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Complete List of Authors:	Babovic, Mojca; Chang Gung Memorial Hospital Linkou Branch, Chang Gung Medical Education Research Centre (CG-MERC) Fu, Ren-Huei; Chang Gung Memorial Hospital Linkou Branch, Chang Gung Medical Education Research Centre (CG-MERC) Monrouxe, Lynn V; Chang Gung Memorial Hospital Taoyuan Branch, Chang Gung Medical Education Research Centre (CG-MERC)
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Understanding how to enhance efficacy and effectiveness of feedback via e-portfolio: A realist synthesis protocol

Mojca Babovič
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Linkou
Taiwan (R.O.C.)

Dr Ren-Huei Fu
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Linkou
Taiwan (R.O.C.)

Prof Lynn V Monrouxe
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Linkou
Taiwan (R.O.C.)

Contact details for corresponding author:
Prof Lynn V Monrouxe
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Education Building
No. 5, Fuxing Street, Guishan District
Taoyuan City
Taiwan (R.O.C.)

Telephone: +886975367748
Email: monrouxe@me.com

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Abstract

Introduction

The validity of feedback as one of the defining components for electronic portfolios (e-portfolios) to be effective and efficacious has yet to be demonstrated. While the literature has shown individual beneficial features of e-portfolios and feedback *per se*, evidence of feedback as mediated through technology directly resulting in improved educational practice is scarce. The explanation of *how* feedback via e-portfolio improves educational practice is particularly vague.

Methods and Analysis

The aim of this research is to unpack *how* and *why* feedback via e-portfolio is likely to flourish or wither on its path. Given the complexity of intervention, we will apply a theory driven approach for evidence synthesis called realist synthesis. Informed by realist philosophy of science, it seems the most appropriate method because it explores observed outcomes (O) in terms of causal relationship between relevant contexts (C) and generating mechanisms (M). Initial programme theory will be developed through literature scoping. Later on it will be tested against purposively gathered evidence (through database and journal search), which simultaneously will be evaluated for rigor and relevance (whether method used are trustworthy and whether data contributes to theory building). We strive to (1) uncover "context sensitive" mechanisms that generate feedback via e–portfolio to be (in) effective and (2) define in what circumstances is this mostly likely to occur.

Ethics and Dissemination

The synthesis' report will be written according to RAMESES guidelines and its findings will be published in peer reviewed articles and presented at relevant conferences. The aim is to inform: (a) policy and decision makers for future course design; (b) medical educators/clinical supervisors and learners for improved educational use. No formal ethical approval is required.

Registration details: The protocol is pending for PROSPERO registration (ID no. 120863).

Article Summary

Strengths and Limitations of this study

- With realist synthesis we account for the breadth and depth of analyses appropriate for complex educational interventions
- No prior realist synthesis has been undertaken on the topic of *how* feedback vie e-portfolio works effectively
- In developing our initial programme theory we include stakeholder groups' input
- Content experts are not included in programme development
- Only studies published in English language will be searched

BACKGROUND

Introduction

The interest in electronic portfolio (e-portfolios) use in healthcare education has been on the rise. This is probably because both portfolios in general and electronic versions in particular have shown to be beneficial to the user. In all its complexity of design, content and interface,[1 2] what makes them stand out from other educational tools is their ability to encourage reflective practices and self-directed learning,[3 4] which caters perfectly to educational discourse that emphasizes competence-oriented, individualized learning styles. By emphasizing feelings of ownership and personal development,[5] they encourage learners to become more self-aware of their learning process and more responsible for their own creation, maintenance and presentation.[6]

Contextual use of electronic portfolios in healthcare education

E-portfolio in healthcare education is foregrounded in its flexibility of access, repository, and content.[2 7-9] When explaining its usage, scholars tend to emphasize its contextualization. For instance, the nature of implementation, design and content[10-13] and the individual perceptions of ease of use and usefulness[14] are all important facets affecting the e-portfolio use and its potential to fundamentally transform the learning process.

Rather than dwelling in the notion of e-portfolio being merely a combination of portfolio and technology,[15] in this paper, we try to argue how organizational, cultural and individual factors present a significant entry point for theorizing the e-portfolio use. More importantly, we do so by focusing specifically on feedback portrayed via e-portfolio. We aim to understand (1) in what circumstances does feedback via e-portfolio work most effectively and (2) whether this relates to fortunes and mishaps of e-portfolio use?

Effectiveness of feedback via e-portfolio

Feedback plays an influential role on educational achievements,[16] and when employed in healthcare settings it is indispensable for successful learning, clinical teaching and improved clinical performance.[17 18] Surprisingly, in healthcare education, little is known about how feedback can be used to maximize its impact on learning, behavior and improved practice; and much less so when talking about technology-enhanced feedback. One reason for this might be that the majority of research papers on feedback published between 1980 and 2015 used the lowest of Kirkpatrick's levels of evaluation – assessing reactions to feedback – and amongst all the studies, only 7% out of 650 included articles were about computer-based feedback.[19] Literature interpreting feedback as one-way, educator–driven processes, with a focus on best delivery practices only, might be another reason. Indeed, educational studies have shown time and again that the

high variability of effective feedback is too complex for it only to be explained with the notion of delivery processes.[16 20] The many facets of learners' feedback seeking behaviors[21-24] as well as the gaps occurring between mentor's and learner's perceptions of the quantity, quality and efficacy of feedback have to be reconsidered if we are to completely understand feedback practice.

The aim of this research is to develop a model to facilitate feedback via e-portfolio, and thus enhance/ improve the responsiveness and use of feedback. Meaning, we need to understand the contextual workings for giving and receiving feedback in a technology enhanced environment. In addition, we have to consider not only the provision of information, but also the influence of the recipient's decision to receive feedback and all the contended responses which might subsequently arise.

METHODS

Aim

Focusing on higher educational settings internationally, we aim to understand why and how feedback via e-portfolio might produce different outcomes. For this purpose, we plan to use a Kirkpatrick hierarchy model modified by Tochel *et al* (2009) and distinguish outcomes that describe the impact of intervention in terms of:

(a) participants' reactions (e.g., their views on learning experiences, attitudes towards e-portfolio use and usefulness, aspects on the nature and efficiency of feedback);
(b) changes in participants' attitudes and learning (e.g., changes in perceiving e-portfolio or feedback as useful, acquisition of new concepts, improvement of skills)
(c) changes in participants' behaviors (motivational changes for further learning, active engagement with agency, e-portfolio content, application of new knowledge);
(d) changes in organizational practices and any improvements in the health and wellbeing of patients occurring because of the intervention.

Research questions

(RQ1) What outcomes are identified resulting from feedback via e-portfolio, and at what level do they occur?
(RQ2) What mechanisms are identified that are related to: (1) positive outcomes of feedback via e-portfolio, (2) negative outcomes of feedback via e-portfolio?
(RQ3) What are the contexts within which the mechanisms trigger these outcomes, and for whom?

Realist synthesis

To address our RQs, within a rapidly developing methodological field of data synthesis,[25] we choose a theory driven approach called realist synthesis.

Underlined by realist philosophy of science, the method's hallmark is in its generative understanding of causality. It holds that outcomes (O) of events are generated by/through underlined mechanisms (M), which may or may not occur in certain context (C).[26] Mechanisms are not "visible"- having their rooting in individual tendencies - and "context specific" – changeable according to the opportunities provided by specific context(s). Realist synthesis thus looks for interactions among the resources provided by the intervention and the reasoning and/or responses of the participants.[27] Rather than assessing variables associated with a particular outcome, the method's strength is in its ability to (1) explore generative mechanisms that underline main causes of (un)intended outcomes and (2) highlight the circumstances in which these mechanisms are triggered.

Realist synthesis starts with a programme theory and ends, if it has been successful, with a "revised, more nuanced and more powerful program theory".[28] (Re)building programme theory means to draw from theoretical descriptions of CMO relationships (middle range theories) that are close enough to the data that allow empirical/hypothetical testing. In our case, by synthesizing the data we will compare how feedback via e-portfolio was intended to work to the empirical data on the actuality in different situations – all with C-M-O relationships. In this manner we might explain some contingencies that influence the prospect of feedback via e-portfolio generating its intended outcomes.

Study Design

This protocol is pending for PROSPERO registration (ID No. 120863). It follows the iterative steps suggested by Pawson *et al.*,[26] as well as two realist synthesis protocols: one by Wong *et al.*[29] and the other by Pearson *et al.*[30] (See Appendix 1 for *Diagram of the Project).* We plan to report the actual realist synthesis according to RAMESES publication standards[31] and use a modified flow diagram.[29 32]

STEP 1: Clarify the scope, locate existing theories, develop programme theory

The objective in first step will be to conduct an exploratory (informal search) for various "working theories",[26] helping us to build an initial programme theory. In realist terms – underlining the relationship between the context, mechanisms and outcomes[28 31 33] –we are to explore ideas around how feedback via e-portfolio is intended to work and why sometimes things go astray. When getting a feel for the literature (its quality, quantity, as well as its boundary scope),[26] we will be mindful not to foreclose potentially important perspectives.[30] Therefore, we will conduct a broad electronic database scan for evidence, with no quality assessment in mind.[34] While the body of references will be narrowed down in *Step 2*, the documents in this stage will only need to contain information on e-portfolio related instruments (i.e., e-logbook, personal digital assistants, personal

development plans) and feedback /assessment/ evaluation. To further test the developing theory we will also conduct face-to-face interviews with e-portfolio users (clinical teachers and postgraduate trainees) as well as engage in discussion with the research team, who are familiar with the e-portfolio and feedback literature.

INITIAL PROGRAMME THEORY

We have started work on this stage and have a number of potential theories that might help explain the mechanisms underlying the effectiveness of feedback via e-portfolio (See Appendix 2 *Initial Programme Theory)*.

Theories of technology adaptation explain how perceptions of e-portfolio correlate to behavioral changes of e-portfolio usage.[35-37] For example, the possibility of motivational mechanisms (such as self-efficacy, subjective norms, level of e-learning enjoyment, experiences and computer anxiety) and their impact on perception of (O1, O2) and intention to use (O3). These theories can shed light onto whether the specific technology adopted might in any way affect the effectiveness and efficacy of feedback portrayed.

Another potentially valuable source for our programme theory development are theories on feedback responsiveness and seeking behaviors.[38-40] Assuming that response to feedback arise solely from one's sense of self-worth (mediated as MECHANISMS of fear from criticism, longing for appraisal, expectation of recognition), individuals are more likely to effortful engage with technology/ agency (O3) when they perceive feedback as being congruent with their selfhood (regardless of the intervention's context). On the other hand, individuals might be able to self-regulate their motivation in relation to a specific CONTEXT. As regulatory focus theory explains,[40 41] it is the "promotion" or "prevention foci" of the context that will dictate the nature of engagement with technology/agency. In realist terms, high engagement and behavioral changes (+/-O3) might occur *only* when positive aspects of the intervention are conducted in promotion aroused conditions (C), those regulated by wishes and desires; *or* when negative aspects of the intervention are given in prevention aroused conditions (C), those regulated by obligation and necessity. For example, in a "promotion foci" implementation context – such as where e-portfolio is voluntary, a part of formative assessment, the mentor comments on learner's tasks are positive - the learner will likely want to engage (M) with the mentor in an effortful manner (O3), or perhaps vigorously seek (M) new creative ways to continue the work (O3). By contrast, in a "prevention foci" implementation context – such as where e-portfolio is mandatory, part of summative evaluation, mentor gives negative comments – the learner will perhaps become extra hard-working (M) / hypervigilant just to avoid (M) punishment and rectify (M) the situation. In this situation, a negative aspect of the intervention (C) might lead to positive learning, behavioral changes (O3). On the other hand, if the mentor praises learner's assignments/ performance (C), it is more likely that the feeling will be

that no additional effort is needed (M, relaxation, indifference, disengagement), leading to no behavioral changes and low engagement with self, the mentor or e-portfolio (O)

Finally, the educational alliance theory states that behavioral changes to feedback happen according to learner's evaluation of mentor's credibility in a supervisor-trainee relationship.[42 43] This might be another source for potential theory development. For example, learners trusting in the credibility of the mentor (clinical competency, content credibility, personal characteristics), and the relationship (meaningfulness and authenticity), will more likely contemplate feedback in an effortful manner, which will also probably lead to behavioral changes (O3).

The initial theories uncovered during our searches will be reconsidered against the empirical data. As such, it is possible that only a small number will be prioritized for the synthesis, based on their greater resonance with that data.

STEP 2: Search for evidence

Utilizing a more formal search for published literature in four bibliographic databases (Web of Science, Scopus, Medline+Journal@Ovid, Wiley Online Library), we will look for sufficient evidence to refine, confirm or refute our initial programme theory (See Appendix 3 *Example Search Strategy for Medline+Journals@Ovid*). Specifically, we will look for: (1) empirical (peer-reviewed full articles) and non-empirical literature (e.g., review, opinion pieces, editorials, commentaries, abstracts from conferences, process evaluations, program manuals) as long as they comply with our rigor and relevance criteria;[31 33] (2) studies of all types of research design will be included; (3) articles published in English; (4) between 2008 and 2017; (5) with participants (learner and educator role) in healthcare and higher educational settings in Taiwan and abroad (See Appendix 4 *Definitions of concepts* and Appendix 5 *Inclusion/ Exclusion Criteria for Formal Search*).

Because there is no finite set of relevant papers that can be strategically defined and found, compared to a more traditional systematic review, realist synthesis adopts an iterative approach to searching for multiple types of evidence.[26] In order to explore the literature deeper for theoretical elements which might help to explain new findings, or re-examine certain aspects of developing theory,[33] we expect to undertake additional inquires such as: (1) hand searching relevant journals (related to e-learning, e-portfolio or feedback in educational setting such as *British Journal of Educational Technology*, *Australian Journal of Educational Technology, Electronic Journal of e-learning (EJEL)*, *International Journal of eportfolios (IJeP)*; (2) using citation tracking (pearling); (3) skimming through various grey literature platforms (https://www.jisc.ac.uk/); and (4) coming across evidence by chance. Additional searches will be purposeful, focusing on relevant sources for developing programme theory. For all searches, we will make augments in our preliminary

criteria (e.g., include papers that are missing sufficient data, or not in the timeframe).

STEP 3: Study selection procedure and appraisal

After importing references into *Endnote 9* we will undertake the study selection in two phases. Firstly, we will screen based on title and abstract, excluding all references not specifically mentioning web/online portfolios *and* the feedback, assessment, evaluation portrayed in it. Secondly, we will look at the full text documents to further exclude based on the following questions: Does this paper (or section of it) involve feedback via e-portfolio, that (a) is described as an ongoing (direct or indirect) interaction between receiver and giver using e-portfolio as educational tool: (b) takes place in higher (healthcare) educational setting? Using the preliminary set of inclusion/ exclusion rationales, the lead researcher (LVM) will check a randomly selected sample of 20% of the identified documents. The remaining will be screened by two reviewers. Any discrepancies will be discussed until reaching an agreement.

Aligned with RAMESSES standards and proposed quality judgments,[31 33] we will appraise the quality of included content of a section of a text as: (1) relevant**,** if they address or contribute to theories we are exploring; and (2) rigor, if the methods used to generate that particular data are credible and trustworthy. Quality judgments will be made on "the level of arguments and theory" rather merely on "the level of data" allowing us to consider evidence seemingly of lesser quality yet potentially relevant to programme theory development. [34] However, to give an indication of the "coherence, plausibility and appropriateness"[31] of our selection, we will (a) apply elemental methodological questions[44] for rigor; and (b) use a hybrid tool[30 45 46] to distinguish conceptually thick (rich) material from conceptually thin (weaker) according to its ability to provide explanations to developing programme theory. This tool has been shown to be useful in theory-driven synthesis just because it gives the option to focus on richer sources of programme theory without denying the weaker ones as well [47] (See Appendix 6 *Test for assessing relevance and rigor*).

STEP 4: Data Extraction and Organization

For the included full text papers, we will develop a data extraction sheet to provide an accessible overview of our findings (See Appendix 7 *Data Extraction Table)* as well as importing them into *Atlas.ti* 8 for further coding of the themes. While coding, we will consider the raw data, textual descriptive findings as well as authors' interpretations written in the results or discussion section. For non-research papers we will consider various forms of textual descriptions. All relevant sections – relating to context, mechanisms and their relationships to outcomes – will be coded deductively (conceptual themes/ codes created from initial programme theory developed prior to data extraction) and inductively (conceptual themes/ codes recognized during the process). Should the paper

contribute to only one specific element of the C-M-O, we will not discard it, as we will be able to make inferences from other sources.

STEP 5: Data synthesis

To refine and further explain the developing programme theory, through the data synthesis process, we will simultaneously analyze evidence for potential C-M-Os and organize them in themes and semi predictable patterns.

- To identify potential C-M-Os we will think "'backwards' from the outcome" [48] and will try to identify the causal mechanisms alongside the contexts within they are associated. We will be careful not to presume there is only one outcome within the chain of events;
- When thematically organizing the data, we will take a similar approach to that described by many other researches: [28 30 45 46]

Juxtapose sources of evidence, for instance, when data about the effects of feedback via e-portfolio in one paper will allow an insight on its effective patterns in another paper;

Reconcile sources and identify differences, such as, understanding why different results might occur in apparently similar situations;

Adjudicate sources of evidence and make judgments between studies based on their methodological strengths and weaknesses;

Consolidate sources of evidence, by creating a multi-faceted explanation of the intervention. That is, whenever we have different outcomes in particular contexts, we will try to explain how and why this might occur.

Situate sources of evidence, for example when a particular mechanism is triggered in context A, while another mechanism might only occur in context B.

During this stage, the programme theory will be redeveloping and in its refinement. As we delve into our included studies and beyond we will be mindful of unexpected patterns, which might inform us of new middle range theories, thereby further explaining dynamics around e-portfolio being an effective means for the feedback process. Considering we expect to find limited data specific for our enquiry, we recognize that some of the theoretical assumptions we will make might be weakly supported. Nevertheless, throughout our work we will be fully transparent about the levels of evidence available to support/ refute our hypotheses, giving the reader the space to decide exactly how much of it is relevant.

Patient and Public Involvement Statement

This realist synthesis around feedback via e-portfolio will be done without patient and public involvement. Our rationale for this is, that, to the best of our knowledge, patients are not typically involved in this aspect of clinical education As such, patients will not be invited to contribute to study design, to interpretation of the results, or help with writing, editing of the document. Also,

we will not include them when developing dissemination strategy.

ETHICS AND DISSEMINATION

No formal ethical approval is required for this synthesis. We aim to publish our findings in at least one peer review journal as well as present them to relevant bodies including broader educational institutions. At present, we have a fairly vague understanding of the complex dynamics between e-portfolio and feedback, even more unclear are all contingencies closely linked to it. By applying a method that has the analytical strength to provide insight into the complexity, [28] we hope to pinpoint the most valued educational features of effective feedback via e-portfolio in a contextual manner. With a forward-looking perspective, we aim not only to inform the educational community, but also to give practical guidance, recommendations to policymakers on how to reenact the context, or even provide enhanced resources in the future.

Author Contributions: LVM conceived the idea for the study, in discussion with MB, designed the study and developed the protocol. MB drafted the protocol manuscript with input from LVM and Kenny Fu. MB prepared the search strategy for *Medline Journals@Ovid* and other supplement data. All authors have read and approved the final manuscript.

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Competing Interest: The authors report no competing interests.

Ethics Approval: No formal ethical approval is required for this synthesis.

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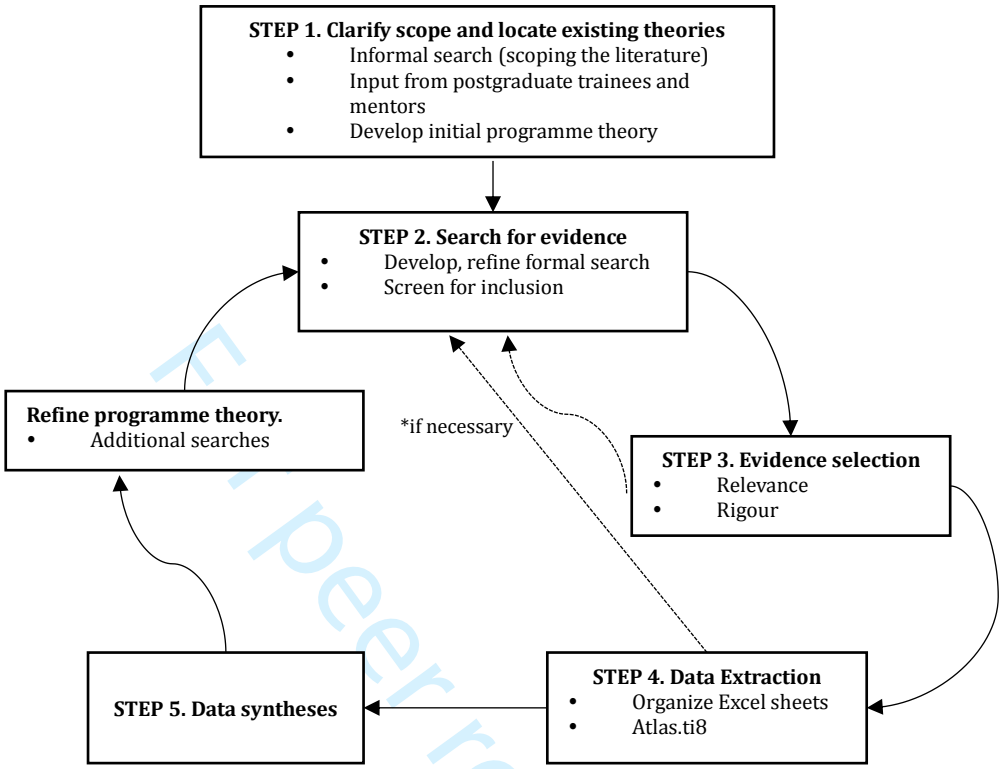
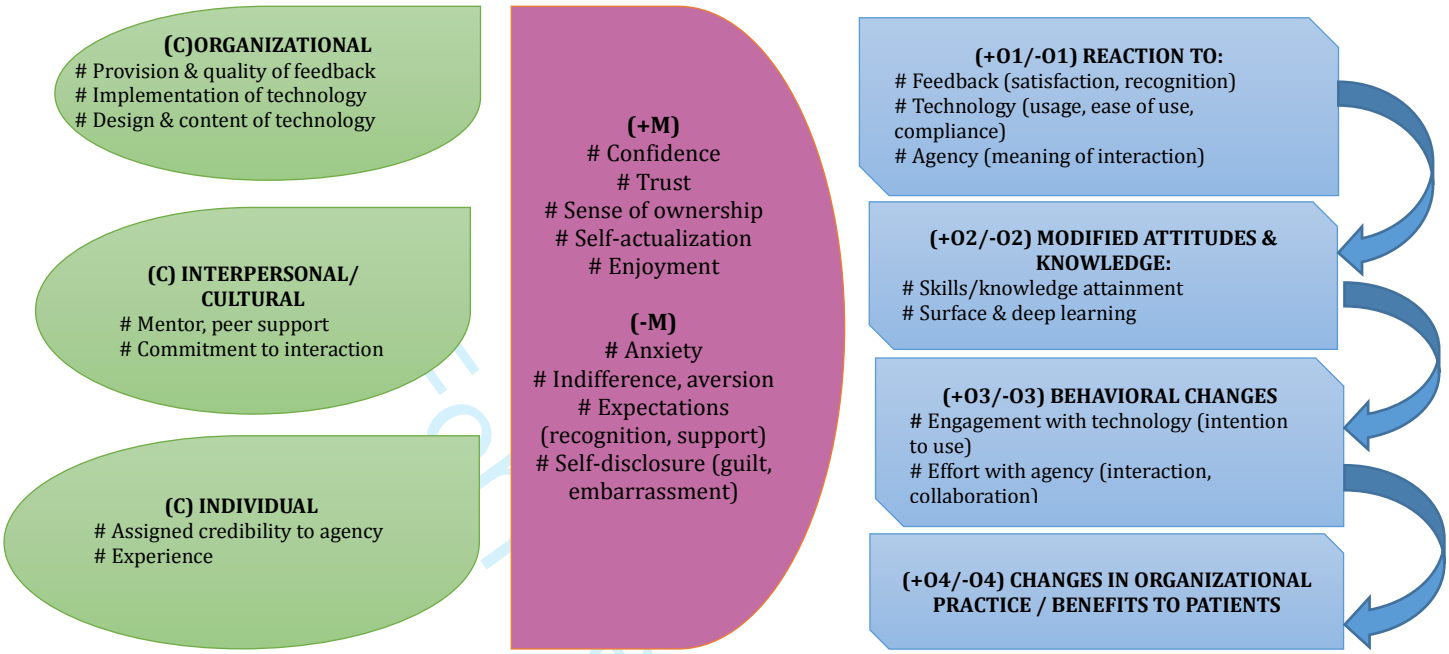
Appendix 1 Diagram of the Project

Figure 1. Flow diagram of the Project (Pawson *et al.* 2005; Wong *et al.* 2015a)



Appendix 2 Initial Programme Theory

Figure 2. Initial Programme Theory



Appendix 3 Example search strategy for Medline+Journals@Ovid

Table 1. Example search strategy for Medline+Journals@Ovid

1	**exp FEEDBACK/**
2	((summative or formative or workplace) adj (feedback or assessment or evaluation)).mp.
3	((electronic or online or "web based" or "web-based") adj (feedback or assessment or evaluation)).mp.
4	(portfolio$ or eportfolio$ or "e-portfolio$").mp.
5	((paper or "paper based" or "paper-based") adj3 portfolio).mp.
6	((online or electronic or web or "web based" or "web-based") adj3 portfolio).mp.
7	((online or electronic or web or "web based" or "web-based") adj3 tool).mp.
8	OR/1-3
9	OR/4-7
10	AND/8,9
11	limit 10 to yr="2008 - 2017"
12	limit 11 to English

Appendix 4 Definitions of concepts

Table 2. Definitions of concepts

	DEFINITION	FORM
Feedback	Direct or indirect (qualitative, quantitative) interaction between giver and receiver or self.	Electronic, web-based, online, (e-) feedback, assessment, evaluation.
E-portfolio	E-portfolio as a tool for managing and documenting one's own learning over a lifespan in ways that encourages deep and continuous learning.[1]	Electronic, digital, web-based, online, e-portfolios
Feedback via e-portfolio	E-portfolio that fosters a provision of more or less effective feedback	Perceptions of feedback via e-portfolio; Effectiveness of feedback via e-portfolio; Usage of feedback via e-portfolio

Appendix 5 Inclusion and exclusion criteria for formal search

Table 3. Inclusion and exclusion criteria for formal search

	INCLUSION	EXCLUSION
Topic	All documents including feedback via e-portfolio as core element.	Papers focused only on: a. feedback or e-portfolio; b. feedback on implementation or e-portfolio design c. e-portfolio as a tool of research.
Study Design	All study designs.	-
Type of Paper	Research (peer-reviewed) and non-research pieces (reviews, editorials, communications, conference proceedings, reports).	Documents not applying rigor and relevance criteria [30]
Types of Setting	Evidence from higher (healthcare) educational setting.	Studies done in primary education setting.
Types of participants	Receivers AND givers of feedback (i.e., mentor- learner/ learner-leaner, learner-self).	-
Language, geographical spread, timeframe	Published worldwide in English. Timespan: 2008-2017	-

1 Jenson *et al*. What It Is and Why It Matters. Change: The Magazine of Higher Learning 2014;46 (2): 50-57. 2014.

Appendix 6 Test for assessing relevance and rigour

Table 4. Test for relevance (Pearson *et al*. 2012; 2015; Brennan *et al.* 2017)

Conceptually Rich	**Thicker description' but not 'conceptually rich'**	**Conceptually Thin**
Unambiguous theoretical concepts are described in sufficient depth. Relationships between, amongst concepts are clearly articulated. Concepts are sufficiently developed, defined to enable understanding without the reader needing to have first-hand experience of an area of practice. Concepts are grounded strongly in a cited body of literature. Concepts are parsimonious (i.e., provide the simplest, but not over-simplified, explanation)	Description of programme theory or sufficient information to enable it to 'surface'. Consideration of the context in which the programme takes place. Discussion of the differences between the design and orientation of programme theory (what was intended) and implementation (what really happened). Recognition and discussion of the strengths/weaknesses of the implemented programme. Some attempt to explain anomalous results and findings with reference to context and data. Description of the factor affecting implementation. Typified by **terms** ('model', 'process', or 'function'), **verbs** ('investigate', 'describes', 'explains'), **topics** ('experiences').	Insufficient information to enable the programme theory to surface. Limited or no consideration of the context in which the programme took place. Limited or no discussion of the differences between the design and orientation of programme theory (what was intended) and implementation (what really happened). Limited or no discussion of the strengths/ weaknesses of the implemented programme. No attempts to explain anomalous results and findings with reference to context and data. Limited or no description of the factors affecting implementation. Typified by only by mentioning an 'association' between variables.

Table 5. Test for rigour (Ohly *et al*. 2017)

	Yes	**Fairly**	**No**
The study methods are clearly reported.			
The study methods are appropriate to answer RQ.			
The sample characteristics enable generalizability.			
Raw data supports the study findings (conclusions).			
Limitations of the study are acknowledged and clearly reported.			

Appendix 7 Data Extraction Table

Table 6. Data Extraction Table

Study ID	Country	Population	Setting	Methodology	Focus of paper	Relevance to programme theory

Reporting checklist for protocol of a systematic review.

Based on the PRISMA-P guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the PRISMA-P reporting guidelines, and cite them as:

Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1.

		Reporting Item	Page Number
Identification	#1a	Identify the report as a protocol of a systematic review	n/a (Realist Synthesis Protocol/RAMESES Standards p5)
Update	#1b	If the protocol is for an update of a previous systematic review, identify as such	n/a
	#2	If registered, provide the name of the registry (such as PROSPERO) and registration number	n/a (pending for Prospero ID 120863)
Contact	#3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	p1
Contribution	#3b	Describe contributions of protocol authors and identify the guarantor of the review	p10
	#4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	n/a
Sources	#5a	Indicate sources of financial or other support for the review	p10
Sponsor	#5b	Provide name for the review funder and / or sponsor	p10

Role of sponsor or funder	#5c	Describe roles of funder(s), sponsor(s), and / or institution(s), if any, in developing the protocol	n/a
Rationale	#6	Describe the rationale for the review in the context of what is already known	p3,4
Objectives	#7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	p4
Eligibility criteria	#8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	p7 (Appendix 5)
Information sources	#9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	p7,8
Search strategy	#10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	p7 (Appendix 3)
Study records - data management	#11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	p8,9
Study records - selection process	#11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	p8
Study records - data collection process	#11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	p8,9
Data items	#12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	p7,8 (Appendix 4,7)
Outcomes and prioritization	#13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	p4
Risk of bias in individual studies	#14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	p8 (Appendix 6)

Data synthesis	#15a	Describe criteria under which study data will be quantitatively synthesized	n/a
	#15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's T)	n/a
	#15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	n/a
	#15d	If quantitative synthesis is not appropriate, describe the type of summary planned	p9
Meta-bias(es)	#16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	n/a
Confidence in cumulative evidence	#17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	n/a

BMJ Open

Understanding how to enhance efficacy and effectiveness of feedback via e-portfolio: A realist synthesis protocol

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Understanding how to enhance efficacy and effectiveness of feedback via e-portfolio: A realist synthesis protocol

Mojca Babovič
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Linkou
Taiwan (R.O.C.)

Dr Ren-Huei Fu
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Linkou
Taiwan (R.O.C.)

Prof Lynn V Monrouxe
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Linkou
Taiwan (R.O.C.)

Contact details for corresponding author:
Prof Lynn V Monrouxe
Chang Gung Medical Education Research Centre (CG-MERC)
Chang Gung Memorial Hospital
Education Building
No. 5, Fuxing Street, Guishan District
Taoyuan City
Taiwan (R.O.C.)

Telephone: +886975367748
Email: monrouxe@me.com

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Abstract

Introduction

The validity of feedback as one of the defining components for electronic portfolios (e-portfolios) to be effective and efficacious has yet to be demonstrated. While the literature has shown individual beneficial features of e-portfolios and feedback *per se*, evidence of feedback as mediated through technology directly resulting in improved educational practice is scarce. The explanation of *how* feedback via e-portfolio improves educational practice is particularly vague.

Methods and Analysis

The aim of this research is to unpack *how* and *why* feedback via e-portfolio is likely to flourish or wither on its path. Given the complexity of intervention, we will apply a theory driven approach for evidence synthesis called realist synthesis. Informed by realist philosophy of science, it seems the most appropriate method because it explores observed outcomes (O) in terms of causal relationship between relevant contexts (C) and generating mechanisms (M). Initial programme theory will be developed through literature scoping. Later on it will be tested against purposively gathered evidence (through database and journal search), which simultaneously will be evaluated for rigor and relevance (whether method used are trustworthy and whether data contributes to theory building). We strive to (1) uncover "context sensitive" mechanisms that generate feedback via e–portfolio to be (in) effective and (2) define in what circumstances is this mostly likely to occur.

Ethics and Dissemination

The synthesis' report will be written according to RAMESES guidelines and its findings will be published in peer reviewed articles and presented at relevant conferences. The aim is to inform: (a) policy and decision makers for future course design; (b) medical educators/clinical supervisors and learners for improved educational use. No formal ethical approval is required.

Registration details: The protocol is pending for PROSPERO registration (ID no. 120863).

Article Summary

Strengths and Limitations of this study

- With realist synthesis we account for the breadth and depth of analyses appropriate for complex educational interventions
- No prior realist synthesis has been undertaken on the topic of *how* feedback vie e-portfolio works effectively
- In developing our initial programme theory we include stakeholder groups' input
- Content experts are not included in programme development
- Only studies published in English language will be searched

BACKGROUND

Introduction

Despite variations in content and format, portfolios are essentially a means through which healthcare learners can report on work done, feedback received, progress made and their plans for improving competence.[1] Portfolios in post-graduate healthcare education can be employed for a range of end-purposes including reflective practice and assessment (summative and formative), and act as an essential connection between workplace learning organisationally and individually.[2] As such, the content of a portfolio may vary according to the requirement of an organisation and the design of the training program. For example, the content of medical trainees' e-portfolios may include quantitative assessments (e.g. the Mini-Clinical Evaluation Exercise, Direct Observation of Procedural Skills, Case based Discussion and 360-degree evaluation), reflective writing (e.g. a medical ethics and legislation report, health care quality report, and personal development report), and an evidence-based medicine report. In the context of such a portfolio, clinical teachers are required to provide appropriate feedback for trainees on their assessment and reports in contained within.[3] Finally, portfolios can be either physical documents, or can be managed online (known as an e-portfolio).

The interest in e-portfolio use in healthcare education has been on the rise. This is probably because both portfolios in general and electronic versions in particular have shown to be beneficial to the user. In all its complexity of design, content and interface,[1 4] what makes them stand out from other educational tools is their ability to encourage reflective practice and self-directed learning,[5 6] which caters perfectly to the educational discourse that emphasizes competence-oriented, individualized learning styles. By emphasizing feelings of ownership and personal development,[7] they encourage learners to become more self-aware of their learning process and more responsible for their own creation, maintenance and presentation.[8]

Contextual use of electronic portfolios in healthcare education

E-portfolio in healthcare education is foregrounded in its flexibility of access, repository, and content.[1 2 9 10] When explaining its usage, scholars tend to emphasize its contextualization. For instance, the nature of implementation, design and content[11-14] and the individual perceptions of ease of use and usefulness[15] are all important facets affecting the e-portfolio use and its potential to fundamentally transform the learning process.

Rather than dwelling in the notion of e-portfolio being merely a combination of portfolio and technology,[16] in this paper, we try to argue how organizational, cultural and individual factors present a significant entry point for theorizing the e-portfolio use. More importantly, we do so by focusing specifically on feedback

portrayed via e-portfolio. We aim to understand (1) in what circumstances does feedback via e-portfolio work most effectively and (2) whether this relates to fortunes and mishaps of e-portfolio use?

Effectiveness of feedback via e-portfolio

Feedback plays an influential role on educational achievements,[17] and when employed in healthcare settings it is indispensable for successful learning, clinical teaching and improved clinical performance.[18 19] Surprisingly, in healthcare education, little is known about how feedback can be used to maximize its impact on learning, behavior and improved practice; and much less so when talking about technology-enhanced feedback.

One reason for this might be that the majority of research papers on feedback published between 1980 and 2015 used the lowest of Kirkpatrick's levels of evaluation – assessing reactions to feedback – and amongst all the studies, only 7% out of 650 included articles were about computer-based feedback.[20] Literature interpreting feedback as one-way, educator–driven processes, with a focus on best delivery practices only, might be another reason. Indeed, educational studies have shown time and again that the high variability of effective feedback is too complex for it only to be explained with the notion of delivery processes.[17 21] The many facets of learners' feedback seeking behaviors[3 22-24] as well as the gaps occurring between mentor's and learner's perceptions of the quantity, quality and efficacy of feedback have to be reconsidered if we are to completely understand feedback practice. Indeed, feedback via e-portfolios can occur variously, including: as asynchronous written feedback in which the educator leaves their comments for the learner to find and read, as synchronous technology-enhanced feedback, as synchronous face-to-face feedback, as mandatory or voluntary and as open access or not.

The aim of this research is to develop a model to facilitate feedback via e-portfolio, and thus enhance/ improve the responsiveness and use of feedback. Meaning, we need to understand the contextual workings for giving and receiving feedback in a technology enhanced environment. In addition, we have to consider not only the provision of information, but also the influence of the manner in which feedback is provided, the recipient's decision to receive feedback and all the contended responses which might subsequently arise.

METHODS

Aim

Focusing on higher educational settings internationally, we aim to understand why and how feedback via e-portfolio might produce different outcomes. For this purpose, we plan to use a Kirkpatrick hierarchy model modified by Tochel *et al* (2009) and distinguish outcomes that describe the impact of intervention in terms of:

(a) participants' reactions (e.g., their views on learning experiences, attitudes towards e-portfolio use and usefulness, aspects on the nature and efficiency of feedback);
(b) changes in participants' attitudes and learning (e.g., changes in perceiving e-portfolio or feedback as useful, acquisition of new concepts, improvement of skills)
(c) changes in participants' behaviors (motivational changes for further learning, active engagement with agency, e-portfolio content, application of new knowledge);
(d) changes in organizational practices and any improvements in the health and wellbeing of patients occurring because of the intervention.

Research questions

(RQ1) What outcomes are identified resulting from feedback via e-portfolio, and at what level do they occur?
(RQ2) What mechanisms are identified that are related to: (1) positive outcomes of feedback via e-portfolio, (2) negative outcomes of feedback via e-portfolio?
(RQ3) What are the contexts within which the mechanisms trigger these outcomes, and for whom?

Realist synthesis

To address our RQs, within a rapidly developing methodological field of data synthesis,[25] we choose a theory driven approach called realist synthesis. Underlined by realist philosophy of science, the method's hallmark is in its generative understanding of causality. It holds that outcomes (O) of events are generated by/through underlined mechanisms (M), which may or may not occur in certain context (C).[26] Mechanisms are not "visible"- having their rooting in individual tendencies - and "context specific" – changeable according to the opportunities provided by specific context(s). Realist synthesis thus looks for interactions among the resources provided by the intervention and the reasoning and/or responses of the participants.[27] Rather than assessing variables associated with a particular outcome, the method's strength is in its ability to (1) explore generative mechanisms that underline main causes of (un)intended outcomes and (2) highlight the circumstances in which these mechanisms are triggered.

Realist synthesis starts with a programme theory and ends, if it has been successful, with a "revised, more nuanced and more powerful program theory".[28] (Re)building programme theory means to draw from theoretical descriptions of CMO relationships (middle range theories) that are close enough to the data that allow empirical/hypothetical testing. In our case, by synthesizing the data we will compare how feedback via e-portfolio was intended to work to the empirical data on the actuality in different situations – all with C-M-O relationships. In this manner we might explain some contingencies that influence the prospect of

feedback via e-portfolio generating its intended outcomes.

Study Design

This protocol registered at PROSPERO (ID No. 120863). It follows the iterative steps suggested by Pawson *et al.*,[26] as well as two realist synthesis protocols: one by Wong *et al.*[29] and the other by Pearson *et al.*[30] (See Appendix 1 for *Diagram of the Project).* We plan to report the actual realist synthesis according to RAMESES publication standards[31] and use a modified flow diagram.[29 32]

STEP 1: Clarify the scope, locate existing theories, develop programme theory

The objective in first step will be to conduct an exploratory (informal search) for various "working theories",[26] helping us to build an initial programme theory. In realist terms – underlining the relationship between the context, mechanisms and outcomes[28 31 33] –we are to explore ideas around how feedback via e-portfolio is intended to work and why sometimes things go astray. When getting a feel for the literature (its quality, quantity, as well as its boundary scope),[26] we will be mindful not to foreclose potentially important perspectives.[30] Therefore, we will conduct a broad electronic database scan for evidence, with no quality assessment in mind.[34] While the body of references will be narrowed down in *Step 2*, the documents in this stage will only need to contain information on e-portfolio related instruments (i.e., e-logbook, personal digital assistants, personal development plans) and feedback /assessment/ evaluation. To further test the developing theory we will also conduct face-to-face interviews with e-portfolio users (clinical teachers and postgraduate trainees) as well as engage in discussion with the research team, who are familiar with the e-portfolio and feedback literature.

INITIAL PROGRAMME THEORY

We have started work on this stage and have a number of potential theories that might help explain the mechanisms underlying the effectiveness of feedback via e-portfolio (See Appendix 2 *Initial Programme Theory)*.

Theories of technology adaptation explain how perceptions of e-portfolio correlate to behavioral changes of e-portfolio usage.[35-37] For example, the possibility of motivational mechanisms (such as self-efficacy, subjective norms, level of e-learning enjoyment, experiences and computer anxiety) and their impact on perception of (O1, O2) and intention to use (O3). These theories can shed light onto whether the specific technology adopted might in any way affect the effectiveness and efficacy of feedback portrayed.

Another potentially valuable source for our programme theory development are theories on feedback responsiveness and seeking behaviors.[38-40] Assuming that response to feedback arise solely from one's sense of self-worth (mediated as MECHANISMS of fear from criticism, longing for appraisal, expectation of

recognition), individuals are more likely to effortful engage with technology/ agency (O3) when they perceive feedback as being congruent with their selfhood (regardless of the intervention's context). On the other hand, individuals might be able to self-regulate their motivation in relation to a specific CONTEXT. As regulatory focus theory explains,[40 41] it is the "promotion" or "prevention foci" of the context that will dictate the nature of engagement with technology/agency. In realist terms, high engagement and behavioral changes (+/-O3) might occur *only* when positive aspects of the intervention are conducted in promotion aroused conditions (C), those regulated by wishes and desires; *or* when negative aspects of the intervention are given in prevention aroused conditions (C), those regulated by obligation and necessity. For example, in a "promotion foci" implementation context – such as where e-portfolio is voluntary, a part of formative assessment, the mentor comments on learner's tasks are positive - the learner will likely want to engage (M) with the mentor in an effortful manner (O3), or perhaps vigorously seek (M) new creative ways to continue the work (O3). By contrast, in a "prevention foci" implementation context – such as where e-portfolio is mandatory, part of summative evaluation, mentor gives negative comments – the learner will perhaps become extra hard-working (M) / hypervigilant just to avoid (M) punishment and rectify (M) the situation. In this situation, a negative aspect of the intervention (C) might lead to positive learning, behavioral changes (O3). On the other hand, if the mentor praises learner's assignments/ performance (C), it is more likely that the feeling will be that no additional effort is needed (M, relaxation, indifference, disengagement), leading to no behavioral changes and low engagement with self, the mentor or e-portfolio (O)

Finally, the educational alliance theory states that behavioral changes to feedback happen according to learner's evaluation of mentor's credibility in a supervisor-trainee relationship.[42 43] This might be another source for potential theory development. For example, learners trusting in the credibility of the mentor (clinical competency, content credibility, personal characteristics), and the relationship (meaningfulness and authenticity), will more likely contemplate feedback in an effortful manner, which will also probably lead to behavioral changes (O3).

The initial theories uncovered during our searches will be reconsidered against the empirical data. As such, it is possible that only a small number will be prioritized for the synthesis, based on their greater resonance with that data.

STEP 2: Search for evidence

Utilizing a more formal search for published literature in four bibliographic databases (Web of Science, Scopus, Medline+Journal@Ovid, Wiley Online Library), we will look for sufficient evidence to refine, confirm or refute our initial programme theory (See Appendix 3 *Example Search Strategy for Medline+Journals@Ovid*). Specifically, we will look for: (1) empirical (peer-

reviewed full articles) and non-empirical literature (e.g., review, opinion pieces, editorials, commentaries, abstracts from conferences, process evaluations, program manuals) as long as they comply with our rigor and relevance criteria;[31 33] (2) studies of all types of research design will be included; (3) articles published in English; (4) between 2008 and 2017; (5) with participants (learner and educator role) in healthcare and higher educational settings in Taiwan and abroad (See Appendix 4 *Definitions of concepts* and Appendix 5 *Inclusion/ Exclusion Criteria for Formal Search*).

Because there is no finite set of relevant papers that can be strategically defined and found, compared to a more traditional systematic review, realist synthesis adopts an iterative approach to searching for multiple types of evidence.[26] In order to explore the literature deeper for theoretical elements which might help to explain new findings, or re-examine certain aspects of developing theory,[33] we expect to undertake additional inquires such as: (1) hand searching relevant journals (related to e-learning, e-portfolio or feedback in educational setting such as *British Journal of Educational Technology*, *Australian Journal of Educational Technology, Electronic Journal of e-learning (EJEL)*, *International Journal of eportfolios (IJeP)*; (2) using citation tracking (pearling); (3) skimming through various grey literature platforms (https://www.jisc.ac.uk/); and (4) coming across evidence by chance. Additional searches will be purposeful, focusing on relevant sources for developing programme theory. For all searches, we will make augments in our preliminary criteria (e.g., include papers that are missing sufficient data, or not in the timeframe).

STEP 3: Study selection procedure and appraisal

After importing references into *Endnote 9* we will undertake the study selection in two phases. Firstly, we will screen based on title and abstract, excluding all references not specifically mentioning web/online portfolios *and* the feedback, assessment, evaluation portrayed in it. Secondly, we will look at the full text documents to further exclude based on the following questions: Does this paper (or section of it) involve feedback via e-portfolio, that (a) is described as an ongoing (direct or indirect) interaction between receiver and giver using e-portfolio as educational tool: (b) takes place in higher (healthcare) educational setting? Using the preliminary set of inclusion/ exclusion rationales, the lead researcher (LVM) will check a randomly selected sample of 20% of the identified documents. The remaining will be screened by two reviewers. Any discrepancies will be discussed until reaching an agreement.

Aligned with RAMESSES standards and proposed quality judgments,[31 33] we will appraise the quality of included content of a section of a text as: (1) relevant**,** if they address or contribute to theories we are exploring; and (2) rigor, if the methods used to generate that particular data are credible and trustworthy. Quality judgments will be made on "the level of arguments and theory" rather

merely on "the level of data" allowing us to consider evidence seemingly of lesser quality yet potentially relevant to programme theory development. [34] However, to give an indication of the "coherence, plausibility and appropriateness"[31] of our selection, we will (a) apply elemental methodological questions[44] for rigor; and (b) use a hybrid tool[30 45 46] to distinguish conceptually thick (rich) material from conceptually thin (weaker) according to its ability to provide explanations to developing programme theory. This tool has been shown to be useful in theory-driven synthesis just because it gives the option to focus on richer sources of programme theory without denying the weaker ones as well[47] (See Appendix 6 *Test for assessing relevance and rigor*).

STEP 4: Data Extraction and Organization

For the included full text papers, we will develop a data extraction sheet to provide an accessible overview of our findings (See Appendix 7 *Data Extraction Table)* as well as importing them into *Atlas.ti* 8 for further coding of the themes. While coding, we will consider the raw data, textual descriptive findings as well as authors' interpretations written in the results or discussion section. For non-research papers we will consider various forms of textual descriptions. All relevant sections – relating to context, mechanisms and their relationships to outcomes – will be coded deductively (conceptual themes/ codes created from initial programme theory developed prior to data extraction) and inductively (conceptual themes/ codes recognized during the process). Should the paper contribute to only one specific element of the C-M-O, we will not discard it, as we will be able to make inferences from other sources.

STEP 5: Data synthesis

To refine and further explain the developing programme theory, through the data synthesis process, we will simultaneously analyze evidence for potential C-M-Os and organize them in themes and semi predictable patterns.

- To identify potential C-M-Os we will think "'backwards' from the outcome" [48] and will try to identify the causal mechanisms alongside the contexts within they are associated. We will be careful not to presume there is only one outcome within the chain of events;
- When thematically organizing the data, we will take a similar approach to that described by many other researches: [28 30 45 46]

Juxtapose sources of evidence, for instance, when data about the effects of feedback via e-portfolio in one paper will allow an insight on its effective patterns in another paper;

Reconcile sources and identify differences, such as, understanding why different results might occur in apparently similar situations;

Adjudicate sources of evidence and make judgments between studies based on their methodological strengths and weaknesses;

Consolidate sources of evidence, by creating a multi-faceted explanation of the

intervention. That is, whenever we have different outcomes in particular contexts, we will try to explain how and why this might occur.
Situate sources of evidence, for example when a particular mechanism is triggered in context A, while another mechanism might only occur in context B.

During this stage, the programme theory will be redeveloping and in its refinement. As we delve into our included studies and beyond we will be mindful of unexpected patterns, which might inform us of new middle range theories, thereby further explaining dynamics around e-portfolio being an effective means for the feedback process. Considering we expect to find limited data specific for our enquiry, we recognize that some of the theoretical assumptions we will make might be weakly supported. Nevertheless, throughout our work we will be fully transparent about the levels of evidence available to support/ refute our hypotheses, giving the reader the space to decide exactly how much of it is relevant.

Patient and Public Involvement Statement

This realist synthesis around feedback via e-portfolio will be done without patient and public involvement. Our rationale for this is that, to the best of our knowledge, patients are not typically involved in this aspect of clinical education. As such, patients will not be invited to contribute to study design, interpretation of the results, or help with writing, editing of the document. Also, we will not include them when developing dissemination strategy.

ETHICS AND DISSEMINATION

No formal ethical approval is required for this synthesis. We aim to publish our findings in at least one peer review journal as well as present them to relevant bodies including broader educational institutions. At present, we have a fairly vague understanding of the complex dynamics between e-portfolio and feedback, even more unclear are all contingencies closely linked to it. By applying a method that has the analytical strength to provide insight into the complexity, [28] we hope to pinpoint the most valued educational features of effective feedback via e-portfolio in a contextual manner. With a forward-looking perspective, we aim not only to inform the educational community, but also to give practical guidance, recommendations to policymakers on how to reenact the context, or even provide enhanced resources in the future.

Contributorship Statement: LVM and KHF conceived the idea for the study, in discussion with MB, designed the study and developed the protocol. MB drafted the protocol manuscript with input from LVM and KF. MB prepared the search strategy for Medline Journals@Ovid and other supplement data. All authors have read and approved the final manuscript.

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Ethics Approval: No formal ethical approval is required for this synthesis.

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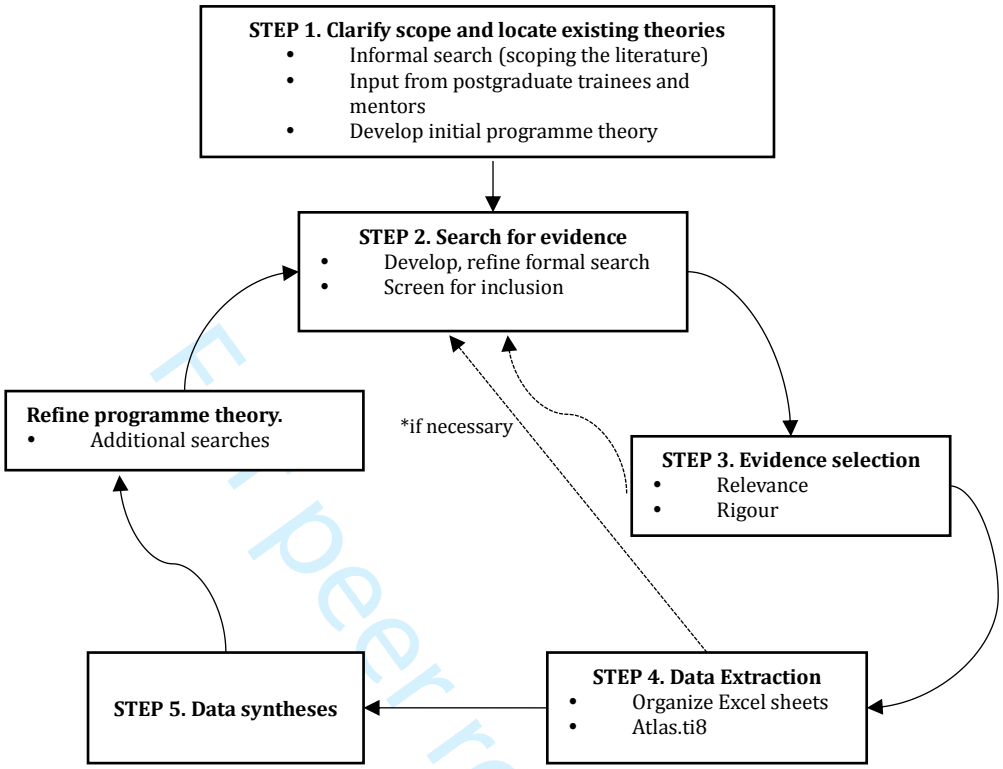
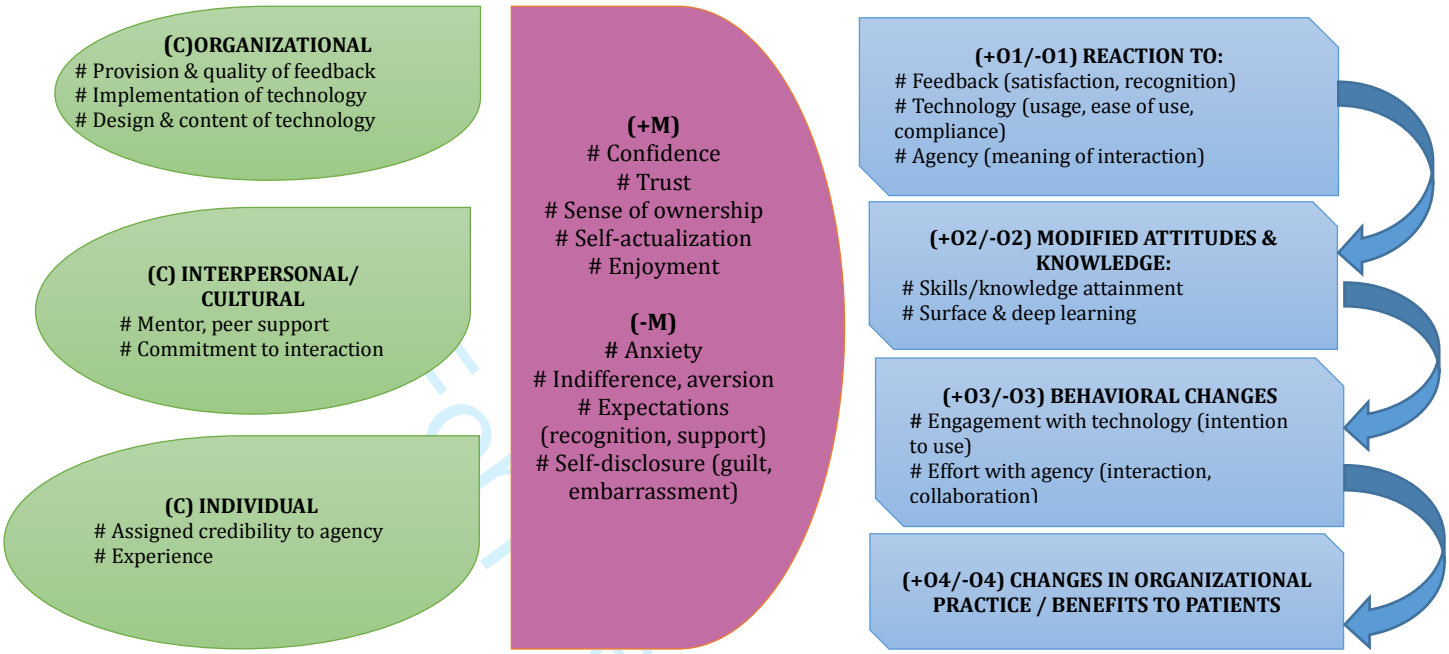
Appendix 1 Diagram of the Project

Figure 1. Flow diagram of the Project (Pawson *et al.* 2005; Wong *et al.* 2015a)



Appendix 2 Initial Programme Theory

Figure 2. Initial Programme Theory



Appendix 3 Example search strategy for Medline+Journals@Ovid

Table 1. Example search strategy for Medline+Journals@Ovid

1	**exp FEEDBACK/**
2	((summative or formative or workplace) adj (feedback or assessment or evaluation)).mp.
3	((electronic or online or "web based" or "web-based") adj (feedback or assessment or evaluation)).mp.
4	(portfolio$ or eportfolio$ or "e-portfolio$").mp.
5	((paper or "paper based" or "paper-based") adj3 portfolio).mp.
6	((online or electronic or web or "web based" or "web-based") adj3 portfolio).mp.
7	((online or electronic or web or "web based" or "web-based") adj3 tool).mp.
8	OR/1-3
9	OR/4-7
10	AND/8,9
11	limit 10 to yr="2008 - 2017"
12	limit 11 to English

Appendix 4 Definitions of concepts

Table 2. Definitions of concepts

	DEFINITION	FORM
Feedback	Direct or indirect (qualitative, quantitative) interaction between giver and receiver or self.	Electronic, web-based, online, (e-) feedback, assessment, evaluation.
E-portfolio	E-portfolio as a tool for managing and documenting one's own learning over a lifespan in ways that encourages deep and continuous learning.[1]	Electronic, digital, web-based, online, e-portfolios
Feedback via e-portfolio	E-portfolio that fosters a provision of more or less effective feedback	Perceptions of feedback via e-portfolio; Effectiveness of feedback via e-portfolio; Usage of feedback via e-portfolio

Appendix 5 Inclusion and exclusion criteria for formal search

Table 3. Inclusion and exclusion criteria for formal search

	INCLUSION	EXCLUSION
Topic	All documents including feedback via e-portfolio as core element.	Papers focused only on: a. feedback or e-portfolio; b. feedback on implementation or e-portfolio design c. e-portfolio as a tool of research.
Study Design	All study designs.	-
Type of Paper	Research (peer-reviewed) and non-research pieces (reviews, editorials, communications, conference proceedings, reports).	Documents not applying rigor and relevance criteria [30]
Types of Setting	Evidence from higher (healthcare) educational setting.	Studies done in primary education setting.
Types of participants	Receivers AND givers of feedback (i.e., mentor- learner/ learner-leaner, learner-self).	-
Language, geographical spread, timeframe	Published worldwide in English. Timespan: 2008-2017	-

[1] Jenson *et al*. What It Is and Why It Matters. Change: The Magazine of Higher Learning 2014;46 (2): 50-57. 2014.

Appendix 6 Test for assessing relevance and rigour

Table 4. Test for relevance (Pearson *et al.* 2012; 2015; Brennan *et al.* 2017)

Conceptually Rich	**Thicker description' but not 'conceptually rich'**	**Conceptually Thin**
Unambiguous theoretical concepts are described in sufficient depth.	Description of programme theory or sufficient information to enable it to 'surface'.	Insufficient information to enable the programme theory to surface.
Relationships between, amongst concepts are clearly articulated.	Consideration of the context in which the programme takes place.	Limited or no consideration of the context in which the programme took place.
Concepts are sufficiently developed, defined to enable understanding without the reader needing to have first-hand experience of an area of practice.	Discussion of the differences between the design and orientation of programme theory (what was intended) and implementation (what really happened).	Limited or no discussion of the differences between the design and orientation of programme theory (what was intended) and implementation (what really happened).
Concepts are grounded strongly in a cited body of literature.	Recognition and discussion of the strengths/weaknesses of the implemented programme.	Limited or no discussion of the strengths/ weaknesses of the implemented programme.
Concepts are parsimonious (i.e., provide the simplest, but not over-simplified, explanation)	Some attempt to explain anomalous results and findings with reference to context and data.	No attempts to explain anomalous results and findings with reference to context and data.
	Description of the factor affecting implementation.	Limited or no description of the factors affecting implementation.
	Typified by **terms** ('model', 'process', or 'function'), **verbs** ('investigate', 'describes', 'explains'), **topics** ('experiences').	Typified by only by mentioning an 'association' between variables.

Table 5. Test for rigour (Ohly *et al.* 2017)

	Yes	**Fairly**	**No**
The study methods are clearly reported.			
The study methods are appropriate to answer RQ.			
The sample characteristics enable generalizability.			
Raw data supports the study findings (conclusions).			
Limitations of the study are acknowledged and clearly reported.			

Appendix 7 Data Extraction Table

Table 6. Data Extraction Table

Study ID	Country	Population	Setting	Methodology	Focus of paper	Characteristics of intervention	Relevance to programme theory

Reporting checklist for protocol of a systematic review.

Based on the PRISMA-P guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the PRISMA-P reporting guidelines, and cite them as:

Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1.

		Reporting Item	Page Number
Identification	#1a	Identify the report as a protocol of a systematic review	n/a (Realist Synthesis Protocol/RAMESES Standards p5)
Update	#1b	If the protocol is for an update of a previous systematic review, identify as such	n/a
	#2	If registered, provide the name of the registry (such as PROSPERO) and registration number	n/a (pending for Prospero ID 120863)
Contact	#3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	p1
Contribution	#3b	Describe contributions of protocol authors and identify the guarantor of the review	p10
	#4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	n/a
Sources	#5a	Indicate sources of financial or other support for the review	p10
Sponsor	#5b	Provide name for the review funder and / or sponsor	p10

Role of sponsor or funder	#5c	Describe roles of funder(s), sponsor(s), and / or institution(s), if any, in developing the protocol	n/a
Rationale	#6	Describe the rationale for the review in the context of what is already known	p3,4
Objectives	#7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	p4
Eligibility criteria	#8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	p7 (Appendix 5)
Information sources	#9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	p7,8
Search strategy	#10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	p7 (Appendix 3)
Study records - data management	#11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	p8,9
Study records - selection process	#11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	p8
Study records - data collection process	#11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	p8,9
Data items	#12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	p7,8 (Appendix 4,7)
Outcomes and prioritization	#13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	p4
Risk of bias in individual studies	#14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	p8 (Appendix 6)

Data synthesis	#15a	Describe criteria under which study data will be quantitatively synthesized	n/a
	#15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's T)	n/a
	#15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	n/a
	#15d	If quantitative synthesis is not appropriate, describe the type of summary planned	p9
Meta-bias(es)	#16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	n/a
Confidence in cumulative evidence	#17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	n/a