COMMUNITY-ENGAGED PROBLEM-BASED LEARNING (CE-PBL): PREPARING SUSTAINABLE ENERGY EXPERTS FOR APPLIED CONTEXTS

Mominul Hasan, Bernd Moeller, Wulf Boie

Department of Sustainable Energy and Development (SEDev), Europa-Universitaet Flensburg

ABSTRACT

Community-engaged problem-based learning (CE-PBL) integrates problem-based learning with community engagement to foster experiential, student-centred education. This study evaluates the CE-PBL in a sustainable energy master programme using qualitative feedback from 122 students across 10 cohorts (2002–2020), using hybrid thematic analysis with generative AI. The analysis identifies themes aligning closely with programme objectives and graduate attributes, such as teamwork, technical expertise, and adaptability. Human-machine collaboration using ChatGPT-4 effectively supported data analysis, though the study underscores the essential role of human verification for contextual accuracy. The study shows that the CE-PBL module significantly contributes to developing critical skills in sustainable energy engineering students. However, further research is needed to assess its broader impact.

KEYWORDS

Community-engaged learning, Problem-based learning, Sustainable energy, Thematic analysis, ChatGPT, Course evaluation, Standards: 6, 7, 8

INTRODUCTION

Community-engaged problem-based learning (CE-PBL) is a blended educational approach combining problem-based learning (PBL) with community engagement principles to foster experimental and student-centred learning. This pedagogical method actively involves students addressing real-world challenges in partnership with community stakeholders, blending theoretical knowledge with practical application to solve problems in society. As the combined approach provides an applied context, combining both these approaches has a significant potential to enhance active learning among students, supporting CDIO (Conceive, Design, Implement, and Operate) standard 8.

As an instructional approach (Pluta et al. 2013), problem-based learning (PBL) uses real-world problems as a framework for students to develop problem-solving skills, acquire knowledge, and enhance their ability to work collaboratively. While traditional teaching methods deliver information directly, PBL may encourage students to engage in self-directed learning (Jamison et al. 2014), allowing students to explore solutions to complex, open-ended problems. Hence, PBL can be seen as a conceptual platform for learning (Loyens et al. 2015). For input, PBL requires real-world problems, which are ill-structured, reflecting real-world complexity, see (Holgaard et al. 2017; CDIO 2018). This may help students develop critical thinking skills while applying newly acquired knowledge in a practical context. Consequently, it is a student-centred approach (O'Neill and McMahon 2005), where students are responsible for identifying what they need to learn (CDIO 2009). They find the required resources, and apply knowledge to the problem. Teachers act as facilitators or guides; they support students by asking probing questions, they encourage reflection, and help them stay focused on the learning objectives. PBL is collaborative (Almajed et al. 2016) in the sense that it usually involves group work, which promotes teamwork, improves communication skills, and enhances the ability to view problems from multiple perspectives. Especially important for students from diverse backgrounds and interests, PBL may encourage students to integrate knowledge from different disciplines (Singaram et al. 2011), fostering a more holistic understanding of the problem at hand.

Consequently, in an interdisciplinary engineering programme, PBL can significantly enhance the quality and outcomes of students' learning, thereby enhancing student leadership in engineering education Routhe et al. (2023). It adds real-world relevance (Laur 2013) to a university programme because it emphasises solving complex, real-world problems that inherently require knowledge from multiple disciplines. This may promote the integration of concepts from engineering, economics, management and social sciences. Furthermore, PBL can encourage students to think holistically and understand how aspects of, e.g., the energy transition interact within the energy system, which is at the core of interdisciplinary applications. Because PBL typically involves group work, where students with different qualifications and interests collaborate, they are being prepared for professional settings where interdisciplinary teams are common. Finally, students learn to articulate their discipline-specific knowledge in ways that are understandable to stakeholders, improving communication.

Recent CDIO-based studies explore Challenge-Based Learning (CBL) and project-based service learning, reinforcing CEL's role in engineering education. Norrman et al. (CDIO 2022) highlight collaboration with external stakeholders to tackle real-world challenges, while Puglisi and Domènech-Gil (CDIO 2023) emphasise multiple engagement tools for lifelong learning.

Community-engaged learning (CEL) or service learning, on the other hand, is a pedagogical approach that integrates academic instruction with community-based experiences to foster

civic engagement and deepen understanding of societal challenges. According to Bringle and Hatcher (1996) this method of learning engages in organised service activities that address community needs and foster deeper course understanding, disciplinary appreciation, and civic responsibility through reflective practices.

CEL offers students and academic staff a real-life experience to develop transversal skills, e.g., graduate attributes, enabling communities to gain benefits from publicly funded institutions and connecting universities with public issues (Adshead and Quillinan 2017). For sustainable energy and development in general, we also perceive CEL as a key to addressing complex energy issues elsewhere in society and fostering a just transition.

The integration of service learning within project-based engineering education further strengthens these outcomes. Bielefeldt, Paterson, and Swan (2010) highlight how Project-Based Service Learning (PBSL) enhances technical competencies, cultural competency, and professional skills among engineering students. Their study suggests that PBSL improves student motivation, engagement, and interdisciplinary learning while also meeting accreditation outcomes. However, challenges remain in assessing the long-term impacts of service learning in engineering education (Bielefeldt et al. 2010). Hou (2014) assessed the evaluation of a similar method to evaluate feedback from students of a Master of Public Health (MPH) study programme and identified significant effectiveness of the method.

CE-PBL Approach at the Europa-Universität Flensburg (EUF) for training Sustainable Energy Professionals

The international Master of Engineering programme in "Energy and Environmental Management in Developing Countries" (EEM, 2009-2024) and its predecessor (SESAM, 1999-2009) and successor (SEDev, from 2025) programmes focus on equipping students, primarily from the Global South, with the skills to address global challenges of sustainable energy transition, energy access and development.

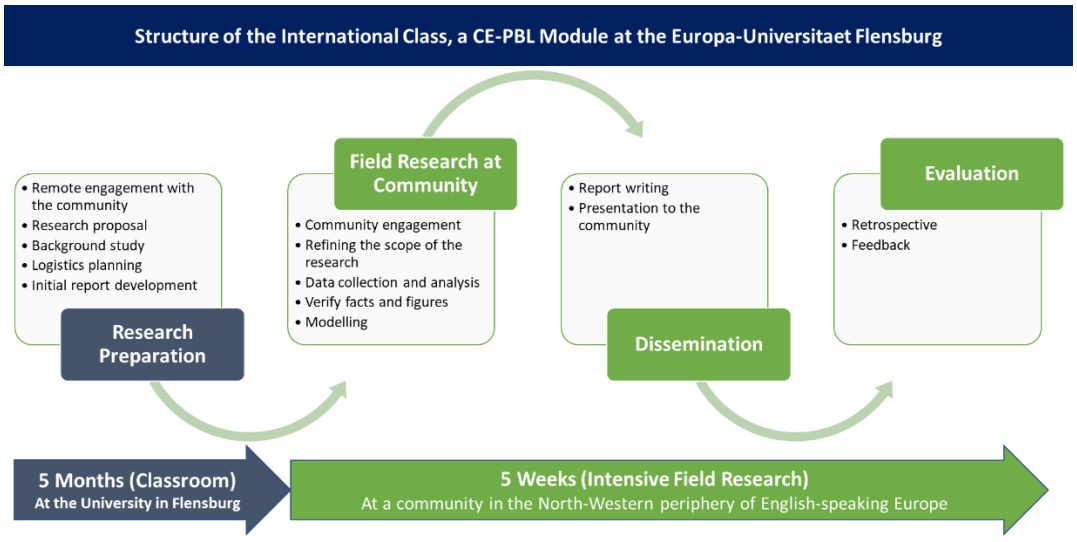

Figure 16: Structure of the CE-PBL module offered by the SEDev department at EUF

A cornerstone of these programmes is the integration of community-engaged problem-based learning (CE-PBL), branded as the International Class (IC) module, designed to prepare students for the real world through applied contexts and interdisciplinary and multicultural professional environments. In the IC module, the CE-PBL approach shifts the traditional role

of professors, placing complex, real-world challenges at the centre of the learning process. Students actively engage with problem-solving exercises during 4-5 week community-based projects, as shown in Figure 16. The module description can be accessed from the university website following the reference (EUF 2025a). These projects focus on developing sustainable local energy solutions through a combination of technical, socio-cultural, and management approaches. The module was introduced in 2002 and rolled out annually. To date, it has been repeated more than 20 times in communities in Scotland and Ireland. A map of all the international classes and reports can be accessed here: (EUF 2025b). Over this period, approximately 260 professionals from more than 60 countries, predominantly from the Global South, were trained through the CE-PBL module, of which about 38% of participants were female. At the end of each project, we have continuously gathered feedback from the students to improve the module in terms of both content and management.

Research Objective and Questions

Aligning with the focus of the study programme stated earlier, the objective of this research is to evaluate the effectiveness of the CE-PBL approach in training sustainable energy professionals based on students' feedback. As the feedback questionnaire was not specifically designed for this research, the approach is to inductively capture themes from the open-ended responses and identify the alignment with programme focus and graduate attributes. The evaluation process is guided by the following research questions:

RQ1: How does the CE-PBL method prepare students for their future careers?

RQ2: What new skills do students acquire through the CE-PBL course to support their career development??

METHODS AND MATERIALS

The feedback questionnaire (FQ) was designed to evaluate the effectiveness of the learning approach among students. It comprised four Likert-scale questions with multiple items and four open-ended questions. However, some questions and their corresponding responses were excluded from this research as they pertained to general management and study location aspects. To evaluate the effectiveness of the CE-PBL module, we utilised a Likert scale with six items and one open-ended question as follows:

FQ1: To what extent (Very much, Much, Hardly, Not at all) do you believe you benefited from different phases and activities of the CE-PBL study module for your future professional work? The activities and phases are (1) research preparation, (2) stay at the study location, (3) introductory session with the community, (4) field research, (5) report writing, and (6) preparing and presenting the findings to the community.

FQ2: What new experiences did you gain during this module, and which of these would you like to incorporate into your future professional work?

Feedback data

In this research, we utilise primary data consisting of students' feedback collected annually at the conclusion of the CE-PBL module, using a consistent paper-based feedback form. Feedback was collected anonymously, and the paper forms were subsequently destroyed in accordance with data privacy policies. To ensure anonymity, no demographic information was gathered due to the small group sizes involved.

Following data cleaning processes, which involved the removal of incomplete or inconsistent entries, feedback from 122 students across 10 cohorts was retained for detailed analysis. Of these, 109 students responded to the open-ended questions, producing an average word count of approximately 20 words per response. It is important to note that a new feedback form was introduced after 2020, and as such, evaluations conducted from 2021 onwards fall outside the scope of this research.

Thematic Analysis

To assess the responses to the open-ended questions, we use a thematic analysis (TA) method inspired from (Braun and Clarke 2006). Figure 17 presents the methodological overview of the TA utilised in this research. A hybrid approach for coding, inspired by (Proudfoot 2023), was adopted. Using this approach, the inductive approach was applied using artificial intelligence (AI) to generate initial codes and themes (Morgan 2023); then the deductive approach was used by the authors upon verifying and updating AI-based coding. As the questions on the feedback form directly asked the students to give feedback on their knowledge and experience gained during the CE PBL module, we proceeded with the values coding approach to identify values, such as beliefs and attitudes expressed in their responses (Saldaña 2009). Parallel to value coding, technical and descriptive coding approaches were also employed to identify knowledge and experiences pertinent to the study domain (i.e., sustainable and renewable energy) and to capture general insights into the students' knowledge and experiences, respectively.

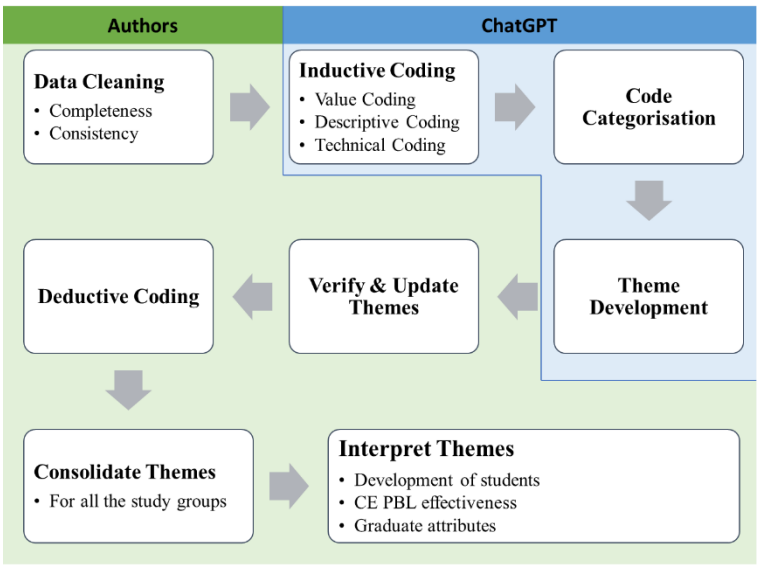

Figure 17: Overview of thematic analysis (Authors' illustration)

Tools

Generative AI-based tool ChatGPT version 4.0 from OpenAI has been used to perform the qualitative research (OpenAI 2025). Several prompts were developed, which were tailored to extract relevant information from the qualitative data to reflect on research questions, as shown in Table 8.

Table 8: ChatGPT prompts for generating initial codes

ChatGPT Prompt	Purpose	Description

Perform inductive coding on the following transcript to generate codes for thematic analysis. To generate codes, use values coding, technical coding and descriptive coding approaches. Highlight codes in the text.	Generate initial codes	It identifies codes using the methodology mentioned in the text and highlights the code in the text, which helps manually verify the coding process.
Develop themes using the codes	Theme develop ment	Identifies broader terms of the codes.

RESULTS

Figure 18 demonstrates the extent to which participants (n = 122) reported benefiting from various components of the CE-PBL study module in preparing for their future professional work. According to the data, most of the participants acknowledged that they significantly benefitted by participating in this module. Combining the values of “Very much” and “Much”, more than 80% of respondents acknowledged benefits from all the phases and activities of the module.

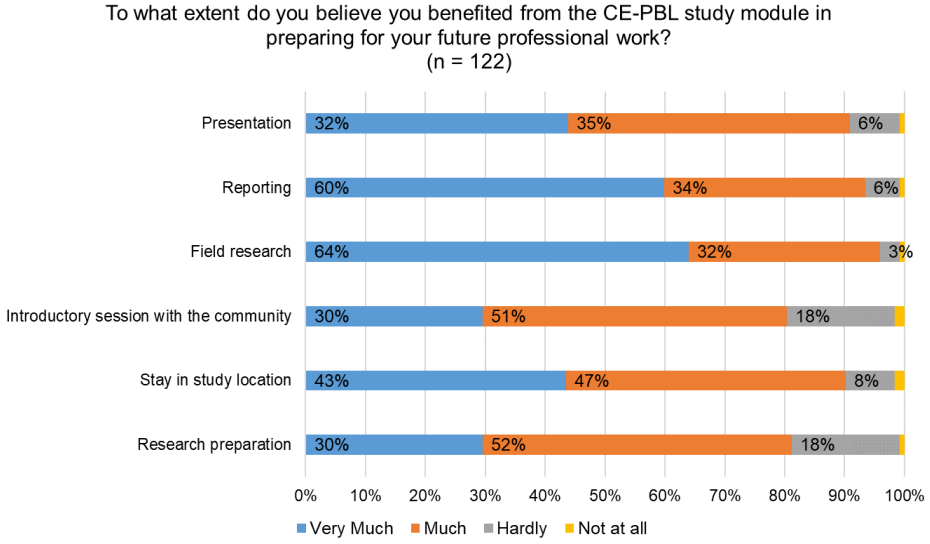

Figure 18: Level of benefit acknowledged by the students

However, a minority indicated no benefits, especially through research preparation and the introductory session with the community, which normally took place during the first week of the 5-week field research phase. The non-benefit expressed by “hardly” and “not at all” for research preparation can be explained by the lack of clarity in research objectives and scope, which is one of the challenges of PBL. Furthermore, some non-benefits can also be explained by heterogenous group dynamics, as there are always students who are more motivated and actively engaged, while others participate less or free-ride. Overall, the findings suggest that practical and research-based components were most beneficial. As the field research component showed the highest benefit, it can be inferred that CE-PBL has a significant impact on transferring knowledge, echoing the effectiveness of the active learning pyramid by Edgar Dale.

Results of Thematic Analysis

The TA was performed on responses to the open-ended feedback question. The analysis of students' feedback on participating in the CE-PBL module indicates the development of new skills and enhancement of existing skills, values, and practical competencies among participants across all 10 cohorts. Table 9 shows the themes identified through the inductive approach and the relevant coding used to develop themes.

Table 9: Inductively identified themes from the thematic analysis

Themes	Codes	Description
Community Engagement	Community development, community energy projects, community engagement	Involves engaging with local communities to develop sustainable energy solutions.
Project Management	Task distribution, project planning, managing deadlines, monitoring and evaluation	Skills related to organising, executing, and evaluating energy projects effectively.
Teamwork and Collaboration	Interdisciplinary teamwork, cultural collaboration, brainstorming, group dynamics	The ability to collaborate in diverse, interdisciplinary, and multicultural teams.
Adaptability and Cultural Sensitivity	Cultural inclusivity, resilience, coping with stress, working in diverse environments	Adaptation to new cultural and working environments while maintaining productivity.
Renewable Energy Systems	Renewable energy, energy demand assessment, wind heat systems, district heating systems	Knowledge and implementation of various renewable energy systems and technologies.
Technical Skills Development	Field measurements, survey development, technical tools (e.g., WindPro), energy audits	Development and application of technical skills specific to sustainable energy engineering.
Sustainable Practices	Sustainability, environmental impact, multidisciplinary energy solutions	Focus on implementing sustainable energy solutions with environmental and societal benefits.

The analysis of student feedback revealed eight key themes: Community Engagement, Project Management, Renewable Energy Systems, Teamwork and Collaboration, Technical Skills Development, Sustainable Practices, Adaptability and Cultural Sensitivity, and Personal Development. The themes underscore the breadth and depth of the CE-PBL approach in equipping students with the skills necessary for careers in sustainable energy and align significantly with the programme focus and objective. Furthermore, these themes also align with the sustainability capabilities and graduate attributes as mentioned in (Thomas and Day 2014) and engineering graduate attributes, as mentioned in (Gutiérrez Ortiz et al. 2021).

Figure 19 shows the distribution of themes across cohorts. According to the results, Teamwork and Collaboration, Community Engagement and Personal Development emerged as significant themes from the quantitative analysis, with the frequency of 40, 33 and 32, respectively, across entire datasets of 10 cohorts. These values also signify the effectiveness of the CE-PBL module in the study programme. Higher frequency in community engagement

shows evidence of tangible experience gained by working closely with communities to develop practical energy solutions and promote local sustainability.

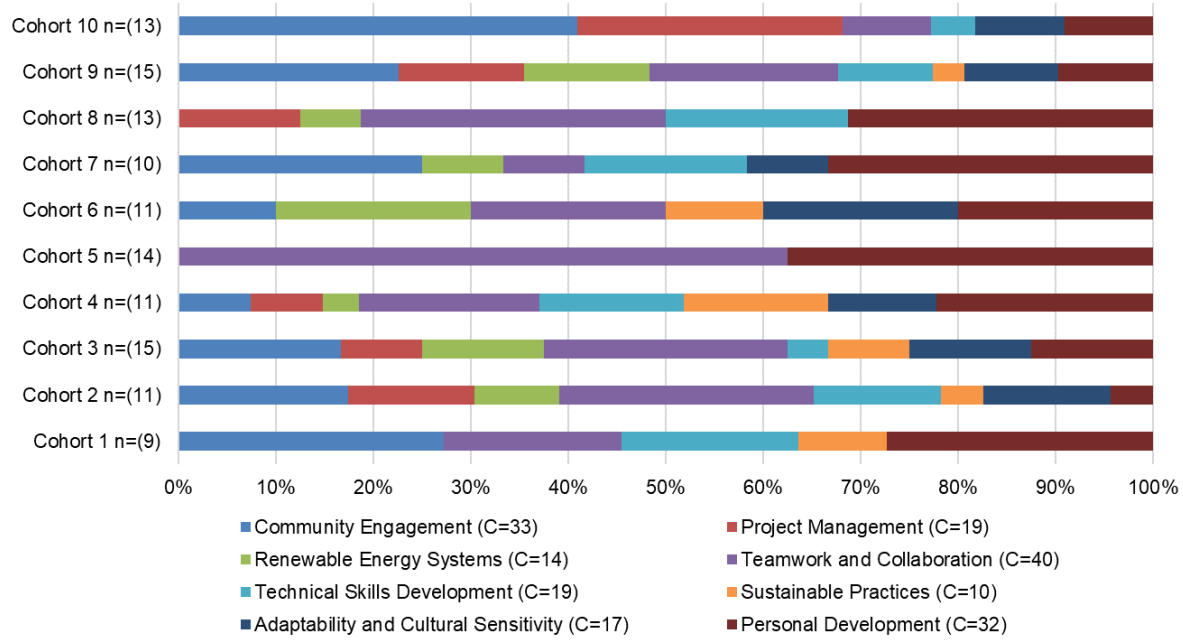

Figure 19: Distribution of acquired skills acknowledged by the students by cohort. Cohort 1 means the oldest, and cohort 10 means the latest cohorts, n = number of respondents in each cohort) and C = frequency of codes representing the theme.

Since each cohort was composed of students from multiple nationalities and cultures, a significant number of students have also acknowledged the development in Adaptability and Cultural Sensitivity, which is very critical for the modern globalised world and to enhance mutual collaboration and cooperation. The Renewable Energy Systems theme showcased the technical expertise students acquired in energy demand assessment, renewable technologies, and system optimisation, providing them with industry-relevant knowledge in the core discipline. Furthermore, the Technical Skills Development theme demonstrated the practical learning outcomes achieved, including the use of tools like WindPro, energy audits, and data analysis techniques. However, it can be observed that the results presented in Figure 19 reveal significant heterogeneity across cohorts. This variability can be attributed to several factors, including the level of cooperation from the communities, the nature of the research topics, and, importantly, group dynamics. For instance, a cohesive group may still derive substantial benefits from a less engaging project, whereas a group experiencing internal conflicts may fail to benefit even from a highly promising project, as observed in several cohorts. Nevertheless, collectively, the identified themes reveal that the CE-PBL is an effective approach for enabling active and student-centric learning in applied contexts.

The quantitative analysis, such as coding and theme generation, was found to be moderately effective with ChatGPT, as reported by Morgan (2023). However, during the verification process of ChatGPT-developed codes and themes, it was found that although ChatGPT helped significantly in developing initial codes and themes, a significant number of transcripts were poorly coded, which emphasises the need for human verification. The verification process added new themes and identified further matches with the themes. It is observed that ChatGPT showed poor performance in tagging community engagement and better performance in tagging themes like teamwork, as community engagement expressions were

latent in the text, while teamwork was mentioned almost directly. On the other hand, as mentioned earlier, the feedback questions were not explicitly designed to measure the impact of the study programme. The thematic analysis conducted on open-ended responses has inherent limitations in accurately identifying and categorising themes. Hence, further research with more targeted assessment methods is required to comprehensively evaluate the effectiveness of the CE-PBL module.

CONCLUSION

In this research, we analysed the effectiveness of the CE-PBL approach in training sustainable energy professionals using students' feedback collected at the end of module delivery. It addresses two research questions using qualitative and quantitative data from 122 students across 10 cohorts. The first research question was explored through benefit-based feedback, with over 80% of students reporting significant positive outcomes. The second research question was addressed through thematic analysis, which identified seven key themes, indicating self-acknowledged development of general and technical skills. These inductively developed themes were aligned well with the programme's objectives as well as general and technical graduate attributes. This study contributes to the body of knowledge by offering evidence of the effectiveness of the CE-PBL learning approach and demonstrating the utility of qualitative analysis supported by human-machine collaboration.

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to Ms. Dorsi Doi Germann for her invaluable and seamless contributions to the International Class and its continuous improvement. We are deeply thankful to the communities in Scotland and Ireland for their generous collaboration and support, which enriched the International Class experience. Our sincere appreciation goes to the students, who were the heart of this initiative and a constant source of inspiration. We also express our gratitude to the German Academic Exchange Service (DAAD) for their financial support, which made all the CE-PBL projects possible and successful. Finally, we also acknowledge the funding support by Europa-Universität Flensburg for participating in this conference.

REFERENCES

Adshead, Maura; Quillinan, Bernie (2017): Having it all? Transferring community-oriented research principles to teaching and learning to develop better university engagement. In *Educational Action Research* 25 (1), pp. 35–55. DOI: 10.1080/09650792.2015.1124044.

Almajed, Abdulaziz; Skinner, Vicki; Peterson, Ray; Winning, Tracey (2016): Collaborative Learning: Students' Perspectives on How Learning Happens. In *Interdisciplinary Journal of Problem-Based Learning* 10 (2). DOI: 10.7771/1541-5015.1601.

Bielefeldt, Angela R.; Paterson, Kurtis G.; Swan, Christopher W. (2010): Measuring the Value Added from Service Learning in Project-Based Engineering Education. In *International Journal of Engineering Education* 26 (3), pp. 535–546.

Braun, Virginia; Clarke, Victoria (2006): Using thematic analysis in psychology. In *Qualitative Research in Psychology* 3 (2), pp. 77–101. DOI: 10.1191/1478088706qp063oa.

Bringle, Robert G.; Hatcher, Julie A. (1996): Implementing Service Learning in Higher Education. In *The Journal of Higher Education* 67 (2), pp. 221–239. DOI: 10.1080/00221546.1996.11780257.

CDIO (Ed.) (2009): Proceedings of the 5th International CDIO Conference, Singapore Polytechnic, Singapore, June 7 - 10, 2009. Student Engagement in a One Day One Problem PBL Class. 5th International CDIO Conference. Available online at www.cdio.org.

CDIO (Ed.) (2018): Proceedings of the 14th International CDIO Conference, Kanazawa Institute of Technology, Kanazawa, Japan, June 28 – July 2, 2018. Student Engagement in a One Day One Problem PBL Class. 14th International CDIO Conference. Available online at www.cdio.org.

CDIO (Ed.) (2022): Proceedings of the 18th International CDIO Conference, hosted by Reykjavik University, Reykjavik Iceland, June 13-15, 2022. Making Good Challenges Great - Engaging External Parties in CBL Activities. 18th International CDIO Conference. Available online at www.cdio.org.

CDIO (Ed.) (2023): Proceedings of the 19th International CDIO Conference, Trondheim, Norway, 26-29 June 2023. Enabling Lifelong Learning by Using Multiple Engagement Tools. 19th International CDIO Conference. Available online at www.cdio.org.

EUF (2025a): Course Module Description: Modul 33- International Classroom. Europa-Universitaet Flensbrug. Available online at https://www.uni-flensburg.de/fileadmin/content/abteilungen/developing-countries/dokumente/downloads/modules/modul-33-international-classroom.pdf, checked on 3/10/2025.

EUF (2025b): The International Class. Available online at https://www.uni-flensburg.de/eem/the-meng-programme/contents/international-class, updated on 3/10/2025, checked on 3/10/2025.

Gutiérrez Ortiz, Francisco Javier; Fitzpatrick, John J.; Byrne, Edmond P. (2021): Development of contemporary engineering graduate attributes through open-ended problems and activities. In *European Journal of Engineering Education* 46 (3), pp. 441–456. DOI: 10.1080/03043797.2020.1803216.

Holgaard, Jette Egelund; Guerra, Aida; Kolmos, Anette (2017): Getting a hold on the problem in a problem-based learning environment. In *International Journal of Engineering Education* 33, Article 2, pp. 1070–1085.

Hou, Su-I (2014): Integrating Problem-based Learning with Community-engaged Learning in Teaching Program Development and Implementation. In *ujer* 2 (1), pp. 1–9. DOI: 10.13189/ujer.2014.020101.

Jamison, Andrew; Kolmos, Anette; Holgaard, Jette Egelund (2014): Hybrid Learning: An Integrative Approach to Engineering Education. In *J of Engineering Edu* 103 (2), pp. 253–273. DOI: 10.1002/jee.20041.

Laur, Dayna (2013): Authentic Learning Experiences: Routledge.

Loyens, Sofie M.M.; Jones, Suzanne H.; Mikkers, Jeroen; van Gog, Tamara (2015): Problem-based learning as a facilitator of conceptual change. In *Learning and Instruction* 38, pp. 34–42. DOI: 10.1016/j.learninstruc.2015.03.002.

Morgan, David L. (2023): Exploring the Use of Artificial Intelligence for Qualitative Data Analysis: The Case of ChatGPT. In *International Journal of Qualitative Methods* 22, Article 16094069231211248. DOI: 10.1177/16094069231211248.

O'Neill, Geraldine; McMahon, Tim (2005): Student-centred learning: What does it mean for students and lecturers? In *Emerging issues in the practice of University Learning and Teaching*. Available online at https://www.ucd.ie/teaching/t4media/student_centered_learning.pdf.

OpenAI (2025): ChatGPT. Version ChatGPT 4o: OpenAI. Available online at https://chatgpt.com/.

Pluta, William J.; Richards, Boyd F.; Mutnick, Andrew (2013): PBL and beyond: trends in collaborative learning. In *Teaching and learning in medicine* 25 Suppl 1, S9-16. DOI: 10.1080/10401334.2013.842917.

Proudfoot, Kevin (2023): Inductive/Deductive Hybrid Thematic Analysis in Mixed Methods Research. In *Journal of Mixed Methods Research* 17 (3), pp. 308–326. DOI: 10.1177/15586898221126816.

Routhe, Henrik Worm; Holgaard, Jette Egelund; Kolmos, Anette (2023): Experienced Learning Outcomes for Interdisciplinary Projects in Engineering Education. In *IEEE Trans. Educ.* 66 (5), pp. 487–499. DOI: 10.1109/TE.2023.3284835.

Saldaña, Johnny (2009): The coding manual for qualitative researchers. Los Angeles Calif.: Sage.

Singaram, Veena S.; van der Vleuten, Cees P. M.; Stevens, Fred; Dolmans, Diana H. J. M. (2011): "For most of us Africans, we don't just speak": a qualitative investigation into collaborative heterogeneous PBL group learning. In *Advances in health sciences education : theory and practice* 16 (3), pp. 297–310. DOI: 10.1007/s10459-010-9262-3.

Thomas, Ian; Day, Teresa (2014): Sustainability capabilities, graduate capabilities, and Australian universities. In *International Journal of Sustainability in Higher Education* 15 (2), pp. 208–227. DOI: 10.1108/IJSHE-05-2012-0046.

BIBLIOGRAPHICAL INFORMATION

A S M Mominul Hasan is a lecturer and programme coordinator of the Sustainable Energy and Development (SEDev) department at the Europa-Universität Flensburg, Germany. He holds a master's degree in Energy and Environmental Management (EEM) and a bachelor's degree in Electrical and Electronic Engineering. He has finalised his doctoral research on Bangladesh's solar energy potential and implementation pathways. His research interest lies in energy system modelling and analysis, solar PV systems, community energy and project management.

Bernd Moeller is a Professor of sustainable energy systems management in developing countries. He chairs the international M.Eng. programme Sustainable Energy and Development (SEDev) and is Vice Director of the Center for Research in Sustainability and Transformation. Before joining Europa-Universität Flensburg he worked as a research fellow at Aalborg University in Denmark, where he obtained a PhD in Energy Planning. As a member of the Sustainable Energy Planning Research Group, he gathered experience with energy systems analysis and later specialised in spatial analysis and the use of geographical information systems in energy and environmental planning.

Wulf Boie worked as a lecturer and programme coordinator at the Energy and Environmental Management programme (EEM, now SEDev) from 1992 to 2022. He studied mechanical engineering, vocational education and social science in Cologne and Kassel. In the EEM Programme offered renewable energy, energy efficiency and energy planning and was in charge of the „International Class – the CE PBL module". He was the key person in collecting the data for this research. From 2009 till 2013, Wulf Boie was head of the project „International Network for Energy and Environmental Sustainability", a cooperation project of the Flensburg University with Universities in Bangladesh, Ghana, Colombia and the Caribbean.

Corresponding author

A S M Mominul Hasan
Dept. of Sustainable Energy and Development (SEDev)
Europa-Universität Flensburg
Munketoft 3b, 24937 Flensbrug, Germany
mominul.hasan@uni-flensburg.de