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**PEDAGOGICAL AND ACADEMIC REFLECTIONS FROM THE iWATER SUMMER SCHOOLS:** Storm Water Management in Urban and Landscape Planning

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**ABSTRACT**

The importance of blue-green infrastructure and sustainable stormwater management in planning has increased during the last decades. However, due to the systemic, multiscalar and multidimensional character of water, the use of multi-inter-transdisciplinary knowledge has become a precondition, generating at the same time new curricular and pedagogical challenges. On the other hand, Studio courses are solidly positioned at the core of many design and planning disciplines but have witnessed the increasing use of intensive formats that might affect the way in which the learning process is developed. This paper analyses - from a critical perspective and through a particular Case Study (iWater Summer Schools) - some of the potentials and challenges affecting the intersection between Studio-teaching, intensive learning processes and landscape planning in highly multidisciplinary conditions. In particular, and after conducting a literature review on studio-based and intensive courses, the paper proposes a set of strategic points to design and assess intensive landscape planning Studios. These points are used to critically discuss the methods, results and especially the learning processes that took place in the iWater Summer Schools and to propose some future pedagogic lines of research.

**Keywords:** Intensive Studios in Landscape Planning, Pedagogy in Landscape Planning, Green-Blue infrastructures, Stormwater Management, Sustainable Landscape Planning

1. **INTRODUCTION: ASSESSING INTENSIVE, STUDIO-BASED PLANNING COURSES**

1.1. Aim and Rationale

Stormwater management is a crucial and strategic issue to increment the environmental, social and economic sustainability of cities and to improve wellbeing and urban resilience. In addition, the relevance of water in national, regional and urban agendas has increased following rapid urbanization, climate change, socio-environmental awareness and a deeper understanding of the opportunities, risks and potentials linked to water.

In this new scenario, the sustainable and multidimensional handling of stormwater has become a central element in research, planning and design, fostering the definition of symbiotic green-blue infrastructures, the generation of a wider range of ecosystem services and nature based solutions, as well as the emergence of new ways of urban management.

In the framework of the iWater Project (Interreg Central Baltic), Aalto University, in collaboration with seven Baltic cities, organized a set of three intensive Summer Schools in 2016. The schools were attended by students, tutors, city representatives and professionals who worked together in seven pilot sites including consolidated urban fabrics, planned urban growths and peri-urban areas.

This paper discusses the methods and results of the iWater Summer Schools (iWSS) from two different perspectives. On the one hand, and from a pedagogical point of view, it explores the potentials and limitations that intensive multidisciplinary planning studios might have as a teaching method in Landscape and Urban Planning education (Figure 1). On the other hand, it presents some of the challenges and opportunities provided by stormwater management in Urban and Landscape Planning.
1.2. PLANNING STUDIOS in Landscape Architecture: Concepts and Challenges

Studio courses are at the core of design, planning, architecture and landscape architecture teaching. The conventional planning studio model can be described as a workshop course where students develop solutions to a particular challenge in a classroom or real setting, often with some sort of contact with a real or hypothetical client or group (Aitken-Rose, 2001; Higgins, 2005, IN Higgins, 2009, p 10). In most cases, studios are student-centered courses where the participants have a major role in the co-definition of topics and project outputs (Shepherd and Cosgriff, 1998; Kumar and Kogut, 2006 IN Higgins, 2009) and where the teacher facilitates the navigation through the design or planning process. Therefore, planning studio-based learning is to a great extent connected with active learning, intense interaction between students and teachers, problem-based and experimental learning in a flexible environment, integration of theory and practice, emphasis on both process and outcome, and formative and summative assessment (Higgins, 2009). Moreover, the main characteristics of a planning studio course can be systematized according to different pedagogical terms: learning outcomes, pedagogical approach, learning and teaching methods, assessment methods and main skills provided (Higgins, 2009).

Due to increasing digitalization, the appearance of new ways of social interaction, new economic and logistic conditions affecting the availability of resources for education, and the need of reinforcing the research and publishing activity in the academic world, the studio-based learning model is under revision.

1.2.1. Studio-based learning in MULTIDISCIPLINARY environments

The benefits of studio-based learning in landscape architecture, planning and design education have been recognized by scholars and docents as well as by the academic practice (Armstrong, 1999; Francis, 2001, Lamunu, 2008, Higgins et al., 2009). Studios can be developed in multiple ways but most commonly are linked to case studies. Therefore, the Studio-Case Study pair is particularly relevant if studio teaching is to be studied from a pedagogical perspective.

Studio-based learning in landscape architecture should assume the transversal character of the landscape, its different temporal and spatial scales and its multiple dimensions (cultural, environmental, economic, perceptual and spatial). Therefore, the challenge is double; on the one hand, it is necessary to define studio topics and methods that promote multifaceted approaches and multidisciplinary collaborations. On the other hand, studios should facilitate the acquisition of “specific and deep skills” connected to the particular competences of landscape architects and to the added value that they can provide in multidisciplinary projects.

1.2.2. Studio-based learning in INTENSIVE courses

Intensive courses have become quite common in colleges and universities (Daniel, 2000; Wlodkowski, 2003; Davis, 2006; Kucsera & Zimmaro, 2010) that have favored this type of courses for different reasons. Firstly, they offer a flexible model that fits adult and part-time education. Secondly, they are
particularly adequate to concentrate intensively and exclusively on a particular topic or subject (Daniel, 2000). Intensive teaching can be conducted in different formats and has been applied in many different disciplines, with particular effectiveness in those where skill acquisition is more relevant than discursive and conceptual learning (Davies, 2006). Due to its intrinsic character, planning and design studios tend to have an intensive character but the related pedagogic literature is still scarce.

The main benefits of intensive courses are increased motivation, retention, stamina and focus, diversity of teaching methods, stimulation and enthusiasm, stronger relations amongst students, decrease in procrastinating behaviors and flexibility (Scott, 2003, Davies, 2006; Kucsera & Zimmaro, 2010). According to Daniel (2000), teachers tend to explore new teaching techniques in intensive courses and keep more time for experiential learning and discussion whereas students are more prone to modify their learning techniques.

Nevertheless, although intensive courses are perceived as a supplementary and flexible tool to respond to changing demands, there is serious concern about the learning outcomes they provide and the level of workload and fatigue they impose on participants (Davies, 2006, Kucsera & Zimmaro, 2010).

1.2.3. Studio-based learning and RESEARCH

Regarding their potential contribution to academic research and due to the explorative and co-participated creation of knowledge that characterizes many studio-courses, they can become the first step towards more advanced research, especially if they are properly planned and integrated in the “research chain”.

Difficulties to incorporate research in design and planning disciplines have been stated by multiple researchers. Interestingly, Armstrong also identified the potentials and limitations of studios in terms of research. Thus, “using the design studio as part of the exploration of a wider research-problem has interesting research potential. It is nevertheless contentious in terms of positivist research because the form of rigor required for positivist research data is unlikely to be produced within the studio without compromising pedagogical requirements for design development” (Armstrong, 1999, p. 9).

Therefore, one of the key issues if studio courses are expected to be more than research-activators is to provide academic rigor to the qualitative, or even quantitative, research that usually takes place in Landscape Design or Planning Studios. This suggests the need of advancing in the refereed assessment of studios (Armstrong, 1999) as well as in the use of different methods to critically contrast the generation of ideas and solutions, e.g. triangulation (Patton, 1990 IN Armstrong, 1999) or crystallization (Richardson, 1994 IN Armstrong 1999).

1.2.4. Studio courses, LEARNING STYLES AND PERSONALITY TYPES

Studio-based learning implies a high level of student empowerment and a strong level of peer interaction. Subsequently, studio courses offer plenty of space for individual personalization. According to Brown et al. (1994), everyone has a preferred style of learning and these preferences can inform the design and development of courses in order to promote a more effective learning process. The same principles lie behind the report developed by Carey and Barthelemech (2016), where the individual dimension of the learning process is analyzed for landscape architecture design studios.

Ultimately, although the “taxonomic” classification of individuals according to learning styles might be contentious, the purpose of aligning teaching methods and learning/teaching styles still sounds promising, especially in highly vocational and heterogeneous disciplines like landscape architecture.
1.2.5. Designing and assessing intensive, multidisciplinary and research oriented planning studios

Following the review above, a set of strategic factors affecting the design of planning studios was defined (Figure 2). These factors were used to critically evaluate the structure, implementation and results of the iWSS.

<table>
<thead>
<tr>
<th>Key characteristics of Planning Studios (Higgins et al, 2009)</th>
<th>Additional considerations for multidisciplinary, research-connected, personalized and intensive Planning Studios</th>
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<td>1.1. Learning outcomes</td>
<td>4. Implications of running the studio with an intensive format</td>
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- Application of theory and knowledge to a practical problem
- Development of professional skills emulating practice
- Emphasis on both the process and product and in inter-relationship between the two
- Experimental learning
- Problem-based learning
- Student centered, active engagement
- Reflective learning
- Project-based, often in groups
- Informal and flexible, not lecture based: may include tutorials, workshops, fieldwork, interaction with practitioners and communities
- Individual or group or a combination
- Formative assessment: feedback informs final outcome
- May include oral presentation
- Not exam-based
- Urban design
- Plan and policy making
- Teamwork
- Negotiation
- Management: time, self, others
- Public engagement
- Oral and graphic presentation, including IT
- Critical analysis
- Creative thinking
- Possibilities to apply the specific disciplinary knowledge
- Possibilities to be influenced by the knowledge provided by other disciplines
- Possibilities to generate new concepts and knowledge by interacting with other disciplines
- Research orientation and use of research methods.
- Mechanisms to validate the outcomes as new knowledge
- Development of scholarly publications and exhibitions
- Responsive to the characteristics of the whole class
- Responsive to individual students
- Responsive to individual teachers
- Teams created according to students’ learning styles
- Motivation
- Retention
- Focus
- Diversity of teaching methods
- Stimulation
- Discussion
- Relations amongst students
- Procrastination
- Flexibility
- Achievement of learning outcomes
- Workload
- Fatigue
- Depth
- Convenience

Figure 2: Table with factors affecting the design of studio-based, multidisciplinary, research-oriented, individual responsive and intensive planning studios (own elaboration based on Higgins et al, 2009 and the consulted pedagogic literature).

1.3. iWSS: intensive, international, studio-based, multi-inter-transdisciplinary studios

1.3.1. Objectives, learning outcomes and participants

The iWSS were an academic project designed and coordinated by Aalto University in close collaboration with the iWater cities of Riga, Jelgava, Gävle, Söderhamm, Tartu, Turku and Helsinki as well as with a wide range of Latvian, Swedish, Estonian and Finnish Universities.

After completing the course, students were expected to be able to work with the following concepts and issues: (1) Principles, tools and techniques for integrated Stormwater Management (SWM), (2) integration of sustainable SWM in urban planning and design, and (3) integration of SWM in landscape planning and design, with a particular emphasis on green infrastructure and ecosystem services.

Key objectives of the iWSS included: (1) dissemination of academic knowledge on integrated Urban Stormwater Management, (2) facilitated contact between academics, professionals and local administration, and (3), production of new strategic visions for seven qualitatively different pilot sites in the iWater cities.

All pilot sites were affected by severe stormwater management challenges and displayed contrasting conditions. For instance, the pilot sites in Helsinki and Gävle included consolidated urban areas with predominant residential and industrial land uses respectively. Sites in Riga, Turku and Tartu consisted of recently planned urban areas in which the iWSS were expected to offer new and more water sensitive alternatives. Finally, sites in Söderhamm and Jelgava were located in floodable and strategic peri-urban sites.

The iWater Summer Schools were attended by 61 students from 17 countries, 16 universities and different academic backgrounds (40% landscape architecture, 18% architecture, 13% environmental
10% sustainability sciences, 5% urban and regional planning, 5% environmental sciences, 3% civil and transport engineering, 6% other degrees).

1.3.2. Methodologies
Each iWSS was conducted as a 5 days intensive and highly practical studio worth 3 ECTS. During each school, students worked in multidisciplinary teams and were assisted by academic and local experts. Due to time limitations, all the iWSS followed a linear sequence including a contextual and site analysis, the development of urban and storm water strategies and the definition of specific and multiscalar solutions. Each of these phases started with a set of preparatory lectures and concluded with an open review. During each summer school, 20% of the time was devoted to lectures, 60% to teamwork and 20% to reviews (Figure 3).

In order to facilitate the interaction between students and teachers, most of the work was developed using manual techniques and qualitative methods. In addition, the students were also provided with a rough quantitative system to calculate the volume of run-off for a standard rainfall event. This simple method helped them to evaluate different alternatives and make decisions accordingly (Figure 4).

1.3.3. Academic results
From a substance level, the iWSS dealt with the most common challenges affecting integrated urban SWM (Galan, 2016). Namely, integration of SWM in urban planning and design, hybridization of blue, green and grey infrastructures, connection between SWM and ecosystem services, management of run-off, both from a volumetric and quality perspective, and finally, identification of factors affecting the implementation and management of their proposals (Figure 5).
Interestingly, almost all the students agreed that the iWSS complemented their previous knowledge and provided them with new tools and approaches even in their own fields of expertise.

... “In general, this was a dynamic teamwork with positive cooperation with the tutors. We managed to create an efficient solution for the pilot site in a very short period of time. We gained knowledge, learned new tools and realized the great importance of stormwater management”... (anonymous feedback from an iWater student).

2. MATERIAL AND METHODS
A small group of students and teachers from Aalto University who participated in the iWSS evaluated the schools using the assessment criteria presented in Table 1. The assessment was developed using a questionnaire with fifty-one short questions that had to be answered with scores ranging between 1 (very low), 2 (low), 3 (medium), 4 (high) and 5 (very high). Due to the small size and homogeneity of the sample, results were not processed statistically although they provided key information for the future development of a comprehensive survey amongst all the students and teachers who participated in the iWSS. Nevertheless, the results suggested some preliminary conclusions regarding the quality of the iWater Summer School as an intensive and multidisciplinary planning studio, its potential to support research and its responsiveness to individual characteristics of both students and teachers.

3. RESULTS and DISCUSSION
The analysis of the iWSS from a planning studio perspective suggests that the “acquisition of learning outcomes”, the “pedagogical approach”, the “learning and teaching methods” and the “assessment methods” were aligned with the ones defined by Higgins et al. (2009) for a prototypical planning studio. Concerning the “skills commonly developed in planning studios” and according to both teachers and students, the iWSS had a low public engagement and an average performance in terms of self-management of time and acquisition of planning and negotiation skills. In spite of this, the schools were perceived as a positive platform for creative thinking, critical analysis and teamwork.

Secondly and regarding the level of multidisciplinarity, interdisciplinary and transdisciplinary, the iWSS were positively evaluated by both teachers and students. This can be explained by the highly transversal character of the central topic (Stormwater Management) and by the academic diversity of the students.

Concerning the potential linkage of the iWSS to research, results indicated an average level in the overall research orientation of the schools, in the use of qualitative methods and in the level of abstraction, exploration and resolution of planning challenges transcending normal practice. The evaluation was particularly low concerning the use of quantitative methods, level of speculation, the use of mechanism to validate the outcomes as new knowledge, and the development of scholarly publications or research outcomes. These results can be the consequence of the introductory character of the schools, of their short length (5 days) and, mainly, of the absence of a predefined plan to provide a research dimension to the course.

Fourthly, the iWSS were not perceived as particularly responsive to the learning styles and personality types of their participants although teachers were more critical in this particular issue. These results can be explained by the predefined structure of the course and by its short length, which hindered the possibility of individual adaptations.

Finally, and regarding the effects of organizing the iWSS in a highly intensive format, results agreed with the existing literature. Thus, both teachers and students considered that, in comparison with
other similar and non-intensive planning courses, the iWSS were particularly effective in promoting high levels of motivation, focus, stimulation, discussion, peer interaction and in decreasing procrastination. In addition, students and teachers also positively evaluated the level of achievement of learning outcomes and the possibility to integrate the course as an additional activity in their academic calendars. On the other hand, results were more critical concerning the levels of retention of acquired knowledge, academic depth, workload, fatigue and flexibility. As detected in previous studies, results could have been highly biased by the positive predisposition of the students who attend optative courses and by their difficulties to compare them with other equivalent non-intensive courses.

**Figure 5**: Analysis and proposals for the iWater pilot site located in Turku (Finland) (by Lelde Dreimane, Liga Sēja and Yanyi Zhang).
4. CONCLUSIONS
The literature review and the pedagogical analysis of the iWSS identified a set of criteria to support and assess the design of intensive, studio-based, multidisciplinary planning courses. In addition, it suggested some crucial factors to reinforce their research potential and to make them more responsive to the personal characteristics of students and teachers. From a learning theory perspective, both, the literature review and the proposed ideas support the need of integrating behavioral, constructivist and social constructivist approaches to studio-based learning.

In addition, the outcomes of the iWSS showed the potential of intensive studio-based planning courses and of transversal components, like Water, to promote multi-inter-transdisciplinary learning, to link different scales and to respond to a wide variety of planning challenges. Furthermore, some general principles were concluded for the use of Stormwater Management in urban planning and design, for the co-definition, co-implementation and co-management of sustainable green-blue systems and for the generation of ecosystem services.

The development of this paper suggests the need and convenience of advancing in the pedagogical study of studio-based planning courses in order to optimize their academic use and their future integration in an increasingly dynamic academic, social and technological context.

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Figure 1: iWSS: A studio-based, multidisciplinary, intensive, research-oriented and personalized course?
Figure 2: Table with factors affecting the design of studio-based, multidisciplinary, research-oriented, individual responsive and intensive planning studios
Figure 3: Structure of one iWater Summer School.

Figure 4: Students working during the second iWater Summer School (Gävle, Sweden, 2016).

Figure 5: Analysis and Proposals for the iWater Pilot Site located in Turku (Finland) (by Lelde Dreimane, Līga Sēja and Yanyi Zhang)