improve user-friendliness. Specific recommendations include:

- Planning Phase: Lessen the focus on mandatory collaboration to allow for more autonomy.
- Implementation Phase: Provide options for both collaborative and individual documentation, with a preference for collaborative efforts.
- Reflection Phase: Eliminate revision components, deemed redundant within the reflection process, to alleviate workload concerns; shift from peer evaluation to feedback, and streamline the reflection for efficiency without sacrificing depth.
- Showcase Phase: Enhance distinction from earlier phases and clarify the balance between formative and summative assessments.

Considering these elements, an updated Co-PIRS model has been proposed, integrating these refinements (see Figure 10).

Figure 10

The updated Co-PIRS model



4.6. Implication

The pilot validation of the Co-PIRS model emphasizes its importance for educational research, highlighting the impact of co-design on learner agency and the need for further study across various educational levels. It points to the significance of teacher strategies, material utility versus learner satisfaction, and suitable workload in co-designed e-portfolios. The validation process in this work is in itself a contribution to research in educational innovation, and in particular in the e-portfolio field, since the pilot stage allows implementing in small contexts, informs the model and prepares both the practice and the research instrument for further scalable contexts.

For educators, the findings stress the importance of co-design training, creating relevant materials, and using e-portfolios for reflection and assessment to enhance learner autonomy and feedback mechanisms.

Policymakers are advised to support e-portfolio co-design learning infrastructure and training, ensuring the availability of adaptable e-portfolio systems that promote student agency and satisfaction.

The model's analysis supports e-portfolios' role in boosting student satisfaction and skill development, advocating for their adaptation in diverse educational settings. The study champions a learning paradigm that values personalized and co-designed experiences, emphasizing learner empowerment.

4.7. Conclusion

The Co-PIRS model's pilot validation highlights its effectiveness in enhancing learner agency, satisfaction, and engagement through e-portfolio co-design, emphasizing the importance of teacher involvement and tool functionality. These insights guide educators and policymakers in fostering learner-centered approaches and inform ongoing refinements to the model and e-portfolio learning practices.

The study's limitations include a small sample size of 36 and its setting in a Hong Kong private school, potentially affecting the generalizability and cultural applicability of the findings. The reliance on self-reported questionnaires and the short evaluation period may also limit the study's scope, suggesting a need for more diverse and longitudinal research.

Future studies should aim for broader participant diversity and incorporate expert insights, possibly through Delphi studies. Employing methodological triangulation and extending the research timeframe could enhance validity and provide a comprehensive understanding of the Co-PIRS model's long-term impact. These efforts will deepen the understanding of co-design e-portfolio practices and their role in educational innovation.

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