



GETTING STARTED IN ENGINEERING EDUCATION RESEARCH

DIFFERENCES IN ENGINEERING RESEARCH VS ENGINEERING EDUCATION RESEARCH

The difference between engineering education research and engineering research is that engineering education research:

1. Does not have to work as long as you can justify the data and evidence - why did it not work, with what control factors etc. The results can often be used as a contribution to the existing work and data. The results of engineering education research are often used as part of a framework or model for the enhancement of teaching and learning.
2. Can often be based on theory, literature, or someone else's work
3. Can be qualitative and/or quantitative
4. Does not always require a lot of money to research the subjects
5. Often involves human, thus ethics approval is required

HOW TO GET STARTED?

If you are an engineering teacher who is interested in establishing research in engineering education, often, a good way to start is to reflect on your own teaching experience and your students' learning experience. Reflecting on your teaching may help you come up with research topics close to your teaching practice and experiences. For example, if you are teaching a large class, you may want to examine the effectiveness of the pedagogy which you applied in your class to engage students. By reflecting on your teaching, you will not just come up with good research topics for engineering education, you will also be able to enhance your course, your curriculum using innovative and appropriate pedagogies and become an excellent engineering teacher. Your teaching will be back up with evidence from different sources. Thus, teaching and learning and the scholarship of teaching and learning in engineering education should come hand in hand. This is known as a research-teaching nexus.

SOME POINTS TO CONSIDER WHEN CONDUCTING ENGINEERING EDUCATION RESEARCH

1. Focus and Relevance
 - Are the research questions or propositions clearly stated and addressed?
 - Are the research questions relevant and important to engineering education research or practice?
 - Is it feasible to investigate the research questions given your teaching and learning context and environment?

2. Context and Contribution

- Is the research situated within relevant bodies of knowledge?
- Does the research contribute to new knowledge?
- What previous works have been included as literature reviews?

3. Research Methodology

- Are the research designs, methods, theories, and/or practices appropriate to answer the research questions?

4. Results and Generalizability

- Are there original ideas or results supported by clear reasoning and compelling evidence?
- Are there original ideas or results of general significance?

5. Conclusions

- What is next?
- What impacts can the results bring to engineering education?

HOW TO PUBLISH IN ENGINEERING EDUCATION

BEFORE WRITING A JOURNAL ARTICLE, DO A CONFERENCE PRESENTATION.

For teachers who are new to research in engineering education, it is advisable to first submit your paper to a conference for presentation. Conference audiences can often provide some good feedback, and based on the feedback, you can then revise the conference submission as a journal submission.

SELECTING AN APPROPRIATE JOURNAL

It is also advisable to research your selected journal before preparing your manuscript for submission by:

- Studying the journal's guidelines for authors.
- Knowing and understanding the journal's criteria. – Are your objectives compatible with the journal's aims and criteria? (It is an encouraging sign if you notice that the journal of your choice have published similar articles on your topic previously.)
- Looking at journal impact factors: This will give you an idea on the quality of the journal and how difficult it will be to get your paper accepted.

PREPARING MANUSCRIPT FOR SUBMISSION – GENERAL STRUCTURE OF A JOURNAL ARTICLE

Section	Components	Purpose
<i>Title page</i>	Title	<ul style="list-style-type: none"> Attract readers' attention. Useful Tips: Be specific, keep it informative & concise.
	Abstract	<ul style="list-style-type: none"> Tell readers what has been done & what are the main findings.
	Keywords	<ul style="list-style-type: none"> Used as an index for your manuscript.
<i>Main text</i>	Introduction	<ul style="list-style-type: none"> Provide a context to convince readers that you clearly know why your work is useful.
	Literature Review	<ul style="list-style-type: none"> Report the results of previous research that has been carried out on your topic of interest
	Methods	<ul style="list-style-type: none"> Provide sufficient detail about your study to enable readers to evaluate its appropriateness or replicate your study. Typically made up of 3 sub-sections: participants, materials/testing instruments, procedures.
	Results	<ul style="list-style-type: none"> Present to readers what have you found. Figures and/or tables are used to present findings when appropriate.
	Discussion	<ul style="list-style-type: none"> Summarize significant findings. Interpret your findings: Explain to readers what the results mean. Compare results to previous research. Discuss the implications of your study.
<i>Conclusion</i>		<ul style="list-style-type: none"> Include a brief restatement of the different sub-sections in the main text. Conclude the overall discussion & implication. Highlight how your research contributes to the current knowledge in the field and recommend further research.
<i>References</i>		<ul style="list-style-type: none"> Present the list of publications you cited in the main text.
<i>Appendix</i>		<ul style="list-style-type: none"> Attach any supporting materials (e.g. survey).

TIPS ON HOW TO INCREASE YOUR CHANCES OF GETTING PUBLISHED

- Abstract should capture readers' attention with clear description of what the paper is presenting and what are the outcomes.
- Valid assessment of results, demonstrating what is being proposed does improve student learning (e.g. use of before & after test scores or control & experimental group for comparison).
- Methodology – ensure your methods are suitable for your research questions. (Are my methods able to collect data and evidences to provide me the results I need?)
- The paper should be readable:
 - Minimum spelling and grammar errors.
 - Follow a logical presentation format.
- If your native language is not English, it is advisable for you to find a native speaker or someone who is good in English to proofread the initial draft of your paper.
- Some journals have a word and page limit, ensure that you are within these limits.
- Most journals prefer jargon free writing, thus, write as simple and to the point as possible.
- Demonstrate what is original and new about your research. Highlight the contribution of your work to the field.
- Peer review by your colleagues. Welcome advice from people around you with potential valuable input. No matter how competent you feel, having your work seen through a different lens may help to spot flaws that you have not been able to identify.
- Aim high, but not too high. Aiming for top journals with research findings that are not groundbreaking will lead to a lot of rejections and time wasting.

Web Reference and Resources

- Batchman, T. (2004). Getting published in the IEEE Transactions on Education. Retrieved from <http://ewh.ieee.org/soc/es/batchman.html>
- Chan, C. K. Y. (2012). Teaching in engineering - Σ (the right elements) towards a scholarly approach. Retrieved from <http://engg.hku.hk/home/seminars/FSS/FSS2012-04-15.pdf>
- Froyd, J. E. (2009). How to publish in engineering education journals. Retrieved from http://hke3r.cetl.hku.hk/doc/Froyd09_how_publish.pdf
- JournalPrep. (2012). How to write and publish an academic research paper: 101 Tips from Journal Prep.com. Retrieved from <http://journalprep.com/101-tips.php>