2023-10-27

The Doctoral Symposium in Engineering Education Research at SEFI 2023

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THE DOCTORAL SYMPOSIUM IN ENGINEERING EDUCATION RESEARCH AT SEFI 2023

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Conference Key Areas*: Fostering Engineering Education Research*
Keywords*: Engineering Education Research, doctoral education, networking*

ABSTRACT

The 7th SEFI Doctoral Symposium in Engineering Education Research, held at the campus of Technological University Dublin on Sunday, September 10th, preceded the SEFI 2023 Annual Conference. In all, 37 Ph.D. researchers attended, which is a record number for this event. They came to share and further probe their Ph.D. research topics and plans of study and to strengthen and extend their professional networks. During this full and intense day, 27 established scholars provided the Ph.D. researchers with personal feedback and ideas regarding their research. The highlight, according to the Ph.D. student participants, was the warm and enthusiastic reception they received from the well-established seniors of the global engineering education research community. Although SEFI is a European organization, the Ph.D. researchers and senior advisers who attended travelled to Ireland for this event from Africa, Australia, and South and North America, and from all over Europe.

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1 INTRODUCTION

1.1 The Role of the Doctoral Symposium in Engineering Education Research

Engineering education research (EER) is an emerging and expanding field, and it is now possible to pursue doctoral education in many institutions, in Europe as well as in other parts of the world. As in any research field, PhD students can benefit greatly from getting to know the leading scholars. This is however particularly true in EER since many PhD supervisors are educational champions with a background in engineering subjects, who are not themselves trained in educational research. It is also common that a PhD student is the only one in their university working on this topic. In such cases, it means a lot to have a supportive network beyond one's own environment (Edström et al., 2018). It is against this background that SEFI organises a Doctoral Symposium in conjunction with its annual conference. Prior to this year, the DS has been held the day before SEFI 2016 in Tampere, 2018 in Copenhagen, 2019 in Budapest, 2020 online from Twente, 2021 online from Berlin, and 2022 in Barcelona.
The objective of this paper is to document and share insights from the 7th SEFI Doctoral Symposium in Dublin 2023. The paper explains the design of the program and discusses recruitment of participants – both the doctoral students and experienced researchers. It proceeds to present some of the rich materials that was created and captured, including introductions, literature tips and advice from seniors and reflections from all participants. Finally, some reflections are made.

1.2 The SEFI Doctoral Symposium 2023

As in previous SEFI conferences, this year's Doctoral Symposium (DS) was held as a full-day pre-conference event on the Sunday preceding the conference.
The DS is fully interactive and uses a variety of formats to create an enriching experience:

- Short (one-minute) pitches by the seniors, so the early career researchers can familiarize themselves with well-established researchers
- Discussions in small groups focusing on each student's Ph.D. project (up to 30 minutes per student)
- Speed-dating activities to grow each participant's network
- Presenting (one-minute) take-home-messages, to ensure that valuable lessons are learnt and shared

1.3 Doctoral Student Participants

As in previous years, Ph.D. students were invited to submit an application in the form of an extended abstract, including:

- *A general introduction* (about their background and interest in EER)
- *An outline of their research* (an elevator pitch, along with identification of their research interest, thesis title, supervisors, current work),
- *Reflections* (their current questions, challenges, dilemmas, wishes, ambitions),
- *Preferences for networking* (at SEFI2023, and for keeping in touch after the conference).

The organising team, who (with some slight changes) has worked together on this event over the years, was delighted by the high number of applicants applying to attend in 2023. Much of the work submitted in 2023 was well developed and 40 proposals were accepted; however, due to visa complications three candidates were prevented from making the trip. Ultimately, 37 PhD students attended for the full day.

They represented 15 countries in four continents: Aruba, Australia, Belgium, Denmark, Finland, Germany, Ireland, Lithuania, the Netherlands, Norway, South Africa, Spain, Sweden, the UK, and the USA.

1.4 Senior Participants

To provide the Ph.D. researchers with feedback, coaching, and guidance, a diverse group of well-established senior participants was recruited. The organisers aim for a ratio of normally three juniors being coached by two seniors in focused sessions during the day. This has proven an optimal ratio for ensuring diverse but lively and targeted feedback for juniors.
The willingness – even eagerness – of the seniors to participate in this event was nothing short of remarkable. Seniors volunteer their time to travel to SEFI a day early and dedicate an entire Sunday to the event. Despite this, there was palpable enthusiasm among the seniors to participate, and almost every invitation that was issued was also accepted. This year 27 established scholars came to serve as senior advisors, including the organising team (the four authors of this paper). The senior participants and organisers travelled to the DS from Australia, Belgium, Denmark, Ireland, the Netherlands, Portugal, South Africa, Sweden, the UK, and the USA.

1.5 Group Formation

The core of the symposium consisted of group activities in which doctoral students and seniors worked together. This year, seven groups were formed, each containing four doctoral students and two to three senior participants. The groups were composed taking into account a balance between diversity and similarity regarding years of experience, research interests – both in terms of topics and methods, university, and country. The group formation was sent out to all participants in advance, together with a compilation of all extended abstracts. The instruction was to prepare by reading the abstracts of the doctoral students, at least the ones in their own group. The groups were formed a week in advance, with a few last-minute changes due to visa cancellations.

1.6 Event Outline

The program was designed to accommodate lively and deep discussions between Ph.D. researchers and experienced researchers. Group activities were the focus, and these were interspersed with plenary sessions:

09:00-09:30	Arrival, coffee & tea
09:30-10:00	Introductions and Instructions for the Day
10:00-12:00	First Group Session
12:00-13:00	Lunch
13:00-14:30	Speed Dating
14:30-15:10	Second Group Session
15:10-15:30	Refreshment Break
15:30-16:30	Plenary Report (Take-Home Messages: <1 Minute Per Person)
16:30-17:00	Final Reflections

2 CAPTURING THE DISCUSSIONS

2.1 Getting to Know the Experienced Researchers

Before the Doctoral Symposium, the senior participants were asked to submit some reading tips for the doctoral students. The first question was: *If a doctoral student*

wanted to read something by you, what would you recommend and why? In response, the seniors mentioned the following selection of their own work (in alphabetical order):

Una Beagon

My PhD thesis - just to show the layout of chapters and the depth in which you have to go into to satisfy your examiners. It's important to know what is expected in the PhD.

- Beagon, U. (2021) A Phenomenographic Study of Academics Teaching on Engineering Programmes in Ireland: Conceptions of Professional Skills and Approaches to Teaching Professional Skills, Doctoral Thesis, TU Dublin, 2021. https://arrow.tudublin.ie/engdoc/125/

Jonte Bernhard

Quality in engineering education research (EER):

- Bernhard, J., & Baillie, C. (2016). Standards for quality of research in engineering education. *International Journal of Engineering Education, 32*(6), 2378-2394.

The relationship between "pure" engineering research and EER:

- Bernhard, J. (2015). Engineering education research as engineering research. In S. Hyldgaard Christensen, C. Didier, A. Jamison, M. Meganck, C. Mitcham, & B. Newberry (Eds.), *International perspectives on engineering education: Engineering education and practice in context, Volume 1* (pp. 393-414). Springer.

How engineering thinking can, indeed, improve the methods of EER:

- Carstensen, A.-K., & Bernhard, J. (2019). Design science research – a powerful tool for improving methods in engineering education research. *European Journal of Engineering Education, 44*(1-2),85-102.

Tom Børsen

If you are interested in curriculum development and interdisciplinary:

- Karadechev, P., Petersen, L. S., & Børsen, T. (2021). *Interdisciplinary competencies in the study program of Techno-Anthropology.* Aalborg University Press.

If you are interested in engineering ethics education:

- Børsen, T. Serreau, Y., Reifshneider, K., Baier, A., Pinkelman, R., Smetanina, T., & Zandvoort, H. (2021). Initiatives, experiences and best practices for teaching social and ecological responsibility in ethics education for science and engineering students. *European Journal of Engineering Education, 46*(2), 186-209.

Jenni Case

This was my attempt to try and understand how the curriculum within which I worked had come to be. This is not only a national but also a global context. There is huge potential in looking at these matters comparatively.

- Case, J. M. (2017). The historical evolution of engineering degrees: competing stakeholders, contestation over ideas, and coherence across national borders. *European Journal of Engineering Education, 42*(6), 974-986.

Shannon Chance

This is a comparison of two similar methodologies, with examples of how they're done.

- Chance, S., Duffy, G., & Bowe, B. (2020). Comparing grounded theory and phenomenology as methods to understand lived experience of engineering educators implementing problem-based learning. *European Journal of Engineering Education, 45*(3), 405-442.

I'm also quite proud of this lesser-known work:

- Chance, S., Marshall, J., & Duffy, G. (2016). Using architecture design studio pedagogies to enhance engineering education. *International Journal of Engineering Education, (32)*1B, 364-383.

Tinne De Laet

My latest publication focusing on metacognition for physics problem solving:

- Sijmkens, E., De Cock, M., De Laet, T. (2022). The Disciplinary Learning Companion: The Impact of Disciplinary and Topic-Specific Reflection on Students' EC-TEL 2022. *Lecture Notes in Computer Science, vol 13450*. Springer, Cham.

Inês Direito

Emotions in engineering education is an emerging research field:

- Lönngren, J., Direito, I., Tormey, R., & Huff, J. (2023). Emotions in engineering education. In A. Johri (Ed.), *International Handbook of Engineering Education Research* (pp. 156-182) Routledge.

Xiangyun Du

- Lyngdorf, N. E. R., Du, X., & Lundberg, A. (2023). First-year engineering students' learner agency sources in a systemic PBL environment: a Q study. *European Journal of Engineering Education*, 1-18.

Kristina Edström

This paper was such a joy to write – it changed me. I wish all of you to find your own compelling curiosity and your own voice.

- Edström, K. (2018). Academic and professional values in engineering education: Engaging with history to explore a persistent tension. *Engineering Studies, 10*(1), 38-65.

Cindy Finelli

- Finelli, C. J., Daly, S. R., & Richardson, K. M. (2014). Bridging the research-to-practice gap: Designing an institutional change plan using local evidence. *Journal of Engineering Education, 103*(2), 331-361.

David Knight

We need to talk about structural issues far more in engineering education.

- Knight, D. B., Grohs, J. R., Bradburn, I. S., Kinoshita, T. J., Vaziri, S., M. Matusovich, H., & Carrico, C. (2020). Illuminating inequality in access: Variation in enrollment in undergraduate engineering programs across Virginia's high schools. *Journal of Engineering Education, 109*(4), 665-684.

Greet Langie

- Craps, S., Pinxten, M., Knipprath, H., & Langie, G. (2022). Different roles, different demands. A competency-based professional roles model for early career engineers, validated in industry and higher education. *European Journal of Engineering Education, 47*(1), 144-163.

Joyce Main

- Main, J.B., Wang, Y. & Tan, L. (2021). The career outlook of engineering PhDs: Influence of postdoctoral research positions on the attainment of tenure track faculty positions and academic salaries. *Journal of Engineering Education, 110*(4): 977-1002.

Diana Adela Martin

The paper might be of interest if you work on ethics and sociotechnical aspects or if you are collecting data from multiple sources for your PhD:

- Martin, D.A., Conlon, E. & Bowe, B. (2021). A Multi-level Review of Engineering Ethics Education: Towards a Socio-technical Orientation of Engineering Education for Ethics. *Science and Engineering Ethics 27*, 60.

Abel Nyamapfene

This was my first serious foray into engineering education research. It took me several review cycles during which the ever-so-patient reviewers gradually taught me that a paper needs to have at least a study aim or better still a research question….

- Abel Nyamapfene (2010). Does class attendance still matter?, *Engineering Education, 5*:1, 64-74,

Madeline Polmear

An overview on informal learning that includes theoretical perspectives and opportunities for future research:

- Polmear, M., Chance, S., Hadgraft, R., & Shaw, C. (2023). Informal learning: Opportunities for competency development and broadened engagement. In A. Johri (Ed.), *International Handbook of Engineering Education Research*.

Corrinne Shaw

- Malebogo N. Ngoepe, Kate le Roux, Corrinne Shaw, Brandon I. Collier-Reed, (2022). Conceptual Tools to Inform Course Design and Teaching for Ethical Engineering Engagement for Diverse Student Populations. *Science and Engineering Ethics 28*(2).

Jan van der Veen

There are many ways to do case studies. Whatever mixture of quantitative and qualitative research methods you use, make sure you present a rich story.

- MacLeod, M. and J. T. van der Veen (2020). Scaffolding interdisciplinary project-based learning: a case study. *European Journal of Engineering Education 45*(3): 363-377.

Esther Ventura-Medina

This is a short publication that I always keep at hand because it provides a good grounding on theory, classroom issues and research questions in the context of education frameworks that are commonly used in engineering education research:

- Svinicki, M. D. (2010). A guidebook on conceptual frameworks for research in engineering education. *Rigorous Research in Engineering Education, 7*(13), 1-53.

Bill Williams

This article focuses on the engineering workplace and how future engineers can create value:

- Trevelyan, J., & Williams, B. (2019). Value creation in the engineering enterprise: an educational perspective. *European Journal of Engineering Education, 44*(4), 461-483.

Chris Winberg

Many of the doctoral students are doing innovative work - exploring new concepts, new methodologies, and challenging assumptions. Here I tried to explore and apply new concepts, try out new (and not yet generally accepted) methods, while challenging assumptions about the kinds of learning that happens in laboratories - might inspire doctoral scholars in their own work.

- Winberg, C. (2021). The Making of Engineering Technicians: Ontological Formation in Laboratory Practice, *Engineering Studies, 13*:3, 226-248.

Karin Wolff

Enabling students to develop complex thinking & practices:

- Wolff, K., Kruger, K., Pott, R., & de Koker, N. (2022). The conceptual nuances of technology-supported learning in engineering. *European Journal of Engineering Education*, 1-20.

Alternatively, for the students working with technology in education:

- Wolff, K. & Booysen, M.J. (2019). The smart engineering curriculum. *Proceedings of the 8th Research in Engineering Education Symposium*. Cape Town.

In addition, Maartje van den Bogaard, Anne Gardner, John Mitchell, Johannes Strobel, and Roland Tormey shared their recommendations verbally.

2.2 Reading Recommendations from the Experienced Researchers

Next, the senior researchers were asked to give input following the prompt: *Recommend one paper, not your own, for a starting PhD student?* This resulted in a comprehensive collection of publications, with some notable overlaps.

Una Beagon

I went to Scott Daniel's SEFI presentation on this paper early in my PhD and came out of it thinking.... oh I'll do phenomenography - I get that.

- Daniel, S. (2022). A phenomenographic outcome space for ways of experiencing lecturing. *Higher Education Research and Development 41*(3).

Jonte Bernhard

- Case, J. M. (2019). A third approach beyond the false dichotomy between teacher- and student-centred approaches in the engineering classroom. *European Journal of Engineering Education, 44*(5), 644-649.

Tom Børsen

When I did my PhD in university education this chapter helped me navigate in the different paradigms of qualitative research:

- Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. *The Sage Handbook of Qualitative Research, 4*(2), 97-128.

Jenni Case

I am not sure there is one paper I would recommend to everyone. Start reading on the topics and puzzlements that you care about and see where that takes you. But if you want to think about the context in which we work:

- Lucena, J., Downey, G., Jesiek, B., & Elber, S. (2008). Competencies beyond countries: the re-organization of engineering education in the United States, Europe, and Latin America. *Journal of Engineering Education, 97*(4), 433-447.

Shannon Chance

This handbook provides a wide overview of research in our field and has an impressively diverse group of authors. It's a great introduction to the field, and a who's who of sorts:

- Johri, A. (Ed.). (2023). *International Handbook of Engineering Education Research*. Routledge.

Tinne De Laet

- Fleur, D.S., Bredeweg, B. & van den Bos, W. (2021). Metacognition: ideas and insights from neuro- and educational sciences. *npj Sci. Learn. 6*, 13.

Inês Direito

Engineering education researchers' social identities – their backgrounds, world views, experiences and biases – have an impact on their research. This paper is a call for reflexivity and discussion of the ethics of conducting research.

- Secules, S., McCall, C., Mejia, J.A., et al. (2021). Positionality practices and dimensions of impact on equity research: A collaborative inquiry and call to the community. *Journal of Engineering Education, 110*(1), 19–43.

Xiangyun Du

- Direito, I., Chance, S., & Malik, M. (2021). The study of grit in engineering education research: a systematic literature review. *European Journal of Engineering Education, 46*(2), 161-185.

Kristina Edström

Go through a few recent issues of different journals to understand the publication landscape and what is required from a manuscript. It’s a good activity for a journal club!

Cindy Finelli

- Borrego, M. (2007). Conceptual difficulties experienced by trained engineers learning educational research methods. *Journal of Engineering Education, 96*(2), 91-102.

David Knight

- Davis, M. S. (1971). That's interesting! Towards a phenomenology of sociology and a sociology of phenomenology. *Philosophy of the social sciences, 1*(2), 309-344.

Anette Kolmos

- Arthur, W. B. (2009). *The nature of technology: What it is and how it evolves*. Simon and Schuster.
- Barnett, R. (2000). Supercomplexity and the curriculum. *Studies in Higher Education, 25*(3), 255-265.

Greet Langie

- 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.

Joyce Main

- Griffith, A. (2010). Persistence of women and minorities in STEM field majors: Is it the school that matters? *Economics of Education Review. 29*(6). pp. 911-922.

Diana Adela Martin

This paper by Direito, Chance and Malik, is a standard for conducting a systematic literature review. There are no better EER scholars to learn this process from.

- Direito, I., Chance, S. & Malik, M. (2021). The study of grit in engineering education research: a systematic literature review, *European Journal of Engineering Education, 46*(2), 161-185.

Abel Nyamapfene

One of the biggest challenges when moving from technical engineering research to engineering education research, is getting a grip on research methods. This paper, though it's now 12 years old, is a discussion of research methods that a budding EER researcher might want to know more about.

- Case, J.M. & Light, G. (2011). Emerging Research Methodologies in Engineering Education Research. *Journal of Engineering Education, 100*(1), 186-210.

Madeline Polmear

An introduction to qualitative methodologies:

- Case, J. M. & Light, G. (2011). Emerging research methodologies in engineering education research. *Journal of Engineering Education, 100*(1), 186-210.

I also recommend the *International Handbook of Engineering Education Research* (Johri, 2023) since it covers a range of topics and offers fundamental and state-of-the-art insight into the field.

Corrinne Shaw

It depends. Have a conversation with me and I will make a recommendation.

Jan van der Veen

Inspirational combination of theory and practice:

- Klaassen, R. G. (2018). Interdisciplinary education: a case study. *European Journal of Engineering Education, 43*(6): 842–859.

Esther Ventura-Medina

This article by Borrego and Douglas about methods covers quantitative, qualitative and mixed methods approaches:

- Borrego, M., Douglas, E. P., & Amelink, C. T. (2009). Quantitative, qualitative, and mixed research methods in engineering education. *Journal of Engineering Education, 98*(1), 53-66.

Bill Williams

Particularly useful for researchers coming from an engineering or natural sciences background:

- Case, J. M., & Light, G. (2011). Emerging research methodologies in engineering education research. *Journal of Engineering Education, 100*(1), 186-210.

Chris Winberg

This offers some insights on what we're all trying to do:

- Patrick, A. Y., Wisnioski, M. H., McNair, L., Ozkan, D. S., Reeping, D., Martin, T. L., ... & Haines, C. E. (2023). In it for the Long Haul: The Groundwork of Interdisciplinary Culture Change in Engineering Education Reform. *Engineering Studies*, 1-24.

Karin Wolff

For students looking at institutional/leadership/change strategies:

- Garraway, J., & Winberg, C. (2019). Reimagining futures of universities of technology. *Critical Studies in Teaching and Learning, 7*(2), 38-60.

2.3 Advice from Experienced Researchers

Seniors were also asked to give one general tip for a starting Ph.D. student.

Una Beagon

Use this SEFI to attend presentations on methodologies that you are thinking of (if you have not yet decided) rather than the topics of interest. I find that being confident about your methodology is the hardest part of the PhD.

Jonte Bernhard

Think through your research question(s), i.e. find interesting problems you want to investigate. In my opinion the quality of the insights generated is more important than mechanically following a method.

Tom Børsen

Remember, it is your project.

Jenni Case

READ!!!! THINK!!! TALK with others!!! Seriously – there are shortcuts you can take – but if you want an experience that is intellectually transformative (first prize) I think this is the only way forward.

Shannon Chance

Extend your network! Look for people you'd like to collaborate with in the future and cultivate mentors to give you advice and references in the future.

Tinne De Laet

Talk to your colleagues, also the ones of other domains. They well help enrich your work and broaden your horizon.

Inês Direito

Doing a PhD can feel very lonesome, things will not always go according to plan, and you may feel you are not making progress or getting enough feedback. Whatever it is, never struggle on your own! Talk to other colleagues, friends and family, supervisor(s), mentors(s), or mental health professionals. Don't forget to have a life outside work and enjoy your PhD!

Xiangyun Du

Feel safe to be creative. A PhD project is a process to construct your own academic identity.

Kristina Edström

Become an active participant in the research community. For instance, become a reviewer – you learn a lot from reading and critiquing others' work and seeing the review process from the other side.

Cindy Finelli

Remember that there is more to life than your dissertation – make it a priority to take care of yourself!

David Knight

Be curious.

Anette Kolmos

Focus - focus - and more focus. Work on the research questions.

Greet Langie

Stay passionately curious! Do not stop questioning. No one will ever blame you for this, on the contrary.

Joyce Main

Self-care is an important priority. Write a little every weekday.

Diana Adela Martin

The EER community is fantastic and grew via mutual support and friendships. Feel welcome to reach out to the researchers you admire, to ask for advice from a potential mentor, to discuss with the author their paper, to propose projects to SIG chairs or other group leaders of networks or associations in your area of research. And if you are interested engineering ethics education (broadly conceived), or have a suggestion for a project for the SEFI Ethics SIG, especially if it is something you would like to lead, reach out to me.

Abel Nyamapfene

The doctoral process is a marathon and not a 100 metre sprint. Be gentle to yourself, take your time, there is a lot to take in, don't panic, we have all been there.

Madeline Polmear

Have a constellation of mentors. Instead of relying only on your PhD supervisor for information and advice, seek out different mentors who can support you for various purposes, such as career development and personal growth.

Corrinne Shaw

Make sense of your ideas, puzzling through, thoughts and work by writing. Write, write and write some more. Write first for yourself, for sensemaking before you refine or translate for anyone else.

Jan van der Veen

Enjoy the journey and connect with fellow travellers.

Esther Ventura-Medina

Think carefully what question you are asking and try to fit your theoretical lens and methods to this.

Bill Williams

The field is large. Find particular researchers whose work really speaks to you. Then find a way to speak to them.

Chris Winberg

The PhD is lonely journey - so connect with a supportive group - or groups – for example a reading group (I am part of a reading group that includes doctoral scholars and supervisors who are using Activity Theory) and a writing group, such one that meets once a week to either 'just write' and sometimes to talk about writing can make the journey more collegial.

Karin Wolff

Be organised, have a dedicated space and allocated time slots for uninterrupted work. With good systems in place (including document management), it is also important to have peer/mentor/family support structures. The PhD journey can be overwhelming and lonely, but by recognising the importance of 'systemic' and 'affective' support, the ultimate goal of 'cognitive' development and contribution can be achieved.

2.4 Group Notes

The groups wrote collaborative notes during their time together and then prepared notes using an online file. These were valuable, yet lengthier than could be included here.

2.5 Take-Home Messages

As the final activity in the day, the organisers invited each participant to share one nugget of wisdom gained, as a take-home message from the DS. This final plenary provided each attendee with one minute to present a take-home message. The messages from doctoral students and seniors appear below:

Zeyi Liu, Michael O'Connell, and Nicola Rice: We got a lot of information about possible future research domains. WhatsApp and the networking opportunities during the conference will be used to continue discussions. The flow of knowledge is amazing. Thanks to this strong network, I will be able to save a lot of time. I gained a lot of new knowledge. I will pay attention to learning to synthesize and synopsize. It's important to learn to explain your research to a non-academic audience. The variety of projects is impressive. The PhD's have ownership of their research! We are all sponges of knowledge.

Maiken Winther: Context of the PhD is very important to understand the results: educational context (What does it mean to be admitted to this university? What is it like to study here? What does life look like after graduation for these students?)

Lisa Hagedorn: Focus is very important: you don't need to do everything → pick a slice that you want to focus on.

Shan Tuyaerts: Experienced and foreseen challenges are also important research outcomes, as well as potential future research directions.

Esther Ventura Medina: Good research leads to more questions than answers. Your research will not go the way you expected it to. It is more important to answer a meaningful question and provide new insight rather the original question.

Saul Garcia Huertes: Take just one issue and stick to it.

Jenni Case: Contributions from the PhD might be different: to theory, to practice or to methodology but it is important to have a good story.

Shameela Arbi: Scope and methods can always change throughout the PhD process, but it's important to love your topic or area of research. It is not easy to dedicate years of your life to something you're not passionate about.

Yiduo Wang: It is okay to be flexible and make compromises if the previous plan seems too challengeable. The end of the PhD is not the end of life, instead, is the start of the academic career.

Eugenio Bravo: Plan your work and work your plan to get your PhD done.

Eva Murphy: Allow for things to not go as planned.

Sandra Cruz Moreno: My main takeaway is to narrow down my research topic, and to focus on (re)formulating my research question and make it answerable. The second is to network with the EER community while enjoying the process. Lot of fellow researchers agreed that this community is very welcoming and supportive.

Julia Sundman: It is interesting to see the diversity of backgrounds that EE researchers come from – it is also comforting that although not everyone has a background in engineering or educational sciences, we are all motivated by the desire to advance engineering education to respond to the society's and planet's needs. The need to facilitate boundary-crossing in engineering education is clear, and this should be understood further not only in learning contents, students' interactions, but also in collaborative teaching practices among teachers.

Ann-Kristin Winkens: Exchange is everything, especially when starting the PhD, because most of us are newcomers in a cross-/interdisciplinary research field. Engineering Education Research is boundary-crossing, so we need to be open and curious for other perspectives and ways of thinking.

Anette Kolmos: It is such a pleasure to see the growth of the community and the hope for development and innovation of engineering education. I also hear that sustainability, interdisciplinarity, humility, collaboration, challenge- problem- project based learning maybe has become a mainstream element in engineering education. Thanks to the organisers and thanks to the group members.

Jan van der Veen: I see a worldwide community now, great. Topics shared widely are the ways sustainability is included in education but also how engineering education can become more inclusive. Many have a background in science or engineering themselves, a great asset but also an extra challenge to familiarize oneself with social science methods.

Kate Bellingham: There are many different ways of doing this journey - enjoy your voyage of discovery.

Dione Maluwa: It is okay to feel inadequate on this PhD journey because you are embarking on something that very few people will, so be kind to yourself.

Beyza Nur Guler: Your research questions might change along the process. It is important to narrow down your research topic and devote your career to the rest. Curriculum design has stages design, implementation and experiences of students.

Johannes Schleiss: Three learnings: (1) Learning from topics and different perspectives helps, even though the topics are not connected in the first place. (2) Support networks are key and helpful. (3) Measuring impact of change is challenging.

Xiangyun Du and Maartje van den Bogaard: Many of you are doing PhDs outside of your own field of training. That is pretty bold! When in trouble or doubt: keep on moving forward! Be bold and pragmatic in taking steps towards operationalization, choosing your theoretical framework, etc. It doesn't have to be perfect: it needs to be informed.

Tom Børsen: There are trends and great possibilities for synergies between many projects. Many research transformative learning, diversity, sustainability, longitudinal studies, interdisciplinary challenges.

Eugene Leo Draine Mahmoud: Clarify and narrow the research questions and their expected impact, use purposeful sampling within qualitative methods, focus student narratives on assets and successes, incorporate intersectional student identity, ask for help.

Luke Dokter, Erna Engelbrecht, Tina Anne Fuhrmann, Callum Kimpton, Una Beagon, and Roland Tormey: Come to SEFI every year to recharge your research batteries. Write one PhD (not three). Be clear about how you have been systematic in data collection and analysis so as to clearly address your research question.

We need to allocate time to sufficiently reflect over the experiences/impressions from the day, but how ar ewe to do this when we are about to embark on a 4-day conference?

Rani Dujardin, Pleun Hermsen, Olga Ovtšarenko, Ina Peters, Cindy Finelli, Abel Nyamapfene, and Corinne Shaw: Claim credit for what you do! Speak of yourself as a singular person, not as the speaker of a whole research group. Narrow down your PhD topic. The thesis is the beginning of something, not the end. These conversations helped clarify next steps. We need reflection time to think about everything we heard, everyone for themselves. Broad access to publications is a hot topic.

In other words, many universities cannot pay open access fees, others cannot afford licenses for closed access publications. We need to find ways of sharing knowledge within the community. Interesting ideas to pursue as next steps forwards.

Alba de Agustin Camacho: I have learnt about options for journals and conferences. I have enlarged my network. I got interesting input to keep working on my PhD.

Bill Williams: Find your community.

Anna Overgaard Markman: My main take-home message is the importance of community. I have my research group in Aalborg, but it's interesting to meet researchers within the field from different parts of the world.

Fatima Darsot: My main take-home message is that you need a "village to work on your research" and to build it.

Johannes Strobel: Any research can be improved from coming from a different perspective, things can duplicated in so many different traditions.

John Mitchell: There are always interconnections between research, despite what first impressions might be and therefore all experience sharing is valuable.

Svend Christiansen, Camilla Bjorn, Hanna Aarnio, and Tasha Zephirin: Be a rebel with support… [apropos Be a rebel with a cause!!!]. It's helpful to continuously talk about your topic to different audiences to clarify what you're doing [new insights and energy]. Visualize your topic/research interests and be strategic about your yes/no/not yet! You can continue developing your theoretical framework also after completing your PhD thesis.

Shannon Chance: Understand that this is a very welcoming community and feel free to reach out to anyone in this room today with questions or ideas for projects – even those who seem like superstars in the field are likely to respond and help you. I know this first-hand!

Jonte Bernhard: I am glad that so many could participate in the symposium today. I hope the symposium has inspired you and you have learned something. As we hope you have experienced today you will always learn something by extending your network and you get new perspectives from visiting other institutes and communicating with people outside your own close circle. Never stop to keep your mind open!

3 REFLECTIONS AND WAY AHEAD

The 7th DS was the most well-attended, dynamic and interactive SEFI Doctoral Symposium so far. The growing number of participants is an indicator of the strong reputation of the DS over the years, but also of the growing maturity of the research field on engineering education. It is delightful to see a healthy and growing community of researchers across and beyond Europe. With 37 Ph.D. researchers and 27 established scholars giving their all to the community, and to uplifting each other, the field of EER seems to have a bright future.

It is impressive that so many leading experts in the field are willing to donate significant time and effort to mentor others and to help make SEFI a world-leading community for presenting research, collaborating, and sharing ideas. However, it is certainly not only the Ph.D. researchers who benefit and learn in the doctoral symposium; the senior mentors and organisers benefit as well. Senior participants reported that they felt honoured to share their thoughts and ideas with the junior researchers. They appreciated networking with juniors and seniors alike and having the chance to "spot new talent". As reported in a blog by Chance (2023), "*It was, in all honesty, a highlight of the overall week, and each participant shared insights at the end of the day. 'I found my village' exclaimed one of the PhD students to resounding applause. Indeed, this annual symposium, where experienced researchers provide one-to-one advice to doctoral students helps bring our research community together.*"

As recent years have brought larger and increasingly enthusiastic participation to this Doctoral Symposium, with dozens of junior and senior participants joining, significant participation from outside Europe can also be noted. Their diverse presence makes valuable contributions to the dynamic discussions and enables the development of global connections within the field.
The authors are delighted with the expanded capacity of our community to conduct research with strong scholarly grounding and usefulness to readers. We are dedicated to helping foster individuals and the unique abilities, insights and perspectives each new member brings to our community. We observe new and thriving publication venues, and value the vibrant sense of community that characterised this year's doctoral symposium. We hope to stay connected with this year's participants and see all of them again at coming SEFI conferences.

4 ACKNOWLEDGMENTS

The authors wish to thank every participant in the DS since its inception in 2016. The success of the activity is a direct result of the engagement and enthusiasm of juniors and seniors alike. We also thank the local and international organizing committees over the years, including Ger Reilley for his outstanding support in 2023. We thank the SEFI staff and board for entrusting us with the facilities and resources to help make this event possible.

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