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

- Ethical approval: According to the University's policy for ethical practice in research, staff members or research students in Faculties other than Medicine and Dentistry should apply to the Human Research Ethics Committee for Non-Clinical Faculties (HRECNCF) for ethical clearance for research involving human participants. Guidelines and procedures, as well as the application form are available for download through this website http://www.rss.hku.hk/integrity/ethics-compliance/hrecncf.

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.

If you are unsure how to start your research in engineering education or would like to discuss with someone, email Dr. Cecilia Chan for a consultation to get some advice at cecilia.chan@cetl.hku.hk.

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?
   - Are the research questions feasible 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 EducationBefore submitting a journal article…

For teachers who are new in the research area of engineering education, it is advisable that they first submit their publications to conference for presentation. Conference audiences can often provide some good feedback. (See list of conferences [http://hke3r.cetl.hku.hk/conferences.php]) You can then revise the conference submission as a journal submission.

Preparing manuscript for submission

General structure of a journal article

Section	Components	Purpose
Title page	Title	▪ Attract readers' attention ▪ Useful Tips: Be specific, keep it informative & concise
	Abstract	▪ Tell readers what has been done & what are the main findings
	Keywords	▪ Used as an index for your manuscript
Main text	Introduction	▪ Provide a context to convince readers that you clearly know why your work is useful (What about literature reviews? Also separate paragraphs for methods etc)
	Literature Review	▪ Report the results of previous research that has been carried out on your topic of interest
	Methods	▪ Provide sufficient detail about your study to enable readers to evaluate its appropriateness or replicate your study ▪ Typically made up of 3 subsections: participants, materials/testing instruments, procedures
	Results	▪ Present to readers what have you found ▪ Figures and/or tables are used to present findings when appropriate
	Discussion	▪ Summarize significant findings ▪ Interpret your findings: Explain to readers what the results mean ▪ Compare results to previous research ▪ Discuss the implications of your study

Conclusion	▪ 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
References	▪ Present the list of publications you cited in the main text
Appendix	▪ Attach any supporting materials (e.g. survey)

Selecting an appropriate journal

- ❖ See List of Engineering Education Journals (http://hke3r.cetl.hku.hk/eej.php)
- ❖ Research your selected journal
  - Study the journal's guidelines for authors.
  - Know and understand the journal's criteria.
  - Ask yourself "Are my 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.
  - Look 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.

Tips on how to increase your chances of getting published

a. Abstract should capture readers' attention with clear description of what the paper is presenting and what are the outcomes.
b. 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).
c. 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?
d. 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.

e. Demonstrate what is original and new about your research. Highlight the contribution of your work to the field.

f. 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.

g. 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.

h. Some journals may charge publication fee.

i. If your paper is accepted, you will be require to sign a copyright form to transfer the copyright to the publisher.

Understanding the submission and review process (Froyd, 2009)

- Submit manuscript.
- Editor receives manuscript.
  - If appropriate, the editor will pass manuscript on for review.
  - If not appropriate, the editor will return the manuscript fairly quickly.
- Manuscript is reviewed.
- Author(s) receives decision along with comments from the review process.
- Potential decisions:

a. Accept with no or minor changes

What to do:

✓ Make changes and submit.

b. Accept if major revisions are successfully done

What to do:

✓ Read reviewer comments carefully, agree with the reviewers, make suggested changes as appropriate, and resubmit.

- ✓ When you send back your revised paper, it is advisable for you to include a detailed, point-by-point explanation of how you have addressed each of the reviewers' and editor's comments.
- ✓ If you disagree with the reviewers, give reasons for why you disagree. Be clear, but not offensive.

c. Reject

What to do:

- ✓ Do not be discouraged.
- ✓ Read reviewer comments carefully and decide how to restructure the manuscript.
- ✓ Consider reformatting the paper for your second-choice journal.

The review process may take from anything between 2 days to 8 months, it really depends on the journal and the availability of the reviewers.

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