

AALBORG PBL CENTRE ANNUAL REPORT 2018



United Nations
Educational, Scientific and
Cultural Organization



AALBORG UNIVERSITET

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

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The Aalborg UNESCO Centre is very grateful for the support from the consultancy committee which supports activities in all regions of the world.

Various activities have been carried out with individual members of the committee.

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A SPECIAL THANK YOU TO OUR SPONSORS 2018

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Aalborg University • Faculty of Engineering and Science, Aalborg University •
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INTRODUCTION

Over the years, the Aalborg Centre for Problem Based Learning in Engineering, Science and Sustainability under the auspices of UNESCO (hereafter Aalborg UNESCO Centre) has organized a global network on PBL in engineering, science and sustainability. Many of the activities in 2018 have thus supported this goal.

IRSPBL 2018

In October 2018, the Aalborg UNESCO Centre, the International Centre for Engineering Education (ICEE) and Tsinghua University, Beijing, PR China, held the 7th International Research Symposium on PBL with 150 registered international participants, from more than 15 different countries, and with more than 60 papers, discussing different aspects of researching and practicing a PBL curriculum.

In connection with the IRSPBL 2018, all research contributions for the symposium were published in a book.

Two new symposia are planned: A regional symposium on PBL (RRSPBL) in November 2019 in India, and the 8th IRSPBL, in August 2020 in Aalborg, Denmark. The IRSPBL 2020 is hosted by Aalborg University, and is organized in conjunction with the PANPBL2020 conference, from 16-21 August 2020.

Abstract submission is 15 January 2020 - more information will be available soon, as we look forward to an entire week with PBL related activities.

TRAINING INITIATIVES

In 2018, we have once again held an excellence program for 35 professors from China, sponsored by the Chinese Scholarship Council. The purpose of the program is to teach them how to apply PBL at their respective PBL programs.

In addition, we have conducted a six month long PBL program for North Eastern University (NEU), Shenyang, China, in close cooperation with associate professor Chunfang Zhou from the Department of Planning, Aalborg University.

Arrangements have been made here for a three-year long program, where NEU will send ten participants to Aalborg each year to receive PBL training.

At Universidad Nacional de Colombia, a PBL Certificate program for 25 academic staff members took place. All programs are set to continue in 2019.

Furthermore, the two year long program Master in PBL (MPBL) and shorter courses, providing credits for the MPBL is running with 15 participants enrolled.

2018 has also meant the completion of two more online courses: one on problem design and one on sustainability (see more at <https://ucpbl.moodle.aau.dk/>).



Our own visitor's workshops run two times a year, had between 15-20 participants from all over the world.

RESEARCH

In March 2018, top US university MIT identified Aalborg University as a model for engineering programs worldwide, ranking AAU as number four on the top ten list of best engineering programs in the world. Here, the Aalborg UNESCO Centre was mentioned for the quality of the research contribution to change engineering education.

Research-wise, many new projects have been initiated in 2018: A new Nordic STEM initiative has been established with partnerships from other Nordic countries with focus on three

subprojects: engineering education 2030, continuing engineering education and attractiveness. The Nordic STEM initiative is sponsored by ERASMUS+.

Two other ERASMUS+ projects on Industry 4.0 and continuing engineering education have been started. A new project on progression of PBL competences have been started, see about this later. Aside from all the new projects, we are also running the existing ones, e.g.:

PBL-Future, a cross-faculty project financed by strategic funds from Aalborg University and the OBEL Foundation, which is now in its second year.

A 3 year long project on PBL in Africa sponsored by ERASMUS, EU, dealing with capacity build up in two African countries, Tanzania and Ghana, with the aim of training staff on how to develop more innovative educations.

During 2018, we have contributed to the coming UNESCO Engineering Report 2 of the future of engineering education.

Furthermore, 52 research articles have been published and two PhD students have graduated during 2018. New strategies for future activities are in the making. Digitalisation and sustainable development goals are core to both Aalborg University strategy as well as to our research.

ADVISORY BOARD AND CONSULTANCY COMMITTEE

One advisory board meeting was held on 19 October 2018, in connection with IRSPBL'2018 in Beijing China, with participation from nearly all our board members.

The 2019 advisory board meeting is planned to take place in October in the UNESCO head-quarter in Paris, France.

In addition, we will also like to thank our members of the consultative committee. During the year, we have had contact with several members from companies and professional organisations, and we are very grateful for all the help and support.

ORGANISATION AND STAFF

During 2018, the Aalborg UNESCO Centre has properly settled at its new facilities in Rendsburggade 14, in the city centre of Aalborg, enjoying having students around us who are living out PBL every day.

Staff-wise, we have welcomed a new digital learning consultant, Line Vinterberg, and two new research assistants: Anders Boelt and Henrik Worm Routhe. Also, we have welcomed a new Ph.D. student from China, Juebei CHEN.

We hereby thank all our partners for the collaboration in 2018 as we look forward to continuing this in 2019.



GLOBAL NETWORK

Developing a global network on PBL is one of the core activities of the Aalborg UNESCO Centre.

From 19-21 October, the International Centre for Engineering Education (ICEE), a category II UNESCO Centre, and Tsinghua University, Beijing, PR China, together with the Aalborg UNESCO Centre organized the 7th International Research Symposium on PBL, IRSPBL 2018, marking the first time that the IRSPBL conference took place in China.

The theme was Innovation, PBL and Competences, and counted with more than 150 registered participants from 15 different countries and more than 60 papers. The conference consisted of 6 pre-

conference workshops, 4 panel sessions and 4 keynotes by prof. Zheng Quanshui, prof. Li Shuang Shou, Dr. Euan Lindsay and Dr. Emanuela Tilley.

The conference was a success in several ways – both as a very successful event and as a beginning of a closer collaboration with Chinese and other Asian institutions.

Hereby, a huge thank you to everyone who participated, or in some way contributed to organizing the event, and a special thank you to our collaborators at ICEE and Tsinghua University for hosting us during the conference.

Proceedings are available here:
www.ucpbl.net/research-symposium/

The planning has now begun on the next IRSPBL 2020, which will take place from 16-18 August 2020 in Aalborg, Denmark and it is, as previously mentioned, organized in conjunction with PANPBL and hosted with Aalborg University.

Furthermore, a regional research symposium, RRSBPBL, will take place in India on 22-23 November 2019 and is organized and carried out by KLE, Hubli, India.



RESEARCH STRATEGY

From the start, the Aalborg UNESCO Centre research strategy has been to combine engineering education research with the study of PBL practices, in higher education as well as in continuing education. This scope is still to be seen as a strategic and fundamental focus of the centre, although recent years have shown an increased focus on school and high school levels, too.

Several times, the centre has developed its research program and during the last year, a new profile has been developed.

Our research strategy is to explore, research and impact these new educational innovation and to play an active role in reforming educations in the direction of student centered learning and sustainability.

Our present research profile is characterised by the following six themes, and their relation to PBL:

- Management of Change in higher education
- Digitalised Learning
- Education for Sustainable Development(ESD)
- Engineering Education Research (EER)

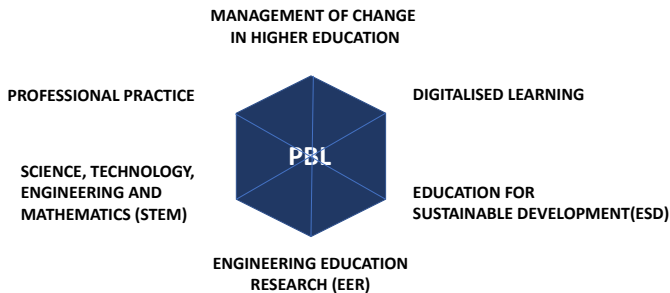
- Science, Technology, Engineering and Mathematics (STEM)
- Professional Practice and Continuing Engineering Education (CEE)

As PBL is the core, every area is studied in the context of PBL, either as a current practice or as a future perspective.

The core, PBL, includes a constructivist, contextual and collaborative learning perspective emphasising participatory problem design, project organised teamwork, self-directed learning and meta-cognition as an integrated part of the educational design.

The research carried out within these six themes is in itself problem-based, as current challenges, potentials and knowledge gaps, while unfolding in real-life setting, initiate the research and a mixed method approach is applied depending on what the problem calls for.

Thus, the Aalborg UNESCO Centre sets out to produce research that contributes to reforming engineering and science education worldwide.



PROGRESSION IN PBL COMPETENCES

At Aalborg University, it has been a part of the university strategy to implement progressive PBL outcomes in all study regulations by autumn 2020. This has created a splendid opportunity for the Aalborg UNESCO Centre for ongoing research before, during and after the implementation process.

In 2018, and before the targeted effort on the systemic level, the centre carried out a study to look into the progression in PBL competences from a staff and student perspective.

The study included three engineering domains (Energy, Software and Architecture & Design). In total nine focus group interviews, three in each domain, has been carried out with student groups, at first and last year of their Bachelor study and approximately half way through their Master study.

Furthermore, nine staff interviews have been carried out to study the intentional view on progression in educational design and practice.

The study showed that the PBL progression after the first year of the bachelor education becomes more tacit, as students on the later semesters have a harder time expressing their PBL competences compared to first year students.

The 2018 study on progression in PBL competences is as an initial step in the work to further study how PBL competences can be conceptualized, how the process of preparing explicitly formulated learning objectives can

be facilitated and how this will impact students' progression in PBL competences.

In late 2018, theory on PBL competences together with insights from the 2018 study formed the basis for a systematic approach to facilitate the integration of PBL competences in study regulations.

A pilot test was carried out of a workshop concept to support idea generation – making staff deconstruct what they considered PBL competences.

In 2019, the focus is on documenting the result from the 2018 study and further develop the process of scaffolding progression in PBL competences.

Besides, a curriculum analysis of the progression in the current study regulation will add further to the baseline study.



TRAINING AND DISSEMINATION ACTIVITIES

The Aalborg PBL model inspires educators around the world. Each year, many of them come to visit Aalborg and our centre. In 2018, the centre carried out 16 visits with participants from more than 15 countries.

Twice a year, during spring and fall, a visitor's workshop on PBL is organised to accommodate the needs of these visitors. Several visitors have expressed their satisfaction with these workshops and some have asked for an extended program with more detailed information.

Our two Visitor Workshop in 2018 took place in March and November, with participants from Japan, Poland, Kuwait, Israel, Spain, Lithuania, Brazil and Australia.

In 2019, workshops will take place on March and November; more information can be found on our website.

Throughout the year, several workshops were held in relation to conferences and by special invitation. Several international invited keynotes were given and centre staff was represented in numerous international conferences – specific details are available in the electronic version of this report on our website.

AALBORG UNESCO CENTRE CERTIFICATE ON BASICS OF PBL AND CURRICULUM CHANGE

This program was developed for the Universidad Nacional, Bogota, Colombia and had its first run in Feb-May 2018 with 22 participants from dif-



ferent engineering programs. The five ECTS program is based on PBL principles and includes a pre-workshop reflective assignment, a four-day workshop at UNAL, a post-workshop project; online supervision, and a final project exam. The project will be repeated at UNAL during fall 2019.



The Aalborg UNESCO Centre also run the certificate programme for the North Eastern University (NEU), China, at Aalborg University, for ten participants. The programme took place from August-December 2018 and was developed in close cooperation with associate professor Chunfang Zhou from the Department of Planning, Aalborg University. Arrangements have been made for a three-year long program, where NEU will send ten more participants to Aalborg each year to receive PBL training.

EXCELLENCE FOR EDUCATIONAL CHANGE – A PROGRAM FOR PBL AND PEDAGOGY INNOVATION

During fall 2018, we have hosted the second group of teachers funded by the Chinese Scholarship Council (CSC). 35 participants from 18 universities in Western China experience a full semester in Aalborg similar to ordinary AAU students, meaning course-work and team-based project-organized PBL.

The courses introduce aspects of pedagogical theories, models and practices, while the two projects are targeting respectively the Aalborg Model and a self-chosen teaching & learning problem in Chinese engineering education. The projects involve observations of teaching and project supervision; interviews with staff and students; ordinary desk research; and facilitation by Aalborg UNESCO Centre staff. The intended outcomes are reflective teaching portfolios and new teaching designs inspired by PBL-principles, AAU practice and literature.

ONLINE RESOURCES

In 2018, a new course online open was developed on the Adapt platform on the subject of Problems in PBL.

This course is divided into three modules, covering:

- the theory of problems in education,
- problem design for project work,
- problem crafting for short cases

MODULE 1:

What is a problem in PBL?

In this module, participants will get some theoretical background on the use of problems in education, ranging from John Dewey's theory on problems, to Freire's critical theory approach and finally, the cognitive psychological research done on problem solving and learning.

MODULE 2:

Designing project briefs.

In this module, participants will familiarize themselves with problem-oriented project work, focused specifically on the Aalborg model. They will also get practical tips and instructions for designing project briefs or proposals to trigger their students' learning.

MODULE 3:

Crafting problems for cases.

In this module, participants will learn about the seven-step method of PBL, and the use of problems and cases for learning. They will go through different variations of this problem-based method, and get tools to design their own short problems and cases.

Participants in this course will be able to develop their own project briefs and short problem and cases as PBL triggers for student learning.

What are Problems in PBL?



Problem Design for Project Work



Problem Crafting for the 7-Step Method



AALBORG UNESCO CENTRE GRADUATIONS

In 2018, the two following PhD students defended and were awarded with PhD degrees.

“Curupira’s Walk:
Prowling Ethnomathematics
Theory Through Decoloniality”

Aldo Parra Sanchez
from Colombia, with thesis



“The Fabrication of the
Mathematics Teacher as
Neoliberal Subject”

Alex M. Muñoz
from Chile, with thesis

Links to both PhD-theses are available on our website.

In January, participants from **North Eastern University**, China graduated after a half a year training program.

On 25 January 35 participants from the CSC sponsored excellence program graduated. Pro-rector Inger Askehave was present at both occasions, handing out certificates.



SELECTED PUBLICATIONS

Edström, K., **Kolmos, A.**, Malmi, L., Bernhard, J., & Andersson, P. (2018). A bottom-up strategy for establishment of EER in three Nordic countries: the role of networks. *European Journal of Engineering Education*, 43(2), 219-234.

Servant, V. F. C. (2018). From Flexner to Rogers: An Inquiry into the Intellectual Origins of Problem-Based Learning at McMaster University Medical School. *Health Professions Education*.

Malmi, L., Adawi, T., Curmi, R., **de Graaff, E.**, Duffy, G., Kautz, C., Williams, B. (2018). How authors did it – a methodological analysis of recent engineering education research papers in the *European Journal of Engineering Education*. *European Journal of Engineering Education*, 43(2), 171-189.

Servant, V. F. C. (2018). Problem solving skills versus knowledge acquisition: the historical dispute that split problem-based learning into two camps. *Advances in Health Sciences Education*, 1-17.

Servant, V. F. C. (Accepted/In press). The Harvard Connection: How the Case Method Spawned Problem-Based Learning at McMaster University. *Health Professions Education*.

Sabah, S., & **Du, X.** (2018). University faculty's perceptions and practices of student centered learning in Qatar: Alignment or gap? *Journal of Applied Research in Higher Education*, 10(4), 514-533.

Dahl, B. (2018). What is the problem in problem-based learning in higher education mathematics. *European Journal of Engineering Education*, 43(1), 112-125.

Sunyu, W., **Kolmos, A.**, **Guerra, A.**, & Weifeng, Q. (red.) (2018). 7th International Research Symposium on PBL: Innovation, PBL and Competences in Engineering Education. Aalborg Universitetsforlag. *International Research Symposium on PBL*.

A full list of UCPBL publications can be found here www.ucpbl.net/research/publications/



This annual report will only report on selected activities.

On our web site, you can find a pdf version of the annual report, containing a more comprehensive portfolio of activities.

All our annual reports throughout the years are available here:

<https://www.ucpbl.net/about/brochures-annual-reports/>



THIS ANNUAL REPORT CONTAINS HIGHLIGHTS FROM UCPL
2018 PLEASE FIND MORE INFORMATION ON
WWW.UCPBL.NET



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