

2020

## An Introduction to Systematic Literature Reviews In Engineering Education

Inês Direito

*UCL Centre for Engineering Education, UK*

Shannon Chance

*Technological University Dublin, Ireland, shannon.chance@tudublin.ie*

Manish Malik

*University of Portsmouth, UK*

Follow this and additional works at: <https://arrow.tudublin.ie/engineduccon>



Part of the [Education Commons](#), and the [Engineering Commons](#)

### Recommended Citation

Direito, I., Chance, S. & Malik, M. (2020). An Introduction to Systematic Literature Reviews In Engineering Education. *SEFI2020 Annual Conference, 20-24 September Enschede, the Netherlands*. doi:10.21427/fnn4-bb80

This Other is brought to you for free and open access by the Engineering: Education and Innovation at ARROW@TU Dublin. It has been accepted for inclusion in Conference papers by an authorized administrator of ARROW@TU Dublin. For more information, please contact [yvonne.desmond@tudublin.ie](mailto:yvonne.desmond@tudublin.ie), [arrow.admin@tudublin.ie](mailto:arrow.admin@tudublin.ie), [brian.widdis@tudublin.ie](mailto:brian.widdis@tudublin.ie).



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 3.0 License](#)

## AN INTRODUCTION TO SYSTEMATIC LITERATURE REVIEWS IN ENGINEERING EDUCATION

**Inês Direito<sup>a</sup>,**  
UCL Centre for Engineering Education<sup>a</sup>

**Shannon Chance<sup>a,b</sup>,**  
Technological University Dublin<sup>b</sup>

**Manish Malik<sup>c</sup>**  
University of Portsmouth<sup>c</sup>

**Keywords:** *research methodology; systematic literature review*

### INTRODUCTION

Whether you are new to engineering education research (EER) or an experienced researcher, knowing what prior work has been conducted in your topic of interest is essential. Literature reviews can not only inform your practice, but also help you identify gaps and new directions for further research. Literature reviews enable you to distil the knowledge necessary to participate fully and with authority in conversations on your topic. Developing a comprehensive review helps ensure you identify all past publications pertinent to your topic and provides a means for others to verify your work – a cornerstone principle of scientific research. In this workshop, you'll learn different typologies of literature reviews (e.g., narrative and systematic), how to identify the types, the advantages of and how to conduct a systematic one.

Launching into any new topic, you may feel overwhelmed. The available information may seem too vast and complex to synthesize and summarize. This is made more complex by EER being an emergent new field – one that draws from, and combines, expertise in multiple disciplines – which adds to the complexity of selecting and analysing literature. Using a structured approach to identify, select, and analyse the existing body of literature can help you build confidence by helping ensure consistency, quality, and reliability of your review.

This workshop illustrates and provides support for systematic literature reviews (SLR). A systematic review is seen as the gold standard in knowledge synthesis (Boland, Cherry, & Dickenson, 2013, in ten Ham-Baloyi & Jordan, 2015). The process of carrying out a systematic review is highly focussed on clearly defined research question(s) that a researcher is interested in. The research question is central to each stage within the process. Aligning each stage to the research question makes the research process explicit and reproducible (Pickering and Byrne, 2014). In the impossibility to keep pace of the ever-growing number of publications in engineering education research, systematic reviews are strong methodologies that can support you finding and understanding which questions have already been answered and which remain to be answered in your research field. Another advantage of this approach is that it helps to revisit the research question(s) to check for future developments and extending the synthesised evidence reliably.

Overall, the hosts of this workshop aim to help raise the quality, usefulness, and profile of EER by helping members of the EER community understand and build mastery of new research methods that have particular relevance for EER. The workshop steps participants through the rationale and processes behind SLRs and participation in it will help build a community of people to collaborate with and offer advice to one other in future endeavours. The three hosts, in fact, met at an engineering education conference and united with the purpose to master SLR techniques and have subsequently published reviews and provide workshops elsewhere. We hope to extend our network and promote this collaborative model for working.

### **Reasons to do a literature review**

A few reasons to do a literature review are:

- To describe the state of the art and developments on a topic;
- To identify seminal works in your area;
- To discover how others researched your topic of interest, and identifying methods that could be relevant to your project;
- To identify gaps/opportunities for future research.

Such reviews can be narrative, using what could be considered convenience or purposeful sampling, or systematic, attempting for fair and equitable coverage of past research question and findings.

Although narrative reviews are the most common type of literature reviews, the analysis in the narrative reviews tends to be *ad hoc* and likely to support the author's intent – which may be to argue a certain stance. These reviews are often biased by literature's availability and reviewer's selection.

On the contrary, systematic literature reviews aim to reduce bias by designing and following a comprehensive plan and detailed search process based on well-defined research question(s) relating a particular topic.

### **Advantages of conducting systematic literature reviews to the Engineering Education Research community**

Systematic literature reviews and narrative reviews may have some overlapping purposes and procedures, yet they constitute two distinctively different approaches to synthesizing the literature. SLR aims to minimize bias and error; the selection of appropriate studies follows objectively defined inclusion and exclusion criteria linked to the research question(s). It follows an explicit process that therefore can be replicated by others, and also at a point in future to re-map the boundaries of the literature in a progressive manner. SLR also is a Research Method; it implies methodical procedures matched to well defined research questions. SLR follows a study protocol and analysis plan – it is based on secondary observations, in which studies are the unit of analysis

### **Purpose**

This workshop provides an introduction to various review types with a focus on SLR. It is tailored for new researchers in Engineering Education but is also of value to more experienced researchers who want to build skill in SLR and meta-analysis. The workshop will use a combination of short presentations and online hand-on activities.

Primary purposes of this workshop are to:

- introduce review typologies;
- describe SLR as a methodology for engineering education research, and highlight how it differs from other literature review methodologies;
- learn to define inclusion and exclusion criteria and use them to search databases;
- describe the steps involved in systematic reporting.

### Structure

This 75-minutes workshop session will be organised in three blocks of short presentations and groupwork covering the following topics:

1. The types of lit reviews (including SLR)
2. Overview of the steps in SLR
3. How to report SLR

### Participant engagement

Building on previous online workshops in EER organized and delivered by the authors, participants will be challenged to work collaboratively with other conference delegates in online breakout rooms. This format will not only enhance the community building aspect of the workshop, but also highlight the advantages/potentialities of working remotely in systematic literature reviews.

### SUPPORTING REFERENCES

- [1] Borrego, M., Foster, M. J., & Froyd, J. E. (2014). Systematic literature reviews in engineering education and other developing interdisciplinary fields. *Journal of Engineering Education*, 103(1), 45-76.
- [2] Booth, A. (2016). Searching for qualitative research for inclusion in systematic reviews: a structured methodological review. *Systematic Reviews*, 5(74).
- [3] Booth, A., Papaioannou, D., & Sutton, A. (2012). *Systematic approaches to as successful literature review*. SAGE Publications.
- [4] Cochrane Collaboration. (2011). *Cochrane handbook for systematic reviews of interventions* (Version 5.1.0) [updated March 2011]. <http://handbook.cochrane.org/>
- [5] Gough, D., Oliver, S. & Thomas, J. (2017). *An Introduction to Systematic Reviews*. 2 ed. London: Sage.
- [6] ten Ham-Baloyi, W., & Jordan, P. (2016). Systematic review as a research method in postgraduate nursing education. *Health SA Gesondheid*, 21(1), 120-128.
- [7] Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Altman, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7). <https://doi.org/10.1371/journal.pmed.1000097>
- [8] Petticrew M, Roberts H. (2006). *Systematic reviews in the social sciences: A practical guide*. Oxford: Blackwell Publishing.

- [9] Pickering, C., & Byrne, J. (2014). The benefits of publishing systematic quantitative literature reviews for PhD candidates and other early-career researchers. *Higher Education Research & Development*, 33(3), 534-548.
- [10] Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019) How to Do a Systematic Review: A Best Practice Guide for Conducting and Reporting Narrative Reviews, Meta-Analyses, and Meta-Syntheses. *Annual Review of Psychology*, 70, 747–70.