



FACE TO FACE AGAIN – REPORT FROM THE DOCTORAL SYMPOSIUM IN ENGINEERING EDUCATION RESEARCH AT SEFI 2022

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ABSTRACT

The 6th Doctoral Symposium at SEFI 2022 attracted 20 doctoral students and 17 senior researchers. After two years as an online event during the pandemic, it was organised as a fully in-person event. In preparation, the doctoral students wrote extended abstracts to introduce themselves and their PhD projects, while the seniors provided reading recommendations and advice. The intense, full-day program was based on group discussions and interactive plenary sessions. The Doctoral Symposium was concluded by a session in which each participant presented their take-home message. This paper outlines how the Doctoral Symposium was organised and summarizes some of the documentation.

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1 INTRODUCTION

1.1 The SEFI Doctoral Symposium

With the exception of a few larger research centres, doctoral education in engineering education research (EER) is often organised in relatively small scale at each institution – this is not least true in Europe. Therefore, it is important for PhD students to network outside their own research environment, in order to enhance the doctoral student experience, support their development as researchers, and increase their understanding of the EER field as a whole. Creating and maintaining connections between researchers, and regional and international networks, are then strategies for strengthening the research field (Borrego & Bernhard, 2011; Edström et al., 2018).

The European Society for Engineering Education (SEFI) recognises the EER field and its importance for furthering engineering education. Through the Doctoral Symposium in Engineering Education Research, SEFI offers PhD students opportunities to share their work with peers and with senior researchers, to build their personal network and exchange feedback. The aim is that participants will:

- meet other students and supervisors to extend their network and view of the EER field,
- present and discuss their own work and the work of others,
- get perspectives from scholars outside their own institution,
- contribute to the conference and the SEFI EER community, and
- promote collaborative research and elaborate future research directions.

In five previous SEFI conferences, a Doctoral Symposium in Engineering Education Research (DS) has been held as a full-day pre-conference event: before the SEFI Annual Conference 2016 in Tampere, 2018 in Copenhagen, 2019 in Budapest, 2020 in Twente (online), and 2021 in Berlin (online).

The purpose of this paper is to document and share some insights into the process and products of the DS 2022. In the following, we discuss recruitment of participants – both the doctoral students and experienced researchers, and explain the activity design. We present parts of the rich material that was created, in particular the advice from seniors and the individual reflections from all participants.

1.2 Back to a face-to-face Symposium

Due to the Covid-19 pandemic the DS had to be arranged online in 2020 and 2021. This year, the SEFI annual conference as well as the DS were back to in-person meetings. As organizers, we had very much been looking forward to arranging the DS as a face-to-face event again. There was however still a risk for new outbreaks which could force us to transfer the DS, and indeed the whole conference, to an online event again. Another risk which could cause low attendance was if the intended participants would be afraid to start travel internationally again, or not allowed to by their universities. Luckily, both these fears were unfounded and the participation at the DS was back to similar numbers as before the outbreak of the pandemic. The only disturbance due to the aftermath of the pandemic was that airlines and airports could not handle the return of traffic post-pandemic. This had, unfortunately, as consequence that a few accepted doctoral student and senior participants could not arrive in Barcelona in time for the DS.

1.3 Doctoral Student Participants

The doctoral students interested in participating were invited to send an extended abstract, containing:

- *A general introduction* (background and interest in EER),



- *An outline of their research* (elevator pitch, research interest, thesis title, supervisors, current work),
- *Reflections* (questions, challenges, dilemmas, wishes and ambitions),
- *Preferences for networking* (at SEFI2022, and for keeping in touch).

The extended abstracts that were submitted showed that the doctoral students were in various stages in their PhD projects, representing various topics from policy level to fine-grained classroom studies. Twenty-four doctoral students were accepted, but four of them had to cancel due to illness or flight problems. Finally, 20 students attended representing 10 countries: Belgium, Denmark, Germany, India, Ireland, the Netherlands, Norway, Sweden, the UK, and the US.

1.4 Senior Participants

A number of experienced researchers in the field – here called senior participants – were invited to provide the PhD students with feedback, coaching and guidance. It is important for the quality of these discussions that there is a high number of seniors.

Just like in the previous symposia, the organisers wanted to keep the ratio of seniors to students very high, aiming at approximately 2 seniors per 3 doctoral students. The invitations were apparently very attractive, as almost every person agreed to extend their travel to volunteer their time, on a Sunday. This year there were in total 17 seniors, including the organising team (the authors of this paper). They came from Australia, Belgium, Denmark, Ireland, the Netherlands, Portugal, Sweden, Switzerland, South Africa, the UK, and the US. Hence, the seniors were even slightly more geographically diverse than the doctoral students.

1.5 Groups

The core of the symposium consisted of group activities in which doctoral students and seniors worked together. Seven groups were formed, each containing 3 doctoral students and 2–3 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. A compilation of all extended abstracts was sent out to all participants. 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, but some last-minute changes were made due to the late cancellations.

1.6 Event Outline

The event took place on Sunday September 18, as a pre-conference day before the SEFI 2022 Annual Conference. The program was designed to accommodate lively and deep discussions between PhD students and experienced researchers. The main parts of the program were group activities, interspersed with plenary activities:

09.30 – 10.00 Coffee & Tea

10.00 – 10.30 Introductions and instructions for the day

10.30 – 12.30 First group session

Lunch

13.30 – 14.15 Speed dating

14.15 – 15.30 Second group session

15.30 – 16.30 Plenary report: Take-home messages and final reflections

2 DOCUMENTED RESULTS

2.1 Getting to Know the Experienced Researchers

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).

Diana Bairaktarova

I would recommend my most current publication. It is a guest editorial and the article frames itself in the context of the Ukraine situation, which feels close to home for me. The editorial is one of the things that I worked on, feeling the urgency to put concerns into action. The article offers an overview of key educational theories and how these can be utilized in educating more empathic engineers for their roles as global citizens. In the editorial, I also cite the dissertational work of one of my graduate students, which makes this publication even more special for me:

- Bairaktarova, D. (2022). Caring for the future: Empathy in engineering education to empower learning. *Journal of Engineering Education*, 111(3), 502-507.

Jonte Bernhard

My first choice is a paper with Caroline Baillie. We discuss issues related to 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.

Next, this one discusses and reflects on the relationship between "pure" engineering research and engineering education research:

- 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.

This paper demonstrates how engineering thinking, indeed, can 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.

Shannon Chance

In this article we discuss differences between two major methodologies used in engineering education research, and then they demonstrate how they applied each methodology to one qualitative dataset (transcribed interviews). Results of each analytical process aligned in this study, yet each method uncovered slightly different findings; a primary lesson is that the lens we view the world (data) through influences what and how we see.

- Chance, S., Duffy, G., & Bowe, B. (2019). 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.

Inês Direito

Launching into any new topic in your PhD, you may feel overwhelmed. The available information may seem too vast and complex to synthesize and summarize. This is made more complex by Engineering Education Research 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 paper presents a systematic literature review in a relatively unexplored area in Engineering Education (grit's influence on students' performance).

- 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.

Xiangyun Du

This work was led by one of my PhD students and exemplifies how a systematic review study serves as a start of a PhD project. It is a good example supporting how to get a PhD journey started.

- Chen, J.B., Kolmos, A. & Du, X.Y. (2020). PBL in Engineering Education – Forms of Implementation and Challenges: A Review of Literature. *European Journal of Engineering Education*, 46(1), 90-115.

Kristina Edström

In this paper I reflect on engineering education research, especially in relationship to engineering education development. I think we all need to consider our role as researchers along these dimensions. What is the purpose of our work: who do we want to be, and what do we want to achieve?

- Edström, K. (2020). The role of CDIO in engineering education research: Combining usefulness and scholarliness. *European Journal of Engineering Education*, 45(1), 113-127.

Anette Kolmos

- Kolmos, A. (2021). Engineering Education for the Future. In *Engineering for Sustainable Development: Delivering on the Sustainable Development Goals* (p. 121-128). UNESCO.
- Kolmos, A., Holgaard, J. E., & Clausen, N. R. (2021). Progression of student self-assessed learning outcomes in systemic PBL. *European Journal of Engineering Education*, 46(1), 67-89.

Greet Langie

- Craps, S., Pinxten, M., Knipprath, H., Langie, G. (2021). 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.

Melissa Marinelli

This paper uses an interesting theoretical framework to understand how industry -university relationships are started and to provide recommendations for improved industry engagement. I think the study is useful as it uses theory and empirical analysis to address a pertinent issue. It links to my research interests of bridging education and practice, student employability, and professional awareness and identity.

- Valentine, A., Marinelli, M., & Male, S. (2022). Successfully facilitating initiation of industry engagement in activities which involve students in engineering education, through social capital. *European Journal of Engineering Education*, 47(3), 413-428.

John Mitchell

An accessible study that looks to understand the development of in the context of an education change.

- Mitchell, J. E. & Rogers, L. (2020). Staff perceptions of implementing project-based learning in engineering education, *European Journal of Engineering Education*, 45(3), 349-362.

Mike Murphy

- Murphy, M., Chance, S. & Conlon, E. (2015). Designing the Identities of Engineers. In *Engineering Education and Practice in Context, Vol.2*. Springer.

Kate Roach

I chose this paper, because it came about through an unexpected opportunity. I collected student evaluations from a large scale module which I ran at the time and while preparing it for university processes, I noticed that there were some interesting trends and comments on



authenticity and that was how the paper came about. The original data was simplicity itself in its conception and execution. The analysis was also straight forward. Even so the data reaches into some of the deeper debates and issues relating to authenticity in engineering education.

- Roach, K., Tilley, E., & Mitchell, J. E. (2018). How authentic does authentic learning have to be?

Higher Education Pedagogies, 3(1), 495-509.

Corrinne Shaw

The reason for this selection is that this is my most recent publication with my research team exploring the students' transition into undergraduate engineering. Our team has a long collaboration of reflexive practice and this article reflects a particular point in our journey of understanding and leveraging the resources that diverse students bring with them.

- le Roux, k., Ngoepe, M., Shaw, C., & Collier-Reed, B. I. (2022). Language and disciplinary literacies for accessing, learning and communicating meaning: students' experiences of the transition from school to first-year undergraduate engineering, *European Journal of Engineering Education*.

Roland Tormey

I'd recommend the following paper because it shows how conceptual and empirical work can come together to do something worthwhile. It is also a project of a scale that is similar to a doctoral project:

- Tormey, R. Rethinking student-teacher relationships in higher education: a multidimensional approach. *High Educ* 82, 993–1011 (2021).

Esther Ventura-Medina

This is a qualitative research based on naturalistic data analyzed with Conversational Analysis to capture the interactions that take place between members of a team to elucidate how they manage their work:

- McQuade, R., Ventura-Medina, E., Wiggins, S., & Anderson, T. (2020). Examining self-managed problem-based learning interactions in engineering education. *European Journal of Engineering Education*, 45(2), 232-248.

Pieter de Vries

I would recommend something that is about to be published, so cannot give you the reference yet. The title is: 'The Ethical Dimension of Emerging Technologies in Engineering Education' and it is about the values and risks of using these technologies in Engineering Education. Emerging Technologies are part of the constituting datafication and digitalisation process that poses major challenges to the current educational infrastructure. Universities are challenged to respond to the demands that seem to develop faster and become more complex. The complexity though is not just technical, it is the combination of technology, and specifically big data use, the link with job requirements, educational practices, ethical responsibilities, and socio-cultural aspects of education. The purpose of this paper is to analyze and discuss elements of those issues in trying to clarify the complexity and lower the threshold for those who are involved and looking for a better understanding of the opportunities and challenges.

Patric Wallin

I would recommend an article that I wrote together with three students on reclaiming higher education as a space for play. I think it provides an interesting contrast to many other articles and challenges traditions on several levels. Furthermore, I think it illustrates how to write a piece where the research process, content and presentation all line up to create a whole.

- Wallin, P., Mariussen, K. L., Mogstad, H., & Sønderaal, M. (2021). A dialog on reclaiming higher education as a space for play. *The Journal of Play in Adulthood*, 3(2).

Bill Williams

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



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.

Diana Bairaktarova

- Johri, A. & Olds, B. (2011). Situated Engineering Learning: Bridging Engineering Education Research and the Learning Sciences. *Journal of Engineering Education*, 100(1):151-185

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.

Shannon Chance

My primary recommendation is a textbook rather than a journal article:

- Major, C. H., & Savin-Baden, M. (2012). *An introduction to qualitative research synthesis: Managing the information explosion in social science research*. Routledge.

As for journal publications, I would recommend an excellent example of a systematic literature review:

- Campbell, A. L., Direito, I., & Mokhithi, M. (2021). Developing growth mindsets in engineering students: a systematic literature review of interventions. *European Journal of Engineering Education*, 46(4), 503-527.

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(1), 1-11.

Inês Direito

- Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), 91–108.
- 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, 747–770.

Xiangyun Du

- 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.

Kristina Edström

A special issue in EJEE should be a state-of-the-art collection of papers on a specific theme. Recently we published special issue on the theme “*Early Career Engineers and the Development of Engineering Expertise*”. The editorial introduces the topic and the ten amazing papers:

- Buckley, J., Trevelyan, J., & Winberg, C. (2022). Perspectives on engineering education from the world of practice, *European Journal of Engineering Education*, 47(1), 1-7.

Anette Kolmos

- Repko, A.F., Szostak, R., & Buchberger, M.P. (2013). *Introduction to interdisciplinary studies*. Sage, London.

Greet Langie

- Naukkarinen, J. & Bairoh, S. (2022) Gender differences in professional identities and development of engineering skills among early career engineers in Finland. *European*



Journal of Engineering Education, 47(1), 85-101.

Melissa Marinelli

Again, this is a paper that bridges engineering education and practice. It presents a way of thinking about early engineering careers that is new and different.

- 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.

John Mitchell

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

Mike Murphy

- Mitcham, C. (2014). The True Grand Challenge for Engineering: Self-Knowledge. *Issues in Science & Technology*, 31(1).

Kate Roach

This is an editorial rather than a research paper, but it is timely and important. It takes as its starting point the complexity of current global crises and raises theoretical lenses that may help us to think about how to deliver support for complex problem solving. This piece is very timely and speaks to the need to help students develop the knowledge, skills and attributes they will need to live and work in a rapidly changing world.

- Chance, S. et al (2019). Guest editorial special issue on using enquiry-and-design-based learning to spur epistemological and identity development of engineering students. *IEEE Transactions on Engineering*, 63(3), 157-164.

Corrinne Shaw

- Kvale, S. (1983). The qualitative research interview. *Journal of phenomenological psychology*, 14(1-2), 171-196.

Roland Tormey

A systematic literature review is a great starting place to develop a doctoral piece of work. This one was done as part of a PhD project:

- Zhang, F., Markopoulos, P. & Bekker, T. (2020). Children's Emotions in Design-Based Learning: a Systematic Review. *J Sci Educ Technol* 29, 459-481.

Esther Ventura-Medina

This paper summarizes quite well different approaches to research in engineering education. Although there are other perhaps more recent papers I always refer back to this one.

- 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.

Pieter de Vries

A comprehensive analysis of Edtech development and policy under Covid:

- Williamson, B., & Hogan, A. *Pandemic Privatisation in Higher Education: Edtech & University Reform* (p. 80). 2021.

Patric Wallin

Time is an important concept in all types of research and this paper challenges the reader to think deeper about it. While it is not situated within Engineering Education Research, I think it is highly relevant.

- Bennett, A., & Burke, P. J. (2018). Re/conceptualising time and temporality: an exploration of time in higher education. *Discourse: Studies in the Cultural Politics of Education*, 39(6), 913-925.



Bill Williams

- Passow, H. J., & Passow, C. H. (2017). What competencies should undergraduate engineering programs emphasize? A systematic review. *Journal of Engineering Education*, 106(3), 475-526.

2.2 Advice from Experienced Researchers

In their advance input, seniors were also asked to give one general tip for a starting PhD student.

Diana Bairaktarova

Expand on your professional network while in grad school to engage with scholars from other fields.

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.

Shannon Chance

Cultivate mentors. Find a range of people with varying expertise and perspectives who are willing to chat with you from time to time and provide you ideas to help you dream big. Make sure you let them know when they've made a difference in your life.

Tinne De Laet

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

Inês Direito

Invest time in literature reviews - both before and after data collection. These help you to develop your research aims and conclusions.

Xiangyun Du

The well-being of a PhD study is highly related to your passion, purposefulness, making milestones to obtain feelings of achievements, and being authentic in one's choices and actions.

Kristina Edström

The senior researchers are absolutely delighted that you have come to this field. They will offer support in so many different ways – here in the Doctoral Symposium, attending your conference talk, as reviewers of your manuscripts, in your doctoral defense, or just chatting with you during the conference dinner. Soon, much sooner than you think, it will be your turn to support others who come after you.

Anette Kolmos

Keep working on your research question and the purpose of the study. Be careful with review, methodology.

Work on your confidence - you are the one who knows most about the subject.

Greet Langie

Focus

Melissa Marinelli

Remember your 'why' - why did you choose to start your doctoral studies? Why is your work important to you? In tough times, these motivations will get you through!



John Mitchell

Refine and be clear on your research question so that you can try to avoid being distracted from the inevitable interesting rabbit-holes that will appear - but always write them down for later.

Mike Murphy

It's a marathon, not a sprint; therefore be measured and not impatient.

Kate Roach

Keep research questions and data collection as simple as you can - complex data does not equal complex thinking!

Corrinne Shaw

Becoming part of a community of practice and write, write, write some more.

Roland Tormey

Write something every week. Writing is a skill that cannot be done judiciously unless it is done with practice.

Esther Ventura-Medina

Take ownership of your project and make sure you have a clear research question.

Pieter de Vries

Go for the nuts that are self-explanatory!

Patric Wallin

Look beyond the Engineering Education Research literature and engage with literature from other disciplinary contexts, also look into education philosophy, critical pedagogy and theory of higher education.

Bill Williams

Identify one or two scholars whose work really speaks to you. Speak to them.

2.3 Group Notes

The six groups wrote collaborative notes during their time together, in total 3 hours. A Google Document was prepared with space for each group. The downloaded version of the notes is 15 pages long in total, and it is outside the scope of this report to analyse this comprehensive material. However, the groups seem to have followed the suggestions in the instructions, as the notes contain generous amounts of:

- Interesting things that resonate with us
- Ideas and strengths that we have identified
- Problems, questions or issues we have identified
- Tips, things to do, read or think about

2.3 Take-home Messages

Each participant was asked to formulate a short nugget of wisdom during the day, as a take-home message from the DS. In the final plenary session, each participant had one minute to present their take-home message. Below the messages of doctoral students and seniors are mixed and appear in no particular order.

Kate Bellingham: The dichotomy I am dealing with - to help universities improve their recruitment of women while using a novel theoretical approach of a dating model - might be solved if I'm less ambitious: Keeping it smaller scale allows me to hear some individual stories, see if the model is useful, then hand that on for further research projects. I shouldn't aim to solve it all myself!



Mariana Velho: Do my research in collaboration with secondary schools in Portugal in order to get a better and more diverse sample.

Nargiza Mikhridinova: I will check other methodologies and reduce my PhD project ambitions in order to keep it feasible. Critical incident technique recommended sounds very promising to be applied.

Greet Langie: The EER-community is getting better interconnected, and this despite the fantastic fact that we are also getting bigger.

Bill Williams: I'm reminded once again of the value of finding connections between ideas, people in different contexts.

Melissa Marinelli: The power of diverse perspectives and backgrounds in discussing issues. The common threads that run through diverse projects. An observation - the many different backgrounds of engineering education PhD students - psychology, philosophy, education science, engineering, computer science, industry experience... very different to my local context in Australia.

Marten Westerhof: be explicit

Vivian van der Werf: In an interview, each word of a sentence can be a data point, whereas in a questionnaire, only each question is a data point (mentioned by Patric). For my own research I will consider using additional individual interviews besides focus groups for interviewing teachers on developed curricula materials (tip by Esther). Reason: focus groups might not always provide additional information as people tend to agree on everything. Individual interviews may show people's actual opinions better than in a group.

Max Vincent Uzulis: It is always good to discuss one's research with others to reflect upon our own methods and approaches. I learned a great lot about my own research and the interesting projects of the other group members.

Esther Ventura Medina: Nice to see Qualitative approaches becoming more prominent - exciting times ahead! Having said this, be mindful that your methodology should help in answering your research question(s).

Patric Wallin: It is important to find a balance between researching stuff within the education system and critically questioning that very system. This balance might be different depending on your position and context, but reflecting on it and being aware of it is important. Never forget that systems can be changed and if you want work towards changing them.

Gitte van Helden: Even (or maybe especially) when your ideas are not yet fully clear and well-articulated, talking about it with others can be very helpful.

Elizabeth Rees Chin: Great to have advice, insights and perspectives on my project - adding in observations to interviews will also be helpful. Lovely to hear those with diverse/non-traditional backgrounds. Also super interesting to hear about everyone else's projects and to share our experiences. A great event.

Diana Bairaktarova: I love the level of engagement in a small group gathering and I am fascinated with the quality of work of the doctoral students and their investment in engineering education research. Kudos to the organizers and to all Doctoral students from whom I learned so much today and I am sure I will continue learning about the future of engineering education.

Mike Murphy: I am astonished with the variety of EER topics presented today. In addition to the variety, the practical nature of them is very encouraging.

Urša Benedičič: Make it simple and be critical. Be clear on what you will and what you will NOT do.

Mieke Cannaerts: Make sure you know why you make certain choices and if they contribute to



answering your question, but also don't lose sight of what you are passionate about.

Panagiotis Pantzos: Critique of method (SDT)

Kate Roach: So lovely to hear the enthusiasm and to see the talent in the room. My main message is keep it simple and stick with what you love.

Roland Tormey: Stop and think about what you are doing - don't do something unless you can defend it. And make sure you can defend what you have done.

Melanie Herzig: Different sessions, experiences, perspectives, and methods shape my research

Sam Snyder: Practicing the discussion of my dissertation has helped me reaffirm my and critique my work, and getting detailed feedback from other engineering educators has been indispensable

Wei Siqing: Limit or narrow down my research scope further to be easier to be answered and understood for others simply.

Anette Kolmos: Open education opens door for new era of education.

Styliani Malkogeorgou: Discussing my work with other PhD students and experienced researchers gave me a new perspective, made me think and reevaluate my research and approach.

Inês Direito: It has been wonderful to meet old and new colleagues who are so passionate about engineering education and research. We can learn so much from each other, listen to different perspectives - especially in informal contexts. To the PhD students: network as much as you can (and have fun!)

Gouri Vinod: I learned about the importance of being clear about the definitions I hope to use in my thesis - an issue I mentioned I wanted to tackle during SEFI. I also learned that it is better for my PhD-level research to be more focused than it is for it to be broad, so I have thought about how I can narrow down my proposed research plans so it is more realistic to complete during the next few years. Being able to network with those I hope to work with during the data collection stage of my project has also been extremely helpful - in addition to hearing about everyone's research interests :)

Luke Dokter: Fantastic diversity of very interesting people here that I am looking forward to getting to know better. It is good to be ambitious, but don't be too ambitious! Focus on completing the doctorate rather than trying to investigate and solve all of the problems that I have identified in my work.

Acceptance of my doctorate within a more traditional engineering context could be a challenge, but being aware of my audience is important. Tailor the message in order to reach your audience. I have a unique opportunity to develop something of importance for the Norwegian Armed Forces and am lucky to have a position that allows me access to employers and former students, something that is almost impossible at other Universities.

Ann-Kristin Winkens: Bill advised this morning, "Identify one or two scholars whose work really speaks to you. Speak to them." This is the most important message for me today, don't be shy, talk to people, ask questions - you are not alone. Everyone is faced with some kind of challenges.

Xiangyun Du: It is exciting to learn about the growing scope of EER, with so many new topics and stronger passion than ever before :-). This gives space for discussions on what a EER PhD project may mean. In particular, how to get a PhD project started? What questions to ask and what scope and ambition can be feasible? This can be quite different if it is a monograph targeted or article-binded theses. It is also quite interesting to discuss with PhD candidates about their ambitions, goals and plans, how much insights they can gain into research and how



much change they can make in the real world.

Pieter de Vries: Very pleased to see so many EE enthusiasts. Even when most want to change the world, it is promising. The diversity is challenging though and the tendency to caress the niche approach certainly has no future. More motivated students is part of the solution.

Shannon Chance: Use this face-to-face conference to build and strengthen your networks so you'll be able to collaborate more effectively online when you're back home. Find people who have interests similar to you or who you think can shed light on specific questions you have, and try to stay connected with them. We're a very warm and welcoming community. Don't be afraid to approach people at SEFI and in the EER community to ask questions and suggest topics to discuss.

Xiaoling Zhang: Limit the research scope, do more concrete work. Read more methodologies and theories. Start small and don't aim to save the "world" within a PhD project. There is a whole life for more work to be done.

Dimitri Eckert: 1. Read more about Methodology, Theories and Methods to get a more rigorous plan for my research. 2. See what tools already exist that I can use.

Abhijith Venugopal: 1. Importance of 'scope' 2. addressed the dilemma in methods 3. Narrow down the concepts to focus, and to complete the degree, 4. Need to have a look into the framework (evolving one), 5. Insights on recommended readings and projects, General: PhD is not the ultimate aim in life, students should narrow down and stick to the specific topics. These interactions are very helpful to ensure that the researcher is moving in the right direction. First time seeing these many people working in EE research!

Corrinne Shaw: I was struck by the nature of the research problems that PhD students have set themselves to solve, often as a consequence of their own experience in education or their observations of how others learn and experience education. Finding out how the problem came about and what contributes to its continuation can be enough for a research study. These are complex problems and the role of the PhD is to solve the research problem and perhaps not the practical problems that were initially observed.

John Mitchell: The range of topics being covered by the PhD students represented is inspiring. The questioning of the level of progress and the need for direction on methodologies and theoretical lens reminds me of the troubled times of my own PhD and just underlines how necessary sessions such as this are and how much more we could be doing as a community to support our early career researchers.

Kristina Edström: The goal of a PhD education is to become an independent researcher. During your PhD, take the opportunity to develop into a whole scholar. In addition to your thesis, learn to teach, give seminars and workshops, organise stuff, develop your networks, lead projects, apply for funding. And learn how to review manuscripts – see me after class!

Jonte Bernhard: I am glad that so many could participate in the symposium today and I am very happy we are back to face-to-face meetings again. I hope the meeting has inspired you and you have learned something. You can 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 SEFI 2022 Doctoral Symposium was successfully carried out in a face-to-face format again. 20 doctoral students and 17 seniors worked together in shaping the future of the engineering education research community. Our impression is that participants were very pleased with meeting face-to-face again and making use of the advantages and affordances of such a meeting format.



On the other hand, we have successfully arranged online DS meetings in 2020 and 2021, and these experiences certainly showed that a remote format was feasible.

However, there are some trade-offs. One great advantage with the online format was that participants who, for various reasons, would not be able to travel to a conference could still attend. The downside is that quite many participants found a full day online quite wearying, and very much so for those located outside European time zones.

For those who are anyway travelling to the conference, a day of face-to-face meeting is less tiring, even energizing, and may also be more rewarding.

We believe that face-to-face and online meetings could complement each other in a favourable way. One way forward could be to use the online format to arrange meetings and webinars *between* an annual, face-to-face, SEFI conference and DS. As mentioned in the introduction, many doctoral students and senior researchers in engineering education in Europe work in small groups. The online format could enable shorter, more frequent meetings, in between face-to-face conferences and seminars, that could further strengthen the research community in engineering education research. Such initiatives are also underway in co-operation with SEFI special interest group for Engineering Education Research and different engineering education research centres.

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