

AALBORG PBL CENTRE ANNUAL REPORT 2020



United Nations
Educational, Scientific and
Cultural Organization



AALBORG UNIVERSITY

Aalborg Centre for Problem Based Learning
in Engineering Science and Sustainability
under the auspices of UNESCO

ADVISORY BOARD MEMBERS

Professor Henrik Pedersen	Dean, Technical Faculty of IT and Design, Aalborg University, Denmark	Chair of Advisory Board
Dr Peggy Oti-Boateng	Director, Science Policy and Capacity Building, UNESCO	Representing Director-General of UNESCO
Professor Brian Figaji	Engineering Council of South Africa, formerly UNESCO Executive Board	Representing Member States
Professor José Ismael Peña Reyes	Professor of Engineering Faculty, Universidad Nacional de Colombia	Representing Member States
Professor Qidi Wu	Director, UNESCO ICEE, Tsinghua University, China	Representing Member States
Associate Professor Zheping Xie	UNESCO ICEE, Tsinghua University, China	Representing Member States
Professor Mogens Rysholt Poulsen	Dean, Faculty of Engineering and Science, Aalborg University, Denmark	Representing Aalborg University
Tine Herreborg Jørgensen	Head of Department of Planning, Technical Faculty of IT and Design, Aalborg University, Denmark	Representing Aalborg University
Adjunct Professor Xiangyun Du	Aalborg PBL Centre, Aalborg University, and Professor at Qatar University	Representing Aalborg University
Professor Frede Blåbjerg	Faculty of Engineering and Science, Aalborg University, Denmark	Representing Aalborg University
Associate Professor Henrik Brohus	Faculty of Engineering and Science, Aalborg University, Denmark	Representing Aalborg University
Professor Anette Kolmos	Director of Aalborg PBL Centre, Aalborg University, Denmark	Staff
Professor Tony Marjoram	Aalborg PBL Centre, Aalborg University, Denmark	Staff
Associate Professor Aida Guerra	Aalborg PBL Centre, Aalborg University, Denmark	Staff

TABLE OF CONTENTS

Introduction	4
Global Network	
Online kick-off seminar for PBL week 2021: PBL in a pandemic world	6
Webinars: Flipped IRSPBL 2020/ 21 – Moving towards a virtual PBL community	7
New Projects	
PBL Digital	8
PBL Digital @TECH	8
PBL in a pandemic world	8
Digital competences in the formal curriculum	9
PBL competence profiles	10
UnFoLD	11
Megaprojects	11
Danish National Centre for Developing Mathematics Education (NCUM)	11
Online Resources	
New online resources for staff to integrate sustainability in engineering education ..	13
Training and Dissemination Activities	
Workshop for visitors on PBL	14
Selected Publications	
Journal Publications	15
Publications in Conference Proceedings	16

INTRODUCTION

Like the rest of the world, we have experienced 2020 as a very unusual year. The pandemic situation, which still influences our lives and will do so for some time, turned all our plans upside down. The Aalborg PBL Centre had to adjust to the situation by cancelling several physical international events. On the other hand, it has forced us to do what we have wanted for some time – to offer more online activities. Online activities have the advantage of reaching out to many more people; although, the deeper experiences of seeing, meeting, discussing, smelling, and feeling new learning environments might be missing.

The main activity for 2020 was to run the International Research Symposium on PBL (IRSPBL) 2020 together with the PBL 2020 conference (PBL2020) in a PBL Week in August 2020. For the IRSPBL, we had around 70 papers submitted and an excellent program pointing towards directions for future engineering education. We had planned panel discussions with high capacities on sustainability, complex problem-solving, and global state-of-the-art implementation of innovative curriculum models. In early April, with advice from our advisory board, we decided to postpone the entire PBL week. However, since the IRSPBL is very much about building networks and sharing research and practice experiences, we decided to publish the proceedings, to run a kickoff seminar, and to establish a series of webinars for authors to present and discuss. This would also keep momentum building in the network where we had the chance to meet and catch up on ideas and experiences due to moving PBL from a

physical to online practices. For the webinars, we cut down the time for presentation and used the time for discussion, and it has been working fantastically.

For the IRSPBL 2021, all our keynotes, panelists, and workshop trainers have accepted to run the activities in 2021, and we have opened up again for paper submissions. We are now looking forward to PBL week, which will be held at Aalborg University 16–19 August 2021. PBL week consists of both the IRSPBL2021 and the PBL2021, which is the conference run by the PAN-PBL society. Due to the coronavirus, we still do not know if it should be a 100% online event or if we will be able to travel again and run the PBL-week 21 in a blended format – but we know that it will be held. After that, the IRSPBL has to move to a new continent.

More events have had to be postponed, such as the Indian Regional Research Symposium on PBL (RRSPBL) where the second symposium was planned for 2021 and will probably have to be postponed to 2022. The visitors' workshop also had to be cancelled during spring 2020 as we were not ready to run this in an online format. During autumn, we held the first online visitors workshop with great success. Also, the certificate program has been transitioned into an online format and will be ready to offer during 2021. We continue to develop stand-alone online training – and this year the PBL and Sustainability course was announced.

All the academic staff at the Aalborg PBL Centre has participated in online conferences within our networks, such as the Eu-

ropean Society for Engineering Education (SEFI) conference, American Society for Engineering Education (ASEE) conference, International Association for Continuing Engineering Education (IACEE) conference, Colloquium on the Global State of the Art in Engineering Education conference, the Engineering Education for Sustainable Development (EESD) conference kick off, and many more. We have been invited to contribute to several webinars and conferences run by the International Federation for Engineering Education Societies (IFEES), Research on Engineering Education Network (REEN), Centre for Engineering Education (CEE at UTM, Malaysia), International Centre for Engineering Education (ICEE at Tsinghua, China), and many more.

Research applications have been handed in during 2020, and some of them have been developed under very difficult conditions, but we have done it. Research projects with international collaboration and where you are dependent on physical meeting for creating trust and motivation have been prolonged.

Internally at Aalborg University, we have been busy in both the implementation of the progression of the PBL competences and digital competences. There has been an ongoing process with defining and facilitating the study boards in choosing and formulating competences. The next phases are to develop and run workshops to facilitate students' reflection and development of PBL competence profiles and digital competences. Furthermore, we have evaluated and consulted on the development of the new initiatives on megaprojects where student-project groups from various disciplines are working together on challenges related to the 17 Sustainable Development

Goals (SDGs). It is important that the students experience interdisciplinary collaboration and a variation in project forms.

In August, in connection with the kick-off seminar, we held our advisory board meeting. We had the privilege of having the Director of Science Policy and Capacity Building at UNESCO, Peggy Oti-Boateng, joining the meeting. The core points on the agenda were the approval of the strategy plan for 2020–2025 and the introduction of new annual reporting systems to the UNESCO headquarters, which will be applied in a year.

On the staff side, associate professor Mona Dahms and assistant professor Annette Grunwald have resigned, but they will continue their affiliations with the Centre in other ways. We thank both of them for many years of collaboration. We had announced a search for a new professor, and we were lucky to employ two new professors. November 1, Professor Thomas Ryberg started full time, and on January 1, 2021 Professor Xiangyun Du starts – in the beginning at 20% time and later going to 100%. With two new professors, this will give the possibility of increasing the ambitions for research and training activities and adding new goals, such as increasing the number of PhD students and global impact.

We look forward to an inspiring and healthy 2021.

Anette Kolmos



GLOBAL NETWORK

ONLINE KICK-OFF SEMINAR FOR PBL WEEK 2021: PBL IN A PANDEMIC WORLD By Anette Kolmos

In August 2020, we expected to hold the eighth International Research Symposium on PBL (IRSPBL 2020) in conjunction with the PBL 2020 annual conference. Both conferences composed PBL week 2020, an entire week dedicated to PBL activities and welcoming all communities to Aalborg University, Aalborg (Denmark). Due to the COVID-19 pandemic, the IRSPBL 2020 and PBL 2020 organising committees had to cancel the PBL week 2020 in its physical format and postpone it for 2021.

To keep momentum and to facilitate the PBL communities, the Aalborg PBL Centre,

in collaboration with the PANPBL organisation and the PBL 2021 organising committee, organised an online kick-off seminar for PBL week 2021. The seminar, entitled “PBL in a pandemic world”, took place on 18 August 2020, 15:00 – 18:00 (CEST).

Prof. Amivata 'Babi' Mitra, MIT, USA, Prof. Joshi H. Gopalkrishna, KLE Tech, India, Prof. Regina E. Edziyie, Kwame Nkrumah University of Science and Technology (KNUST), Ghana, and Associate Professor Lykke Brogaard Bertel, Aalborg University presented new PBL innovations and their experiences with engineering projects under the COVID-19 lockdown.



Figure 2: Screenshot from the kickoff seminar on August 18, 2020

WEBINARS: FLIPPED IRSPBL 2020/ 21 – MOVING TOWARDS A VIRTUAL PBL COMMUNITY

By Aida Guerra

Besides the online kick-off seminar for PBL week 2021, the Aalborg PBL Centre also organised a webinar series named 'Flipped IRSPBL 2020/21: Moving towards a virtual PBL community' in the fall of 2020.

The flipped IRSPBL 2020/21 webinars are the point of departure for the IRSPBL 2020 contributions, published in August 2020 as an e-book, and the opportunity to keep the PBL community 'connected' by:

- Giving the authors the opportunity to present their IRSPBL 2020 contributions;
- Sharing some of what PBL has brought to education, specifically into engineering education;
- Discussing and reflecting on present studies and experiences; and
- Providing a platform to revitalise older collaborations and to establish new ones.

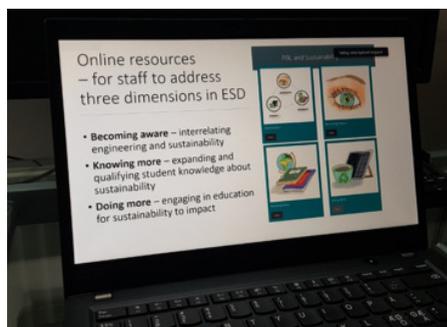


Figure 3: Presentation by Jette E. Holgaard et al. on the IRSPBL 2020 contribution entitled 'Educating Engineering Educators for Sustainability – A Case of Online Resources for Staff Development' (Holgaard et al., 2020)

The IRSPBL 2020 proceedings, entitled Educate for the Future: PBL, Sustainability and Digitalisation 2020, are available for free download at: <https://www.ucpbl.net/>

The webinars take place every last Wednesday of the month, from October until March (except for December), from 13:00 – 15:00 (CET). Each webinar has been attended by an average of 45 registered participants from different parts of the world. The webinars are free of charge. The full programme and records of previous webinars are available at: <https://www.irspbl2021.aau.dk/Flipped+IRSPBL/>

»This has been the most interesting and invigorating conference I have attended online so far. Thank you for facilitating such great discussions!«

Testimony from a participant from Oct. 28

»It was empowering!«

Testimony from a participant from Nov. 25

NEW PROJECTS

PBL DIGITAL

By Lykke Brogaard Bertel

In 2020, the Aalborg Centre has been managing several digitalisation initiatives under the AAU Digitalisation Strategy, including:

1. PBL Digital @TECH; a project focusing on digitally supported learning at the Technical Faculty of IT and Design (TECH).
2. a project investigating PBL in a Pandemic World (PBL practices, potentials and challenges during the covid-19 lockdown), and
3. a project facilitating the implementation of digital competences in the formal curriculum at both Faculty of Engineering and Science (ENG) and TECH

PBL DIGITAL @TECH

By Lykke Brogaard Bertel

Digitalisation is an important element in AAU's strategy 'Knowledge for the World', and the purpose of the PBL Digital @TECH project is to support this strategy and the further development of the AAU PBL model by making it more flexible and project-centered through digitalisation. In 2019–2020, the project has been driven by local initiatives at each department with the support of the Centre for digitally supported learning (CDUL in Danish), and in 2021 the project will be moving into an implementation phase, with a greater focus on systemic initiatives with more collaboration and evaluation across departments and faculties. In 2020, the project has facilitated the development of specific online courses and learning activities, digitally supported PBL group formation and exams, as well as

improving peer- and student-led learning on Moodle and other platforms. In 2021, the project will focus on facilitating problem-based collaboration and competency development among staff, on improving the use of digital tools to support student engagement in online and hybrid PBL, and on potentials and challenges in rethinking the PBL curriculum through micro credentials and flipped semester approaches.

PBL IN A PANDEMIC WORLD

In 2020, the Aalborg Centre has led a project studying digitally supported PBL during the complete COVID-19 lockdown in the spring as well as hybrid modes of PBL in the fall of 2020. The methodological approach in this study has been qualitative, with focus group interviews in almost all departments (60 participants) and with interdisciplinary groups of students (35 participants). The study covered themes such as the following: potentials and challenges in digitally supported teaching and exams, student and staff well-being, and the adaptivity and resilience of the PBL model in a post-pandemic world. In early 2021 and onwards, findings from the study will be published and feed into future work related to the development of principles for digitally supported PBL.

DIGITAL COMPETENCES IN THE FORMAL CURRICULUM

By Lykke Brogaard Bertel

As part of AAU’s digitalisation strategy, the Aalborg Centre is leading a project in 2020–2021 focusing on implementing digital competences in the formal curricula at both ENG and TECH faculties. The purpose of this project is to equip AAU students with generic and domain-specific digital competences to act in and reflect critically on the implications of digitalisation of their discipline, their learning and project work, and society in general. For this purpose, a framework and process have been designed in 2020 to support all study boards at TECH and ENG in identifying gaps in the existing curricu-

lum and defining new digital learning outcomes: both discipline-specific (related to their field and domain) and generic (general academic digital competences, e.g. related to data management and GDPR) as well as PBL-oriented digital learning outcomes (related to their collaboration and project work). The framework is informed by projects such as EU’s DigComp2.0, Students’ digital Academic Competences (STAK in Danish), and Danish IT’s key competency framework addressing these competences on three levels: user competency, creator competency, and reflective competency, creating a matrix for the study boards to use while identifying and defining relevant learning outcomes through a series of facilitated workshops in 2021.

	General/academic competences	PBL-competences	Discipline-/domain specific competences
Digital user competences			
Digital creator competences			
Digital reflective/contextualizing competences			

Figure 1: Framework to support the identification and definition of digital learning outcomes in engineering curriculum

PBL COMPETENCE PROFILES

By Jette Egelund Holgaard

In 2020, we have designed a framework for students to develop a PBL competence profile at the end of their course of study. The PBL competence profile has the purpose of supporting students in being able to make their PBL competences explicit. By making the PBL competences explicit, it is possible to highlight potential synergies of competences in team and business relations, and it is furthermore possible to reflect upon the needs for competence development. Also, by providing a conceptual understanding of PBL theory, methods, and tools, students will also be able to make the needed developments.

Based on a five ECTS PBL course during the first semester of bachelor's study, targeted PBL workshops and intensive PBL experience by working half of the time on problem-based projects, students at AAU develop a high degree of experience and autonomy in identifying, analysing, and solving problems in a team-based setting. However, studies also have shown that the PBL competences developed are still rather tacit. Therefore, we guide students to list PBL competences based on real-life experiences, and based on such clarification of PBL competences, students highlight their personal strengths in working on problem-based projects – this is what makes the so-called PBL competence profile.

Throughout the study, the Aalborg PBL Centre and faculty related to the disciplines support students to develop their PBL competences by conceptual inputs and guidance. However, students are the drivers as they are in fact working in a PBL manner



themselves to develop their own PBL competences. This happens by continuously reflecting on their PBL competence, on a group as well as a personal level. Based on such reflections, students are identifying and analysing their approach to learning and development – most typical in the form of a yet unexplored potential for improvement – and based on the analysis, they experiment with matching a given PBL approach or method to the problem at hand.

When students can make their PBL competences explicit and are able to analyse and develop their PBL competences even further, they are ready to create synergy of competences and develop their own competences with a lifelong learning perspective. With this ambition, the framework is about to be implemented in all educational programs at the Faculty of IT and Design and the Faculty of Engineering and Science. The Aalborg PBL center will follow this process and carry out on-going research of the development of PBL competence profiles during 2021.

UnFoLD

By Thomas Ryberg

The aim of the UnFoLD project is to develop a digital platform for scalable learning in the workplace and higher education through three main innovations:

- Digitised Experiential and Collaborative Learning (ECL);
- Automated qualitative feedback; and
- Measurability of educational impact and Return of Investment (ROI).

This interdisciplinary, user-driven project encompasses collaboration across research and educational institutions, workplaces, and EdTech to combine state-of-the-art within the following areas:

- Research in active learning methodologies and skill development;
- Technical development in digital learning platforms;
- Advanced Artificial Intelligence (AI), Neuro-Linguistic Programming (NLP) and Machine Learning (ML);
- Research in the measurement of educational impact; and
- Practical experience with corporate learning.

The project consortium consists of AAU, UCN, CanopyLAB, Arla, and Port of Aalborg (POA). The project has received an investment of 14 million DKK from Innovation Fund Denmark. Involved from the Aalborg PBL Centre are Thomas Ryberg and Lykke Brogaard Bertel.



MEGAPROJECTS

By Lykke Brogaard Bertel

With the growing need for new sustainable solutions to increasingly complex problems, the year 2020 being no exception, new pedagogical models and strategies are developed across the world to build resilience, and the skills and competences needed to cope with a challenging and changeable future. Competences are not only within one field or discipline but collaborative and transversal across programmes and paradigms. One such strategy is the implementation of large scale and interdisciplinary student projects, or educational *Megaprojects*, developed at Aalborg University. The purpose of the AAU *Megaprojects* is to address highly complex problems and grand societal challenges such as the COVID-19 pandemic or the UN Sustainable Development Goals and offer students the possibility to integrate interdisciplinary and digitally supported collaborative learning into semester projects.

From early 2020 and throughout the year, Lykke Brogaard Bertel, Maiken Winther, Henrik Worm Routhe, Patrick Münzberger and Anette Kolmos from the Aalborg PBL Centre followed the first three rounds of the AAU megaprojects: *Simplifying Sustainable Living*, *The Circular Region*, and *Better Together*. The purpose was to identify and discuss potentials and challenges related to the development and implementation of megaprojects in blended problem-based learning environments, with a particular focus on students' and facilitators' perspectives on collaboration and interdisciplinarity in complex projects. Based on analyses of interviews and observations of workflows and interdisciplinary collaborative activities in the megaprojects, the Aalborg PBL Centre

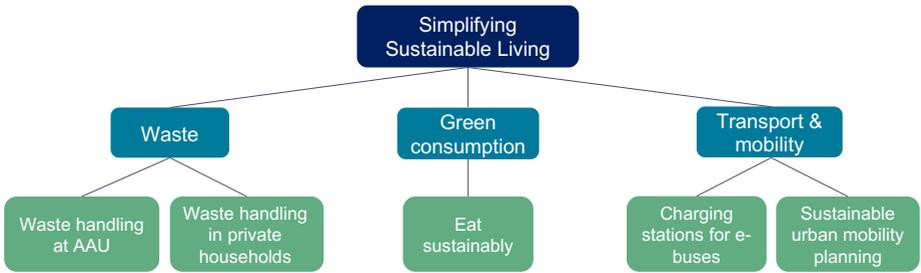


Figure 6: Example of a mega project structure

has recommended adjustments to processes, products, and facilitation in megaprojects to improve student experiences and support collaborative learning, particularly in the early stages of a project. Findings have been presented at the International Conference on Sustainable Development, IRSPBL, and the International Conference on Interactive Collaborative and Blended Learning. Future work includes research on feedback and assessment of progression in PBL competences in variations of multidisciplinary and interdisciplinary projects, as well as potentials for scaling up megaprojects both in terms of *size* of interdisciplinary teams and clusters, *impact* and *global outreach*, i.e. the level of complexity and the involvement of universities and stakeholders across the world.

DANISH NATIONAL CENTRE FOR DEVELOPING MATHEMATICS EDUCATION (NCUM)

By Bettina Dahl Søndergaard

Aalborg University, including The Aalborg PBL Centre, participated in a consortium with four other higher education institutions in Denmark in the application to the Ministry of Education for a new national centre for development of mathematics ed-

ucation (NCUM) at the PreK–12 levels. The four other higher education institutions are: Aarhus University, University of Copenhagen, VIA University College, and University College Copenhagen.

The vision of NCUM is on engaging and up-to-date teaching of mathematics and that educators and researchers collaborate on developing practice from preschool to the end of secondary education. The three main tasks of NCUM are to develop a digital platform, create network and network activities among mathematics educators, and research and development projects.

At the Aalborg PBL Centre, we find it very relevant that we chair the Expert Group dealing with vocational education as this aligns very well to the experiences engineering students have with mathematics. We expect that our experience with PBL for engineering students would prove relevant for vocational education pupils but also that the development of mathematics for vocational pupils would provide inspiration for mathematics education for engineering students.

Link to NCUM: <https://dpu.au.dk/forskning/nationalt-center-for-udvikling-af-matematikundervisning/>

ONLINE RESOURCES

NEW ONLINE RESOURCES FOR STAFF TO INTEGRATE SUSTAINABILITY IN ENGINEERING EDUCATION By Jette Egelund Holgaard

In 2020, we released a set of online resources for staff to integrate sustainability in engineering programs. The team behind the course included engineers, sustainability scientists, education philosophers, as well as PBL researchers in order to address this crosscutting challenge.

The online resources are organised in three stages of ambition:

1. Making students aware of the sustainability challenges in relation to their study domain (getting aware);
2. Providing students with an entrance to know more about sustainability (knowing more); and
3. Empowering students to do more and take action in their projects to contribute to more sustainable development (doing more).

In this way, we want to help staff to facilitate students in rethinking their discipline from a sustainability perspective.

The online material for staff on PBL and sustainability introduces different types of resources, including:

- Video materials to share ideas and experiences with education for sustainability;
- Recommended literature and links to share materials that have been beneficial for teachers as well as students for self-study;

- Examples of best practices – to inspire educational designs and the facilitation of activities in a problem-based learning approach; and
- Facilitating questions in order to initiate further reflections on PBL and sustainability.

As such, the on-line resources can be a stepping-stone to frame education for sustainability for engineering and science students and to appropriate Engineering Education for Sustainable Development (ESD) to specific programmes. The online course in PBL and Sustainability can be found together with the other online resources from the Aalborg PBL Centre here.

<https://www.ucpbl.net/education-courses/Open+Access+Resources/>

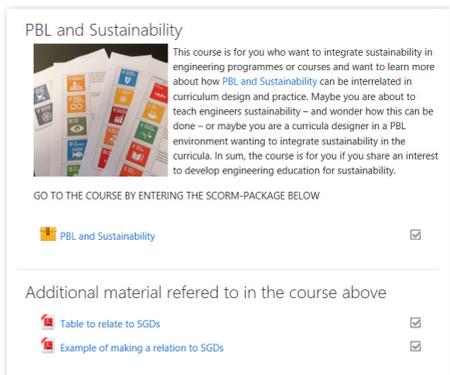


Figure 4: screenshot of the platform Moodle where all courses from the Aalborg PBL Centre are placed.

TRAINING AND DISSEMINATION ACTIVITIES

WORKSHOP FOR VISITORS ON PBL By Aida Guerra

For the first time in November 2020, the Aalborg PBL Centre held its workshop for visitors on PBL fully online.

After being cancelled in spring 2020 due to the COVID-19 outbreak, the Aalborg PBL

Centre ran a two-day online workshop, with the aim of introducing PBL principles and the Aalborg PBL model to international participants and academic staff.

The workshop included asynchronous activities where several resources were made available to participants in the mode of preparation and synchronous activities where participants engaged in small-group and plenum discussions with PBL experts, AAU academic staff, and students.

Eighteen participants from six different countries and organisations participated in the workshop for visitors on PBL. Below you can read the testimonies of two participants and their experiences.

»I was new to the whole concept of PBL at an institutional level. This was truly eye opening, since my only teaching resembling PBL techniques was chaotic, accidental, and unknowingly. . . . This workshop cleared a lot of the fog surrounding the subject and provided a coherent structure to the ideas«

Testimony from a participant
(participant 1)

»I found the content of the workshop relevant, as it built on key notions and tensions that articulate education nowadays, while highlighting the conceptual and methodological specificity of PBL«

Testimony from a participant
(participant 2)

»The access to the materials uploaded in the Moodle platform, in general, and to the Open Access Courses, in particular, made it possible to envisage the broadness of the theoretical landscape, and engage in reading journeys of discovery«

Testimony from a participant
(participant 2)

SELECTED PUBLICATIONS

JOURNAL PUBLICATIONS

Bøgelund, P. & Nørgaard, B., (2020), Becoming a High-Performance Study Team: Re-quired Group Dynamics and Motivational Strategies. *International Journal of Engineering Education*, 36(6), pp. 1833–1849.

Chen, J., Kolmos, A. & Du, X., (2021). Forms of implementation and challenges of PBL in engineering education: a review of literature, *European Journal of Engineering Education*, 46:1, 90-115, doi: 10.1080/03043797.2020.1718615(accepted and published online)

Du, X., Kolmos, A., Hasan, M. A., Spliid, C. M., Lyngdorf, N. E. R. & Ruan, Y., (2020), Impact of a PBL-Based Professional Learning Program in Denmark on the Development of the Beliefs and Practices of Chinese STEM University Teachers, *International Journal of Engineering Education*. 36 (3), pp. 940-954.

Du, X., Spliid, C. M., Kolmos, A., Lyngdorf, N. E. R. & Ruan, Y., (2020), Development of Critical Re-flection for Transformative Learning of Engineering Educators in a PBL-Based Professional Learning Program, *International Journal of Engineering Education*. 36 (4), pp. 1356-1371.

Hadgraft, R. G. & Kolmos, A., 2020. Emerging learning environments in engineering education. *Australian Journal of Engineering Education* (25(1), pp. 3-16. doi:10.1080/22054952.2020.1713522

Hadgraft, R. & Kolmos, A., (2020), Shifting engineering curricula for industry 4.0, *Tomorrow's thinking. Today's People* : GHD Digital, Design© Studio Binocular, pp. 39-39, Available at: <https://www.ghd.com/en/about-us/free-ebook-tomorrow-s-thinking-to-day-s-people.aspx>

Kolmos, A., Holgaard, J. E., & Clausen, N. R. (2020). Progression of student self-assessed learning outcomes in systemic PBL, *European Journal of Engineering Education*, 46:1, 67-89, doi: 10.1080/03043797.2020.1789070

Servant, V. F. C., Deawar, E. F. A. & Bøgelund, P., (2020), "I started this, and I will end this": a phenomenological investigation of blue collar men undertaking engineering education as mature students. *European Journal of Engineering Education*. doi: 10.1080/03043797.2020.1783209 (accepted and published online)

PUBLICATIONS IN CONFERENCE PROCEEDINGS

Guerra, A. (red.), Chen, J. (red.), Winther, M. (red.) & Kolmos, A. (red.), (2020), Educate for the future: PBL, Sustainability and Digitalisation 2020, Aalborg Universitetsforlag. Available at: <https://aauforlag.dk/shop/skriftserier/international-research-symposium-on-pbl/default.aspx>

Skov, M. (red.), Bertel, L. B. (red.), Gram-Hansen, S. B. (red.) & Orji, R. (red.), (2020). PERSUASIVE-ADJ 2020: Persuasive 2020 Adjunct Proceedings (CEUR 2020 Workshop Proceedings), vol. 2629. Available at: <http://ceur-ws.org/Vol-2629/>

Winther, M., Bertel, L. B., Routhe, H. W., Kolmos, A., Andersen, J. & Münzberger, P., Sep. (2020), AAU Megaprojects: An Educational Strategy for Sustainable Development, Proceedings from the 2020 International Conference on Sustainable Development (ICSD 2020).

The screenshot shows the website for the Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability. The header includes the Aalborg University logo and the VBN logo. The navigation menu contains: Home, Profiles, Projects, Publications, Activities, Research Units, Facilities, Press / Media, and a search bar. The main content area features a large image of a person presenting, with the following text: "Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability", "The Technical Faculty of IT and Design", "Department of Planning", "Phone: 99407962", "Email: ucphl@plan.aau.dk", and "Address: Rendsburggade 14, 9000 Aalborg, Denmark". A map titled "Find us here" shows the location in Aalborg. Below the main content is a navigation bar with: Overview, Fingerprint, Network, Profiles (27), Projects (80), Publications (1073), and a menu icon. The "Research Output" section displays a bar chart of research output per year from 1987 to 2021, and a summary table:

Research Output per year	262	242	211	53	305
1987	Book chapter	Article in proceeding	Journal article	Paper without publisher/journal	More

To find all research articles and publications please visit our research portal VBN



STAFF LIST

PROFESSORS

Anette Kolmos
Thomas Ryberg
Xiangyun Du
Tony Marjoram (*Guest Professor*)

ASSOCIATE PROFESSORS

Aida Guerra
Bente Nørgaard
Bettina Dahl Søndergaard
Claus Christian Monrad Spliid
Jette Egelund Holgaard
Lykke Brogaard Bertel
Pia Bøgelund

POST DOC AND ASSISTANT PROFESSOR

Niels Erik Lyngdorf

PHD FELLOWS

Anders Boelt
Dan Jiang
Juebei Chen
Nicolaj Riise Clausen
Concetta Ianniello

RESEARCH ASSISTANT AND PART-TIME LECTURES

Asbjørn Bull Jensen Romme
Giajenthiran Velmurugan
Henrik Worm Routhé
Maiken Winther
Patrick Münzberger
Thomas Andersen
Torben Rosenørn

ADJUNCT PROFESSORS

Erik de Graaff
Roger Georg Hadgraft

ADJUNCT ASSOCIATE PROFESSORS

Annette Grunwald
Ronald Richard Ulseth
Steen Hyltdgaard
Harry Egon Moesby

SECRETARY

Morten Mathiasen Andersen
Stine Randrup Nielsen



United Nations
Educational, Scientific and
Cultural Organization



AALBORG UNIVERSITY

Aalborg Centre for Problem Based Learning
in Engineering Science and Sustainability
under the auspices of UNESCO