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Innovative approaches to research-based learning

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Introduction

University educators are tasked with developing students equipped for real-world problem solving while also delivering research-based-solutions for pressing real-world challenges such as climate change, urbanization, human health and wellness (Styrelsen for Forskning og Uddannelse, 2017). This is specifically the case in professional educations such as Landscape Architecture and Planning where students are expected to make an immediate contribution to the job market and university researchers in this field are expected to deliver innovation (Griffiths, 2004). These intersecting demands have led some to call for research-based learning as a central tenant of university teaching (Brew, 2013; Dohn & Dolin, 2015; Tight, 2016). Research-based learning is broadly defined as teaching that uses research as a pedagogical tool for knowledge output, and it has been shown to produce direct benefits and co-benefits for students and teachers (Brew, 2013). For example, research-based learning is shown to directly engage students in real-world research problems and results by actively applying a field's theory and methods to a known problem (Dohn & Dolin, 2015). In this regard research-based learning has the possibility to bridge the gap between theory and practice, exposing students to critical inquiry in the field while giving teachers the opportunity to engage students in data collection. Co-benefits of research-based learning include engagement with partners in the public, private and NGO sector, the leveraging of class-room knowledge in a real-world setting, and the profiling of a research field through innovative, solution-based results (Griffiths, 2004; Healey, Jordan, Pell, & Short,

2010). Yet questions have been raised regarding the impacts of research-based learning with some suggesting that the combination of research and teaching is at best ineffective and at worst, impossible (McKenzie, Griggs, Snell, & Meyers, 2018; Stappenbelt, 2013).

Moving forward it is critical to consider the benefits as well as the potential challenges that accompany research-based learning, specifically regarding its impact on student's learning in terms of innovation and solutions-based knowledge. *This article takes up this discussion by asking how a research-based approach to teaching mediates learning and knowledge production in the field of Landscape Architecture and Planning?* This is done by drawing on the results of two years of research-based teaching in the MSc course Urban Forestry Urban Greening taught at the University of Copenhagen. First the learning outcomes and pedagogical approach of the Urban Forestry Urban Greening course are introduced. This section engages theories of research-based teaching and innovation to demonstrate how the course pedagogy is aligned with principles of research-based learning. Following, the results of the course projects with the Municipality of Copenhagen from 2016-17 and 2017-18 are presented. The article concludes with a discussion regarding the impacts, benefits, and co-benefits of research-based teaching in Landscape Architecture and Planning.

The research-teaching nexus in Urban Forestry Urban Greening course

The MSc course Urban Forestry Urban Greening at the University of Copenhagen (UCPH) is offered to Landscape Architecture and Nature Resource Management master students. This course challenges students to shift perspectives from the spatial to the political and is a problem- and knowledge-based course drawing on relevant real-world urban green space governance cases from the Danish and international context . The course explores international literature and Danish cases as an introduction to the planning, management, and governance of urban green infrastructure.

Urban Forestry Urban Greening is an obligatory course for students enrolled in the green space management specialization track of the MSc Landscape Architecture program at UCPH. As Landscape Architecture and Planning is a professionalized discipline, students are expected to attain knowledge and core competencies which translate directly to demands in the job market. These competencies include:

- the ability to shape the planning and management of landscapes such as urban space and landscapes
- This should be done with a view to developing the architectural and environmental values on the basis of a basic knowledge of aesthetic, biological, social, technical and management-related conditions.

The Urban Forestry Urban Greening course supports the development of these core competencies through a research-based learning approach by providing a structured theoretical introduction to the diverse governance (planning, maintenance, management and steering of decision making processes) approaches to urban green infrastructure such as parks, street trees, community gardens, green roofs. Teacher-led theoretical lectures and classroom exercises are balanced by student-led inquiry in the field (Dohn & Dolin, 2015). Students are introduced from the beginning of the course to a real-world case with a broad and un-defined problem. This assignment builds off of the principles of problem-based learning, whereby course activities and assignments use a problem as a stimulus and focus for student activity and learning (Brew, 2013). Through field work, interviews, mapping exercises, policy review, and GIS analysis, students self-define the problem in the case and subsequently weave and bridge theoretical material into a solution-oriented product for a client (usually the Municipality of Copenhagen) in the form of an urban green space management plan. Students in the course acquire both existing knowledge and develop new knowledge through research-based data collection in the field which aligns with what Levy and Petrulis (2013)coin as "inquiry-based learning." Research-based learning takes place both independently through student-led reading and exercises as well as in course assigned groups for the final assignment. Ultimately the research-teaching outcomes of the course are student-focused with the instructor (myself) selecting and structuring the base content of the course material and course knowledge outcomes while students are tasked to define their problem, research question and methods for analysis in the creation of their course product. This dynamic approach to research-based learning draws on Brew's (2013) "wholistic model for research-based learning."

Additionally the course focuses on linking the outcomes and attributes of research-based learning with the current demands of the job market in the Landscape Architecture and Planning industry. An innovative approach to university pedagogy assumes that students learn most by taking an entrepreneurial approach to learning, meaning that the student will develop

their own innovative ideas for green space management by learning how to initiate, manage, and support new processes for improved organizational performance (Nabi, Walmsley, Liñán, Akhtar, & Neame, 2018; Samuel, Donovan, & Lee, 2018). Innovation in this case is defined as the act of making changes in learning outcomes and knowledge development, by introducing new methods, ideas or products to the learning process (Nabi et al., 2018). In the Urban Forestry Urban Greening course, students are encouraged to learn innovatively by developing and refining a problem in our real-world case. They are then tasked with designing solutions that fit the municipality's expectations and they must obtain buy-in from key stakeholders such as community members. While our course client, the Municipality of Copenhagen, initially identifies the broad problem and knowledge-gap for the course to address, the students are tasked with developing an idea or concept that provides a novel approach to the problem solving. This innovative approach to research-based learning provides an ideal testing ground for the theoretical concepts introduced in the course and students are challenged to adapt or modify the concepts for problem solving. The course aims to facilitate innovative processes in a research-based learning environment where a student-generated hypothesis is tested out (inductive learning) or generated through teacher and client-selected workshops and interviews (deductive learning) (Samuel et al., 2018).

Outcomes and attributes of course partnerships with the Municipality of Copenhagen

Thematic context

The point of departure for the research-teaching nexus in the Urban Forestry Urban Greening course has been analyzing and learning from the challenges and opportunities surrounding urban re-naturing and climate resilience. From 2016 to 2018 the course has focused on the Municipality of Copenhagen as a critical case area.

The "re-naturing" of cities has come to the fore-front of urban planning the world over. From Singapore to Copenhagen, city leaders have implemented large-scale tree planting campaigns and the greening of post-industrial sites with urban parks and community gardens. Some of the core questions dealt with in the course have included 1) why are green spaces so important for today's cities and towns? 2) how do we develop sustainable

and multifunctional green structures that meet the expectations of local citizens, politicians and other diverse interests? 3) how can green spaces and trees provide nature-based solutions for a climate-resilient future? Working with a Nordic and international perspective, students are challenged to conceptualize and apply key concepts, theories, and methods involved in the governance of urban parks, woodlands, street trees, community gardens and other green areas.

Urban Forestry Urban Greening course work 2016-2017

Research-teaching attributes: structure and line of inquiry

In 2016/2017 the students in the course worked with the Municipality of Copenhagen's urban renewal process in the Sundby neighborhood of Copenhagen. Students were tasked with improving the socio-cultural potential and flows in Sundby's urban nature while addressing the green infrastructure potential of Copenhagen as the core course problem. The task was semi-structured as students were requested to use mapping as a dominant methodology and they were requested to contextualize their line of inquiry in Copenhagen's green infrastructure and climate adaptation processes. Students began their process with intensive lectures and field visits including interviews with community members and community councils. The students also organized a formal meeting with citizens and the two local community councils to identify place-based values associated with urban green infrastructure in Sundby.

Research-teaching skills: outputs, knowledge, and audience

The large size of the site area in combination with the complexity of the course problem meant that students worked on various levels/scales simultaneously to interrogate multi-level governance perspectives. Some students chose to focus on specific typologies of the built environment such as heavily –trafficked streets vs. neighborhood green ways while other students chose to identify traditionally-overlooked informal urban nature types that the municipality had failed to document in their own urban nature strategy. The student's final product resulted in 4 excellent strategies focused on diverse concrete objectives and initiatives that could be implemented in the Sundby 'kvarterplan'at the end of 2017.

The results of the student's work was presented at the beginning of 2017 to the city of Copenhagen's architect Tina Saaby and her staff working with the urban renewal process in Sundby. Additionally 10 members of the local councils attended the students' presentations. This successful dissemination of the students' outputs resulted in several of the student's data collections and concrete objectives and solutions being integrated into the official Sundby kvarterplan (Københavns Kommune, 2017). City officials continue to contact myself and the students from the course for knowledge and insight into the Sundby community planning process.

Student evaluations of the course and the course project were on the whole very positive yet several remarked that the complex scope of the project site and challenges was incredibly difficult to work with in a 8-10 week frame. Time and inexperience challenged the students and most of the students I interviewed following the course wished that they could have continued working on the project in their Block 3 course.

Urban Forestry Urban Greening course work 2017-2018

Research-teaching attributes: structure and line of inquiry

In 2017/2018 the students in the course worked with the Municipality of Copenhagen's partnership tree program, an initiative started by the municipality to give trees away to citizens to plant and steward on private land. The students were tasked with assessing the program with a focus on the short-and long-term consequences of developing and managing urban nature with citizens. The task was semi-structured as students were given a case area, the Islands Brygge neighborhood of Havnevigen and the broader neighborhood of Amager Vest. Students were also requested to contextualize their line of inquiry in Copenhagen's green infrastructure and climate adaptation processes. Students began their investigation with intensive lectures and field visits including interviews with community members and the chairwoman for the local neighborhood council. The students organized an on-line survey sent out to community members to identify place-based

values associated with partnership trees and urban green infrastructure in Havnevigen, IslandsBrygge, and Amager Vest.

Research-teaching skills: outputs, knowledge, and audience

The micro to macro scale of the site(s) in combination with the open-ended nature of the course problem meant that students took diverse approaches to how they worked with scale and governance perspectives. Some students took a close-read perspective of the micro site, Havnevigen, delving into the various user profiles of residents and categorizing nature preferences by age, education, income, and recreational activity. Other students took a macro perspective using Havnevigen as one case site in reference to other cases with diverse scales, socio-economic make up, and urban nature typologies. The students' final product resulted in five innovative strategies focused on diverse concrete objectives and initiatives that could further develop the municipality's partnership tree program.

The result of the students' work was presented at the beginning of 2018 to the city of Copenhagen's strategic planners for urban nature and climate adaptation. Additionally two of the student projects were selected by the municipality for potential implementation and are currently under review by municipal planners and the manager of the partnership tree program. Two students from the course also presented the results of their course work at the European Forum on Urban Forestry, an annual international conference for researchers and practitioners in the field of landscape planning and management. This successful dissemination resulted in the student's research-based learning impacting at the local and international level.

Student evaluations of the course and the course project were positive yet several remarked that, in contrast to the previous year, the chosen scale of the project site was too small and the topic challenge too narrow. From a teaching coordination perspective, I found that the students' work was excellent and exceeded that standards of the year before, indicating that the scale and scope of the project was probably more appropriate for the 8-10 week teaching/learning time frame in the block schedule.

Discussion

This essay has explored the benefits as well as the potential challenges that accompany research-based learning, specifically regarding its impact on

student's learning in terms of innovation and solutions-based knowledge. An analysis of research-based learning in the Urban Forestry Urban Greening course at the University of Copenhagen shows that students gain many benefits from the teaching-research nexus yet are challenged by limitations regarding scope, time, and inexperience. These findings align with the existing literature and point towards future steps of inquiry and potential advocacy for the value of innovative university pedagogy.

Benefits of research-based learning

The literature suggests that by engaging students in real-world research problems, students will successfully be able to bridge the gap between theory and practice drawing on critical inquiry, theories and methods in the field while producing innovative data (Brew, 2013; Dohn & Dolin, 2015; Nabi et al., 2018; Samuel et al., 2018). Students in the Urban Forestry Urban Greening course acquired theoretical and industry-specific knowledge related to the combination of public administration, landscape urbanism, green space management, and governance. They drew on relevant models of urban green space management and governance to explain and challenge the role of a public manager within a basic democratic system. They also reflected upon the different user groups, their wishes and needs, and possible conflicts between different user groups to describe and challenge the different organizational levels in a typical green space management organization, including the roles of the different parts of the organization. Additionally, they summarized and complicated the various benefits of urban green spaces. All of this data was used to create diverse urban green infrastructure management plans for the Municipality of Copenhagen.

Students additionally gained skills relevant both for the classroom and the workplace such as reading and analyze peer-reviewed scientific publications and presenting the applied results of their analysis before students and industry actors. Their classroom analysis prepared them to select and asses relevant information for the course project to discuss central tools, their scope and values in relation to green space management and to develop a Green Space Management Plan, including both short and long term visions and related means to fulfill the plan. Through their research-based group work, students learned to independently develop a line of inquiry, to cooperate effectively in a multi-disciplinary and multi-cultural group with a common project, and to apply the course theory to related subjects and/or to different work situations, e.g. in other countries.

Co-benefits of research-based learning

The literature also suggests that research based- learning provides the co-benefits of engagement with partners in the public, private and NGO sector, the leveraging of class-room knowledge in a real-world setting, and the profiling of a research field through innovative, solution-based results (Griffiths, 2004; Healey et al., 2010). Through the research-teaching nexus in Urban Forestry Urban Greening students achieved just this. The course pedagogy is closely linked with the Landscape Architecture industry to ensure that students are shaping their learning outcomes in line with the current demands of the job market. The Landscape Architecture industry is very dynamic in that it is heavily influenced by trends of economic growth or stagnation. Additionally, demand is based on popular approaches to climate change mitigation and adaptation which shifts based on government and industry strategies and standards. In this regard, it is necessary to take a flexible and innovative approach to the course development to ensure that the course learning outcomes match those of the industry standards.

The innovative approach to pedagogy in Urban Forestry Urban Greening crafts strong industry-based learning outcomes for the course thus better aligning the student learning process in the course to the overall aims of the MSc Landscape Architecture education and the dynamic shifts in the Landscape Architecture industry.

Students have been challenged by short timelines for engaging problems, collecting data, and continuing their learning. Moving forward I would like to further engage my students in the process of developing and refining an idea, designing solutions that fit customer/client expectations, develop business model concepts, and obtain buy-in from important stakeholders to better scale their approach to our block-structure learning timelines. Such an approach also necessitates close partnership with a municipal and or industrial partner/consortium and is ideally problem-based. In this scenario the client (municipality or private organization) will identify a real-world problem and knowledge gap and then provide students with the basic materials to work through the problem by developing an idea or concept that provides a novel approach to the problem solving. This problem could be further addressed through an independent study project and or the student's thesis work. This strategy would provide students with more time to further test their line of inquiry, gather data, and adapt or modify the concepts for real-world problem solving. Such an approach would facilitate creative processes in a long-term research-based learning environ-

ment where a student-generated hypothesis could be tested out (inductive learning) or generated through teacher-selected workshops and interviews (deductive learning) not only in a short block-course but through an internship and or thesis. This would provide opportunity for both students and the teacher to profile their work and raise the value of university pedagogy and teaching outputs in the eyes of students, university administration, and industry.

References

Brew, A. (2013). Understanding the scope of undergraduate research: A framework for curricular and pedagogical decision-making. *Higher Education*, *66*(5), 603–618.

Dohn, N. B., & Dolin, J. (2015). Research based teaching. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 43–62). Samfundslitteratur.

Griffiths, R. (2004). Knowledge production and the research–teaching nexus: The case of the built environment disciplines. *Studies in Higher Education*, *29*(6), 709–726.

Healey, M., Jordan, F., Pell, B., & Short, C. (2010). The research–teaching nexus: A case study of students' awareness, experiences and perceptions of research. *Innovations in Education and Teaching International*, *47*(2), 235–246.

Københavns Kommune. (2017). Sundby for alle: Kvarterplanen for områdefornyelsen Sundby.

McKenzie, A., Griggs, L., Snell, R., & Meyers, G. (2018). Legal education review. *Legal education review*, *28*.

Nabi, G., Walmsley, A., Liñán, F., Akhtar, I., & Neame, C. (2018). Does entrepreneurship education in the first year of higher education develop entrepreneurial intentions? The role of learning and inspiration. *Studies in Higher Education*, *43*(3), 452–467.

Samuel, G., Donovan, C., & Lee, J. (2018). University–industry teaching collaborations: A case study of the msc in structural integrity co-produced by Brunel University London and The Welding Institute. *Studies in Higher Education*, *43*(4), 769–785.

Stappenbelt, B. (2013). The effectiveness of the teaching–research nexus in facilitating student learning. *Engineering Education*, *8*(1), 111–121.

Styrelsen for Forskning og Uddannelse. (2017). Forsk 2025.

Tight, M. (2016). Examining the research/teaching nexus. *European Journal of Higher Education*, *6*(4), 293–311.