Learning and teaching in the Regional Learning Environment

Enabling students and teachers to cross boundaries in multi-stakeholder practices

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Thesis

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If you want to walk fast, walk alone.
If you want to walk far, walk together.
African proverb

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Chapter 1.

Introduction

1.1 The reasoning behind this thesis

This thesis explores student learning and teacher responsibilities in the authentic, multi-stakeholder Regional Learning Environment. The Regional Learning Environment, further abbreviated RLE, in which students collaborate with multiple stakeholders towards sustainable regional transformation, received a great deal of appreciation since its start in the Netherlands in 2005. Students from various study programmes in higher and vocational education enthusiastically worked on real world projects, teachers got inspired by out-of-school activities, and stakeholders praised the students for their creative input in often jammed governing processes. However, evidence for the effectiveness of the RLE in terms of student learning lacked until now. Evidence-based knowledge on what and how students learn in a new learning environment is needed to support further pedagogical and didactical design towards an effective learning environment. The Education and Competence Studies Group of Wageningen University, in collaboration with other research and educational partners, carried out various research projects to explore student and teacher learning in the RLE, and to contribute to the further educational design of the RLE. The studies in this thesis were embedded in, and are an extension of, these research projects.

Main purpose of this thesis is to find evidence for student learning in the new multi-stakeholder Regional Learning Environment related to its typical 'cross-boundary' design characteristics. Findings inform the further evidence-based pedagogical design of the RLE itself, and of similar authentic, multi-stakeholder learning environments, which are regarded as crucial in preparing students in higher education worldwide to face current complex societal problems. Moreover, this thesis contributes to current scholarly attempts to get a grip on what and how people learn across the boundaries of practices, and how boundary crossing competence, needed to work across boundaries, could be addressed in education.

This first chapter introduces the main ideas and concepts that underlie this thesis (Sections 1.2, 1.3, and 1.4), describes the educational design of the RLE (Section 1.5), and introduces the overall thesis research questions, research design and the specific objectives and design of the four studies as carried out (Section 1.6).

1.2 Multi-stakeholder collaboration in higher education

The need for multi-stakeholder collaboration in higher education

The main subject of study in this thesis is a multi-stakeholder learning environment in which students collaborate with various real-life external stakeholders. A stakeholder at this place is defined as a person or a party with an interest or concern in an issue at hand (Freeman, 1984; Healey, 1998). Why should educational institutes put effort into multi-stakeholder collaboration? The main reasoning behind this question lies in the complex and wicked character of problems that current society faces (Rittel &Webber, 1973), and that higher education graduates will inevitably have to deal with during their professional lives. The Global Risks Report 2016 (World Economic Forum, 2016) recently re-identified worldwide global risks, and therewith provided examples of complex problems that society faces. Some well-known examples of these complexities are global warming and forced displacement of people, environmental degradation, water and food crises, rapid spread of infective diseases, and economic and social instability. These problems, with their implications on global to sub-local scales, call for collaborative, transdisciplinary actions to build resilience (World Economic Forum, 2016). It has generally been acknowledged that these problems cannot be solved by individuals or single agencies on their own (e.g. Fazey et al., 2014; Trencher et al., 2013). Neither can they be solved within one discipline or perspective (Lang et al., 2011). Facing the complex issues requires to bridge research and practice, academia and society, disciplines and perspectives in transdisciplinary, multiple stakeholder collaborative processes towards the co-production of new knowledge (e.g. Fazey et al., 2014; Lang et al., 2011; Nicolescu, 2014; Scholz & Steiner, 2015b; Stauffacher et al., 2006; Trencher et al. 2013; Yarime et al., 2012). Since most higher education graduates will be involved in multi-stakeholder

collaborative processes in their professional lives, higher education should prepare students for working in multi-stakeholder collaborative settings. This is certainly valid for Urban and Landscape Planning education programmes, since planning as a profession has a prominent multi-stakeholder collaborative tradition in dealing with the spatial implications related to complex societal problems (Healey, 1997). This incited the choice to take planning students as the main subjects of study in this thesis.

Existing multi-stakeholder learning environments in higher education

In multi-stakeholder learning environments students are argued to profit from being involved in real world transdisciplinary projects on multiple scales, bridging the science-society gap, and applying various approaches and methods for facing complex problems (Yarime et al., 2012). A variety of learning environments in higher education has been developed in which learning from, or working with, stakeholders is included to varying degrees.

Service learning environments, originating from Dewey's educational philosophies in the U.S. (Dewey, 1933; 1938; Jacoby, 2014), studio's, originating from European architectural education systems (Long, 2012b), and mixed variants of these, are long lasting and well known examples of learning environments in which students are confronted with stakeholders or at least with their needs. This latter aspect points to the fact that service and studio learning do not necessarily include actual collaboration with the stakeholders. A huge collection of scholarship on student learning in service learning environments and studios has been produced (e.g. Giles et al., 2011; Long, 2012b; Webb & Burgin, 2009), however, little is known about student learning typically resulting from working with, and learning from, multiple stakeholders.

A third type of multi-stakeholder learning environment can be found in variants of Problem-Based Learning (PBL) or Inquiry-Based Learning (IBL). PBL and IBL are both aimed at training students in solving concrete, realistic and actual problems, and are proven to activate students' self-directed and independent learning when working on these problems (Dochy et al., 2005). Although there is still little experience with stakeholder involvement in PBL and IBL, and student learning as a result thereof, various scholars strive for more stakeholder involvement in PBL and IBL (Meijles &Van Hoven, 2010; Wiek et al., 2014). One example of a multi-stakeholder PBL, is the Rural Atelier that shows similarities with the RLE (Meijles & Van Hoven, 2010).

Schweizer et al. (2008) describe the Community of Practice (CoP) as a multi-stakeholder learning environment used in an energy planning case. In this case students were expected to collaborate with multiple stakeholders from industrial and environmental organizations. However, the students appeared to leave the real collaboration to the teachers involved in the CoP, mainly due to felt differences in social position and a lack of support in overcoming these barriers.

More recent examples of multi-stakeholder learning environments can be found in transdisciplinary sustainability education in which university-community partnerships are regarded to play a crucial role in catalysing progress towards sustainability (e.g. Rosenberg Daneri et al., 2015; Guzmán-Valenzuela, 2015; Whitmer et al., 2010). Examples of learning environments as described in this scholarly field are Shared-Action-Learning (Jiusto, 2013), Field Labs (Allen-Gil et al., 2005), the Transdisciplinary Case Study (Stauffacher et al., 2006), and the Regional Centres of Expertise (Van Dam-Mieras et al., 2008). Also for the case of multi-stakeholder learning environments in Education for Sustainable Development, the effects on student learning of knowledge co-creation with stakeholders are largely under-examined, and if investigated, mostly in small-scale, single cases (Trencher et al., 2015).

The multi-stakeholder RLE as established in Dutch secondary vocational and higher education (Foorthuis et al., 2012) is regarded as a new multi-stakeholder learning environment, since its educational design is not completely similar to one of the existing multi-stakeholder learning environments. The design of the RLE will be described in section 1.5.

Challenges for multi-stakeholder learning environments

Implementing multi-stakeholder learning environments in existing educational settings as well as developing their further pedagogical and didactical design is challenging (Trencher et al., 2015; Yarime et al., 2012). First, various organizational hurdles have to be overcome as building networks with the outside world, exchanging mutual expectations with multiple stakeholders, founding long-term community-university partnerships, and often redistributing teacher roles and tasks within teacher teams. The second challenge, related to the focus of this thesis, is the task to develop an evidence-based educational design of multi-stakeholder learning environments.

Although many scholars portrayed examples of students' working and learning in various multi-stakeholder learning environments, few studies systematically investigated the effectiveness of these learning environments for student learning in relation to its educational design, more specifically to its multi-stakeholder collaborative design. Little is known about the learning processes that occur when students work across practices. Moreover, the effects of typical learning environment characteristics that address working across practices, e.g. multi-disciplinary and multi-stakeholder collaboration, on student learning are hardly understood. Student learning in a so-called 'boundary crossing' setting is a challenging subject for further investigation and is to be explored in this thesis. Research findings of this thesis support an effective preparation of the students for their future professions in which

they inevitably will cross boundaries, i.e. work across practices, and need boundary crossing competence.

1.3 Boundary crossing competence needed to work in multi-stakeholder contexts

Boundary crossing theory and related concepts provide insights and tools for getting a grip on working and learning across practices. The small story in Box 1.1 (translated from Tellegen, 2003) illustrates the essence of boundary crossing for working with and learning from other practices, but also the barriers that boundaries could raise and that should be overcome before collaboration can lead to effective outcomes i.e. co-creation of new knowledge and, ideally, transformative practices (Akkerman & Bakker, 2011; Walker & Nocon, 2007).

Box 1.1. A Small Story on Boundary Crossing

This far and no further

'This far and no further,' said the squirrel to himself. He drew a line in the sand along the riverbank and remained standing on one side of the line. He had since long intended to draw such a line and then not cross that line. 'Then at least I know where I stand,' he thought.
He was tired and sat down. The sun slowly set and there was silence and peace in the forest and over the river. Sometimes the smell of resin or heather past. The squirrel rested his head on his hands and looked to the other side of the line. It seemed like everything was different over there. But he couldn't quite decide what was different.
'Squirrel! Squirrel!' he suddenly heard calling.
'Yes,' he called back. He recognized the voice of the cricket.
'Come here,' said the cricket.
'Where are you?'
'Here.'
The squirrel looked around and saw something moving in the bushes.
'You're on the wrong side of the line. I cannot get to you.'
'In that case, I'll eat him alone,' said the cricket.
The squirrel stretched to see what the cricket meant. He leaned far over the line with his upper body, but he only saw the tip of the crickets' tail. The smell, however, looked familiar.
'Wait a minute!' he shouted. He looked around to see if anyone saw him and then quickly erased the line with its tail. Maybe it's not good to precisely know where you stand, he thought.
'I'm coming,' he called.
But when he arrived at the bushes the cricket said: 'Where have you been all the time? Now, I have eaten it myself. '
'What?' asked the squirrel.
'Yeah ... um ... what's again the name of such a thing ...'
'A beech nut?'
'Yes! Indeed. How did you know that? A beech nut. I finished it. But to say delicious ... '
The cricket shrugged and the squirrel lowered his head and shuffled homeward into the twilight. He intended to never draw lines anymore or to want to know where he stood. And if I ever say 'up to here', he thought, I must immediately shake my head right then. Do you promise? He nodded and promised himself.

(Free translation of Tellegen, T. (2003). Tot hier en niet verder. In T. Tellegen, *Maar niet uit het hart.* Amsterdam, the Netherlands: Singel Uitgeverijen).

When a complex problem is at stake, the first question is whether you want to try to collaborate and, if yes, with whom. It's easier to stay on your side of the boundary ('Up to here and no further, said the squirrel to himself.'). Having decided to collaborate, you need to connect ('…You are on the wrong side of the line. I cannot get to you…'), and to understand the other persons and their identities and languages ('…But to say delicious…', '…What's again the name of such a thing ...'). Boundary crossing requires a reconsideration of one's own perspective and actions ('And if I ever say "up to here", he thought, I must immediately shake my head right then.'), and a certain self-commitment to keep on going ('Do you promise? He nodded and promised himself.').

Boundaries are often seen as obstacles and barriers for working and learning processes (Akkerman & Bakker, 2011). Greatest barriers to integration, read boundary crossing, as perceived by participants in inter- and transdisciplinary projects are the additional time needed, coping with different traditions, and a lack of common terminology. Furthermore, many hurdles arise from agreeing on a common problem formulation and the lack of personal chemistry (Tress et al., 2006).

But, boundary crossing is also regarded as essential to allow for transformation, i.e. new practices as a result from working across boundaries of different practices (Akkerman & Bakker, 2011). To make use of the transformative potential of boundary crossing, and at the same time overcome its barriers, people should develop 'boundary crossing competence' i.e. the ability to work and communicate across different practices and become transformation agents (Augsburg, 2014; Rosenberg Daneri et al., 2015; Walker & Nocon, 2007).

The authentic, multi-stakeholder RLE is hypothesized to be a learning environment in which higher education students are prepared for their future multi-stakeholder collaborative professions. Next to developing their professional expertise, and all kinds of crucial generic competencies (e.g. organizing, deciding, initiating activities), students are expected to learn to cross boundaries between disciplines and perspectives. Section 1.5 explains what the RLE entails. Before that explanation, section 1.4 first substantiates the choice for a focus on Urban and Landscape Planning education in this thesis.

1.4. Planning as a multi-stakeholder collaborative profession by nature

Although the RLE is used in various higher and vocational education programmes, the majority of the RLEs that were studied in this thesis were part of Urban and Landscape Planning curricula. As a consequence, most students who participated in the studies included in this thesis were planning students. The reason behind the choice for the context of planning programmes is that the planning profession is a multi-stakeholder collaborative, 'boundary crossing' profession by nature. Spatial planning draws from

the social, the technical and the environmental sciences in creating interdisciplinary knowledge and instruments supporting the design, implementation, and evaluation of spatial processes. Drawing on the collaborative and participative foundations of Healey (1997; 1998) and Forester (1999), a collaborative mode of practice in planning approaches, including more recent actor networking and co-evolving approaches, is still commonplace (Boelens & De Roo, 2014; Innes & Booher, 2010). Decisions on something as common and interdisciplinary as land use is, can neither be prepared and taken by individuals, nor from individual perspectives (Friedmann, 1987).

It is obvious that multi-stakeholder collaboration, including working with and learning from different disciplines and perspectives, should at least be addressed in planning education. Although planning scholarship stresses the importance of addressing collaborative competencies in the planning curricula (Dalton, 2007; Edwards & Bates, 2011; Seltzer & Ozawa, 2002), by no way do all curricula worldwide include actual student-stakeholder collaboration (Balassiano, 2011; Edwards & Bates, 2011; Frank et al., 2014). Moreover, when planning curricula do include student-stakeholder collaboration, e.g. in service learning or studio variants, systematic investigations of students' learning outcomes related to the educational design of the learning environments are scarce (Angotti et al., 2011; Long, 2012b). Studies in this respect are crucial to continuously improve the effectiveness of authentic and collaborative learning environments in planning education.

The next section describes the RLE as a new multi-stakeholder learning environment for higher education, including planning education, in which students, often working in multi-disciplinary student groups, collaborate with stakeholders to work on regional developmental issues.

1.5 The Regional Learning Environment

This section explain the aims and characteristics of the Regional Learning Environment by starting with an illustrative picture of an imaginary RLE case.

A picture of an RLE

Edelerveen, a small, imaginary village beautifully located in an attractive landscape in the northern part of the Netherlands, has a problem. Young people leave the village because of a lack of economic perspectives. Commercial, educational and health services close, because of a too low level of support. Adolescents who continue to live in the village do not have an inspiring living environment, and start to undertake undesired activities negatively influencing the atmosphere in the village. Edelerveen has no flourishing tourism industry. Tourists only pass by during the summer. Farmers are not allowed to expand their farms, if wished, due to environmental regulations. Commuters working in a nearby regional city buy cheap houses in Edelerveen, but

don't feel dedicated to the villages' concerns and don't match very well with the locals who are known for their slightly stubborn characters.

Already for years, Edelerveen was under special supervision from the local and regional government, but no policy processes made any significant changes. Then, one active inhabitant, sometimes called the 'village chief' of Edelerveeen, heard about the RLE concept as supported by the Dutch Ministry of Economic Affairs (Foorthuis et al., 2012). He mobilised local and regional authorities, the semi-governmental water- and recreational boards, entrepreneurs, NGO's, citizens and regional educational and research institutions to establish, and financially support, the RLE 'Oosterkwartier'.

The stakeholders developed a multi-year business plan and a regional knowledge agenda, including various project themes, that were in turn translated into more concrete student projects. The case Edelerveeen was one of the project themes, embedded in a broader regional future perspective for the region 'Oosterkwartier'. For one of the projects, as carried out within this project theme, a multidisciplinary group of teachers and higher and secondary vocational students came to live in the village for several weeks. They investigated the main problems, contacted and mobilised inhabitants, collaboratively organised workshops and came, in close collaboration with the inhabitants, to a list of initiatives that could boost the village, strengthening its economic position within the region, while honouring its high landscape and nature values. One remarkable result was the creation of a community meeting space for social and cultural activities in an abandoned local shop, including a communication and activity plan. This new community centre, owned by the village council, and financially supported by local and regional authorities and entrepreneurs, is suggested to further catalyse development of the village in a collaborative, multi-stakeholder process, and as such is regarded as a transformative outcome of this RLE.

General aim of the regional learning environment

The general aim of the Regional Learning Environment (RLE) is to facilitate the collaborative creation of new knowledge towards sustainable regional development. In the Netherlands, as well as in other European countries, regions have become a sub-national, supra-local focus point for social, economic, and spatial development (Haughton & Counsell, 2004; Lagendijk, 2001). The RLE concept was introduced in the Netherlands in 2005 as a catalyst for 'regional learning' (Box 5.1) . In this long-term learning and working community students, teachers, researchers, policy makers, members of NGO's, entrepreneurs and/or citizens co-operatively face complex issues of regional development while mutually learning (Foorthuis et al., 2012; Meijles & Van Hoven, 2010). To date, 13 RLEs have been established in various Dutch, mostly rural, regions that are characterized by their high landscape and nature values, recreational pressure and economic and demographic decline. Educational institutions,

on secondary vocational, higher vocational as well as academic level, are always one of the partners in the RLE. A unique feature of the RLE is that student learning is embedded in a real multi-stakeholder, knowledge co-creating process aiming at stimulating both student learning as well as 'regional learning'. The boxes 2.1, 3.1, and 5.1 provide comprehensive illustrations of the practices and project results of three of the studied RLEs.

Educational characteristics of the RLE

From an educational perspective, the RLE is an authentic, multi-stakeholder learning environment (e.g. De Kock et al., 2004; Herrington & Oliver, 2000). Each RLE is characterized by an identical set of learning environment characteristics that will be described in this section. Illustrative examples of what these design characteristics involve in practice can be found in the above section 'A Picture of an RLE' and in the boxes 2.1, 3.1 and 5.1.

The general learning objective of the RLE is twofold, namely to support students' and other parties' learning in the sense of (1) integrated use and development of domain-specific expertise, generic professional competencies, and boundary crossing competence, and (2) to contribute to sustainable regional development. Students work in student groups on real-world, transdisciplinary problems in a real-world situation (Scholz & Steiner, 2015b) i.e. complex regional developmental problems identified and commissioned by an external client. Working on the assignment engages students in authentic, wicked tasks and activities (Balassiano, 2011; Rittel & Webber, 1973). Knowledge is collaboratively constructed between students, between students and their teachers, and preferably between students, teachers and multiple stakeholders. Working in the RLE results in a realistic authentic product that has value for the external client(s) (Meijles & Van Hoven, 2010) and contributes to regional development, ideally towards transformation (Foorthuis et al., 2012). Deliverables vary as a result of agreements between the students, their teachers and the external client(s). Next to the product for the client, process reflection reports are required as a deliverable. Product and process deliverables are both part of the assessment, but assessment criteria and procedures vary between RLEs. The teacher's role is to facilitate and/or coach the learning process instead of mainly transferring knowledge as an expert. Additionally, the teacher is also a learner, working in an almost equal relationship with the students to collaboratively tackle complex regional problems.

The RLE preferably has two additional design characteristics that are expected to explicitly stimulate students to work and learn across boundaries between different disciplines and different perspectives (Meijles & Van Hoven, 2010):

1. students work in multidisciplinary student groups, which means that the groups consist of students from different study programmes i.e. disciplines;

2. students collaborate intensively with multiple stakeholders like researchers, policy makers, members of NGO's, entrepreneurs and/or citizens to enable the inclusion of diverse perspectives and interests when solving transdisciplinary, complex regional problems.

1.6 Research questions and design

As long as a new learning environment has not been proven to be effective, education should wonder whether it's allowed to use it (Davies, 1999). The main objective of this thesis is to find evidence for the effectiveness of the new, multi-stakeholder Regional Learning Environment for students' learning in relation to its multi-stakeholder design characteristics. Two general research questions guide the thesis, namely (1) what do students learn in a multi-stakeholder learning environment, and (2) which learning environment characteristics effectively support student learning in a multi-stakeholder learning context? These general research questions will be studied in the context of the RLE. The RLE is new and as such requires to be proven for its effectiveness. However, the studies and findings are supposed to be exemplary for other authentic, multi-stakeholder learning environments in higher education regarding the many similarities between the RLE and existing multi-stakeholder learning environments. As such, results of this research project could support the evidence-based effective educational design of all authentic, multi-stakeholder learning environments in higher education.

Four associated studies, as presented in Chapters 2 to 5, contribute to the main objective of this thesis. The line of reasoning behind, and alignment between the four studies, will be explained below, leading to the specific research questions for the four respective studies.

Educational effectiveness is a multi-interpretable concept with multiple outcome measures, and should therefore be clarified in the context of a specific study. Biggs' 3P model for constructive alignment (2003) provides a useful framework to explain how effectiveness of the RLE is viewed in this thesis (Figure 1.1).

Constructive alignment according to Biggs starts from the learner who brings along certain learner characteristics (e.g. disciplinary knowledge) and constructs his own learning through relevant learning activities. The teacher creates a learning environment, including learning objectives and learning activities, that effectively supports the learners' learning processes to achieve a set of learning outcomes. All components of the model are aligned with each other in a line from 'presage' (learner and teacher), via 'process' (design characteristics and learning activities) to 'product' (learning outcomes). Below, the studied subjects and variables in this thesis will be clarified by placing them into a contextualised version of the 3P model, and therewith also show their relationships (Figure 1.1). In chapter 6 (General Discussion) this

contextualised 3P model will be used again to review the results of this thesis (Section 6.2 and Figure 6.1), and position suggestions for future research (Section 6.6 and Figure 6.1).

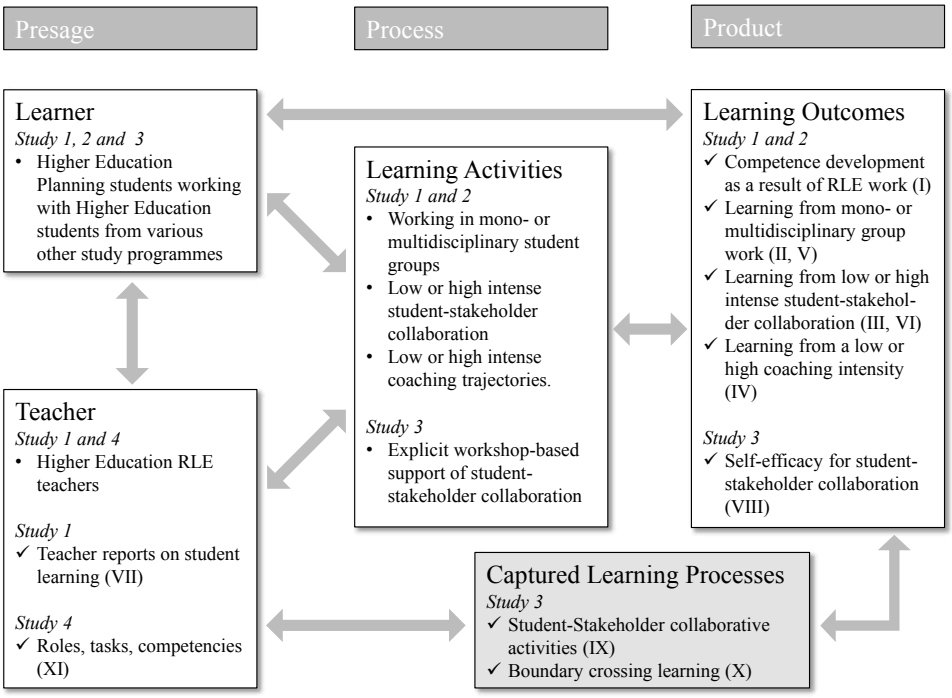


Figure 1.1. Alignment of the Studies Matched to Biggs' 3P Model for Constructive Alignment (Biggs, 2003, p. 19) ✓ = Studied variable (I–XI)

Students, being the *learners* and subjects of study in study 1, 2 and 3 (Chapters 2, 3 and 4), are mainly academic and higher professional education Urban and Landscape Planning students, often working in multi-disciplinary student-groups with higher education students from various other study programmes (e.g. Landscape Architecture, Biology, Forestry, Food and Health, Law and Governance, and Management Studies). *Teachers* as involved in study 1, and subject of study in study 4 (Chapter 5), are higher education teachers involved in RLE teaching next to their duties in other learning environments and/or in educational management and organization. The *learning activities* comprise the activities that students undertake in the RLE, e.g. group work in multi-disciplinary student groups (study 1 and 2), student-stakeholder collaborative activities (study 1, 2 and 3), and workshop-based interventions that include a range of learning activities aimed at supporting student-stakeholder collaboration (study 3). Coaching trajectories are added to the list of learning activities, since study 1 reveals

that coaching trajectories are a crucial learning environment characteristic of the RLE. *Learning outcomes* refer to the intended results of the learning activities of the RLE students. In this thesis, study 1 and 2 use learning outcomes as the outcome measure, i.e. (1) students' competence development as a result of working in the RLE in general, and (2) students' reported learning from working with the typical design characteristics of the RLE. Study 3 captures both students' reported learning processes and learning outcomes, in this case self-efficacy for student-stakeholder collaboration, as dependent variables. To position the learning process measures as studied in study 3 in the 3P model (see Figure 1.1), the learning process variables are shown at the interface of the learning activities (process part of the 3P model) and learning outcomes (product part of the 3P model).

Educational effectiveness of the RLE, where this research project aims to find evidence for, then is operationalised by the following variables (see Figure 1.1; I - XI):

- students' development of domain-specific professional expertise and generic competencies in the RLE in general (study 1 and 2): I;
- students' competence development as a result of the RLEs' typical design characteristics, i.e.:
    - working in multi-disciplinary student groups (study 1 and 2): II;
    - intensive collaboration with multiple stakeholders (study 1 and 2): III;
    - high coaching intensity (study 1 and 2): IV;
- students' reported learning outcomes as a result of:
    - working in multi-disciplinary student groups (study 1 and 2): V;
    - working at a high level of student-stakeholder collaboration (study 1 and 2): VI;
- teachers' reports on student learning and preconditions for learning in the RLE (study 1): VII;
- students' self-efficacy for student-stakeholder collaboration (study 3): VIII;
- types of reported student-stakeholder collaborative activities (study 3): IX; and
- boundary crossing working and learning as a result of support thereof (study 3): X.

According to Biggs, teachers fulfil a crucial role in enhancing the effectiveness of a learning environment, and are as such expected to also be of crucial importance in the RLE. We hypothesize that RLE teachers fulfil new, non-traditional roles and tasks next to their known, traditional ones, and may need to master additional competencies to effectively design and implement RLEs, and support student learning in the RLE. Therefore, this thesis also studies required roles, tasks and competencies of RLE teachers, and compares these with existing higher education teacher profiles (study 4; see Figure 1.1; XI).

The four respective studies will now be introduced one-by-one, including their specific objectives and research questions.

Study 1. Educating boundary crossing planners: Evidence for student learning in the multi-stakeholder Regional Learning Environment

Study 1 investigates to what extent RLEs stimulate students to develop competencies identified as relevant for working in an RLE setting, and if the typical RLE characteristics of multidisciplinary student groups, multi-stakeholder collaboration, and a high coaching intensity enhance student learning. A quasi-experimental mixed methods pre-and post-test design investigates the effectiveness of five RLEs for students' learning (N = 225). Students' development of professional expertise and generic competencies will be measured using a validated competence measurement instrument (Khaled et al., 2014). Student reported learning outcomes as a result of working with the typical characteristics of the RLE will be analysed qualitatively. Next, RLE teachers are asked what learning outcomes as a result of typical RLE characteristics they perceive, and what they identify preconditions for utilizing the learning potential of RLEs.

Study 2. Educating collaborative planners: Strengthening evidence for the learning potential of multi-stakeholder Regional Learning Environments

Study 2 is a follow-up of study 1, in an attempt to further investigate unexpected findings of study 1, and strengthen evidence for the effectiveness of the RLE by studying a new set of seven RLEs and 143 other students. The research questions for this study are whether competence development across RLEs can be reaffirmed, and to what extent student learning can be attributed to the RLE typical characteristics of working in multi-disciplinary student groups, a high level of student-stakeholder collaboration, and a high coaching intensity. The study uses a similar quasi-experimental mixed methods pre- and post-test design as used in study 1. The study is meant to deepen understanding of the RLEs' learning potential, especially of its boundary crossing characteristics, and thereby help to develop a proper intervention for supporting student learning in the RLE.

Study 3. Stimulating students' boundary crossing learning in the multi-stakeholder Regional Learning Environment

Study 3, designed as an intervention study, focuses on students' boundary crossing working and learning processes in the RLE as a result of explicit workshop-based support of student-stakeholder collaboration. Two workshops on student-stakeholder collaboration will be developed, and RLE students (N = 122) will participate in either none, one or two workshops during their RLE projects. The research questions for this study are: does explicit workshop-based support of student-stakeholder collaboration in the RLE result in (1A) more self-efficacy for stakeholder collaboration, in (1B)

more reported collaborative activities between students and stakeholders and in (1C) differences in reported boundary crossing learning mechanisms?

Study 4. Teachers as brokers: Adding an out-of-school perspective to higher education teacher profiles

The purpose of the fourth study is to (1) identify specific roles, tasks and competencies of teachers performing in the RLE, in this study taken as an exemplary out-of-school oriented multi-stakeholder learning environment, and (2) start a debate on out-of-school additions to existing, more in-school focused, higher education teacher profiles. The underlying research questions of the study are: what are the roles, tasks and competencies of teachers in the out-of-school oriented, multi-stakeholder RLE, and how do they add to existing comprehensive higher education teacher profiles?

The descriptive study is qualitative in design using a theory-informed, open coding process to analyse RLE documents, teacher interviews and teacher focus group discussions.

Thesis outline

After the introduction (Chapter 1), this thesis portrays the four respective studies in chapters 2, 3, 4 and 5. The general discussion (Chapter 6) reviews the main results, strengths and limitations of the thesis, illuminates the broader learning potential of the RLE, and builds on the results by considering suggestions for further studies, and theoretical and practical implications of the thesis.

Chapter 2.

Educating Boundary Crossing Planners: Evidence for Student Learning in the Multi-Stakeholder Regional Learning Environment[1]

Abstract

The Regional Learning Environment (RLE) embeds student learning in an authentic multi-stakeholder regional learning process aiming at sustainable regional development. This quasi-experimental mixed-method study confirms the effectiveness of the RLE for planning students' learning (N = 225), and shows the added value of 'working in multi-disciplinary student groups' and 'a high coaching intensity'. Unexpectedly, non-significant effects were found for 'intensive collaboration between students and multiple stakeholders', although teachers illuminated this to be a powerful design principle of the RLE.

The findings inform the future design and pedagogy of the RLE and other authentic learning environments in planning education. Since multi-stakeholder collaboration is inherent to planning practice, future research should examine if and how learning with and from multiple stakeholders can be optimized in the RLE.

Keywords: authentic learning environment, boundary crossing, competence development, multidisciplinary, multi-stakeholder, planning education

[1] This chapter is based on Oonk, C., Gulikers, J.T.M., & Mulder, M. (accepted with revisions). Educating boundary crossing planners: Evidence for student learning in the multi-stakeholder regional learning environment. *Journal of Planning Education and Research*.

2.1 The need for effective learning environments in planning education

In current planning practices, professional planners need to co-operate with a variety of stakeholders from different disciplinary fields and with different perspectives. To perform in these practices, planners need 'boundary crossing' competence, at this place defined as the ability to operate across different practices (Akkerman & Bakker, 2011; Walker & Nocon, 2007). To develop boundary crossing competence of future professional planners, planning education should incorporate learning environments that effectively stimulate boundary crossing. To date, the effectiveness of learning environments in planning education from a boundary crossing perspective has not been confirmed. This study investigates the effectiveness of the new authentic multi-stakeholder Regional Learning Environment (RLE), designed from a boundary crossing perspective, for planning students' learning.

Aiming at preparing planning students for their profession, scholars emphasize the need to incorporate real world planning practices in planning curricula (e.g. Angotti et al., 2011; Baum, 1997; Booher & Innes, 2002; Dalton, 2007; Edwards & Bates, 2011; Friedmann, 1996; Seltzer & Ozawa, 2002). As a result, different authentic learning environments have been developed that attempt to represent the contemporary planning practice, and that provide students with the opportunity to develop their professional competence. Two commonly used and broadly described examples are the planning studio and service learning environments (Angotti et al., 2011; Long, 2012b).

Several studies have portrayed experiences of students, teachers, and other partners involved in planning studio's, service learning environments and mixed variants of these two, resulting in varied suggested guidelines for the educational design of these learning environments (e.g. Balassiano, 2011; Harris, 2004; Higgins et al., 2009; Senbel, 2012; Sletto, 2010; Winkler, 2013). However, this is little evidence for the effectiveness of these authentic learning environments in terms of student learning. More specifically, evidence lacks for the effect of typical learning environment characteristics that represent the current planning profession, on student learning. Such evidence is needed to both develop education programmes that fulfil the demands of the current profession (Young, 2009), and to support evidence-based design and pedagogy of authentic learning environments in planning education (Higgins et al., 2009; Long, 2012b; Németh & Long, 2012; Roakes & Norris-Tirrell, 2000).

The multi-stakeholder Regional Learning Environment (RLE) is a new authentic learning environment in Dutch planning education programmes (Foorthuis et al., 2012; Meijles & Van Hoven, 2010). A unique feature of the RLE is that student learning is embedded in a real multi-stakeholder planning process aiming at stimulating both student learning as well as 'regional learning'. The RLE is expected to represent characteristics of the current planning profession (Albrechts, 2013; Boelens & De Roo, 2014). At least it requires students to 'cross boundaries' between multiple disciplines

and multiple perspectives.

This quasi-experimental study explores, in a mixed method pre- and post-test design, the effectiveness of the RLE for planning students' learning. Moreover, the study analyses whether the 'boundary crossing' learning environment characteristics of 'working in multidisciplinary student groups' and 'working in close collaboration with multiple external stakeholders' enhance this learning. Quantitative data on students' competence development will be enriched with student and teacher reports on student learning in the RLE.

The results of this study highlight the effectiveness of the new RLE for planning students' learning in view of current professional requirements for planners. This is useful with regard to further align planning education and practice (Dalton, 2007; Frank et al., 2014; Seltzer & Ozawa, 2002). The results of the study inform the future design and pedagogy of RLEs, and of planning studios and service learning environments, considering parallels between the RLE and these existing authentic learning environments. On the curriculum level, insights of the study are relevant to develop planning curricula that show an increasing outbound focus, establishing long-term partnerships between universities and the outside world to build on social relevance and civil engagement (e.g. Balassiano & West, 2012; Lieblein et al., 2012; Winkler, 2013).

The theoretical considerations that guide this study first explicate the importance of boundary crossing in the future professional practice of planners. Next, the educational design of the RLE will be described, including the way boundary crossing is explicitly stimulated in the RLE compared to the planning studio and service learning.

2.2 Co-evolutionary planning and the need for boundary crossing planners

The context in which planning operates has changed considerably over the last three decades. Society has become increasingly globalized and networked, and faces complex issues with unpredictable changes in land use systems through multiple scales. Planning processes worldwide have become from an exclusive governmental affair to multi-stakeholder processes. Multiple and in time varying stakeholders co-evolve in uncertain and continuously changing contexts engaging with complexity (Albrechts, 2013; Boonstra & Boelens, 2011; De Roo & Silva, 2010). Planning as a profession responds to these changes by moving beyond more structuralist planning approaches towards developing new approaches that try to address the multidimensional, interconnected and 'wicked' character of current issues and processes (Boelens & De Roo, 2014; Booher & Innes, 2002; Rittel & Webber, 1973). Collaborative, discursive, participatory, co-evolutionary, co-productive and adaptive planning are a few examples of these new planning approaches (Albrechts, 2013; Forester, 1999; Healey, 1997; Innes & Booher, 1999). All these approaches share the

idea that planning problems cannot be solved without taking into consideration the perspectives of multiple actors with diverse values and interests, and multiple understandings and interpretations of reality (Albrechts, 2013; Domingo & Beunen, 2012; Healey, 1997; 2003). More recently the beginning of a transition towards a new planning movement has been identified in which planning is understood to become less 'the pursuit of an end-state plan' (Boelens & De Roo, 2014, p.2), but an 'open and undefined development of becoming' (Albrechts, 2013; Boelens & De Roo, 2014, p.9) facilitating self-organized planning initiatives that emerge from civil society instead of from governmental initiatives (Boonstra & Boelens, 2011). This movement, although it is still a pioneer in planning practice and not regarded as an all-encompassing solution for all planning issues, appears to induce additional new planning approaches. Key endeavour of these approaches is to co-create communal situational communicative ideals instead of reaching predefined outcomes and full consensus on an explicit goal.

In planning processes in which these new approaches are applied, planners increasingly become integrally participating mediators (De Roo & Silva, 2010), also called 'social entrepreneurs' (Boelens & De Roo, 2014, p.19) instead of being more rational, technical facilitators (Healey, 2003; Nienhuis et al., 2012). Planners mediate the non-linear co-evolutionary processes by respectfully sharing relational meanings of multiple stakeholders and situations. They support others to acquire expertise and perspectives from each other, aiming at a communicative ideal that ideally contributes to a more sustainable future. This mediating role of planners challenges the required competencies of planners, and the translation hereof to education. Next to long-established technical, communicative and facilitating competencies (Dalton, 2007; Healey, 1997; Seltzer & Ozawa, 2002), more mediating competencies become relevant for planners. Examples of these new competencies, recently identified by planning scholars, are (1) being able to quickly identify and understand multiple disciplines, cultural traditions, interests, values, and perspectives, and (2) to admit to and intertwine these, (3) to cultivate a safe, respectful and stimulating collaborative climate, (4) to enable others to communicate authentically, and (5) to reflect on process, products and performance and mutually learn from each other towards shared understanding and reasoning (e.g. Balassiano, 2011; Domingo & Beunen, 2012; Thomas, 2012; Umemoto, 2011).

The concept of 'boundary crossing' is argued to encapsulate the new competencies of planners and as such manifests itself as a key competence of current planners. Boundary crossing competence is defined here as the ability to manage and integrate multiple discourses and practices across different sociocultural boundaries (Akkerman & Bakker, 2011; Umemoto, 2001; Walker & Nocon, 2007).

The new RLE is designed with the aim to explicitly address and stimulate boundary

crossing in planning education. The next section describes what the RLE is, shows how boundary crossing elements of the actual planning profession have been implemented in the design of the RLE, and compares the RLE design with that of the planning studio and service learning environment.

2.3 The authentic multi-stakeholder Regional Learning Environment

Regional planning and the RLE

In the Netherlands as well as in other European countries, regions have become a sub-national, supra-local focus point for spatial development (Haughton & Counsell, 2004; Lagendijk, 2001). In 2005, a regional partnership in the Dutch Peat District (northern part of the Netherlands) between nine municipalities, two provinces, two water boards, and several educational institutes, developed, and experimented with, a regional learning arrangement to collaboratively face regional developmental issues. This experiment was the starting point for the further development of the Regional Learning Environment (RLE), supported by the Dutch Ministry of Economic Affairs (Boetzkes et al., 2014; Foorthuis et al., 2012).

The RLE is meant to be a catalyst for 'regional learning'; a learning and working community in which students, teachers, researchers, policy makers, members of NGO's, entrepreneurs and/or citizens co-operatively face complex issues of regional spatial development while mutually learning (Foorthuis et al., 2012; Meijles & Van Hoven, 2010; Scholz & Steiner, 2015b). The RLE has been established so far in 13 Dutch, mostly rural, regions that are characterized by high landscape and biodiversity values, recreational pressure and economic and demographic decline. The RLE aims to facilitate the collaborative creation of new knowledge towards sustainable regional development. Educational institutions are always one of the partners in the RLE. Box 2.1 provides a comprehensive illustration of the state of affairs in one of the studied RLEs.

Educational design of the RLE

From an educational perspective, the RLE is an authentic, multi-stakeholder learning environment (e.g. De Kock et al., 2004; Herrington & Oliver, 2000) and is always characterized by the following learning environment characteristics:

1. the general aim of the RLE is twofold, namely (1) to support students' and other parties' learning in the sense of integrated use and development of domain-specific expertise and professional skills, and (2) to contribute to sustainable regional development;

Box 2.1. Illustration of the RLE Noord-Holland Noord

The RLE Noord-Holland Noord

The rural region Noord-Holland Noord, located in the northern part of the Province of Noord-Holland (Figures 2.1 and 2.2), faces complex issues mainly related to economic and demographical decline. In 2010 the RLE Noord-Holland Noord has been established by the Province, regional educational institutes and the regional Development Agency to share and boost innovation power towards a sustainable economy in this region.The RLE is a long-term regional cooperation between the Province of Noord-Holland, various municipalities, entrepreneurs, schools for both secondary vocational and higher education and Wageningen University and Research Centre. The RLE aims at collaborative regional innovation in the field of agribusiness, leisure, renewable energy, and a living countryside. All stakeholders involved, i.e. local and regional authorities, entrepreneurs, NGO's, researchers, but also students and their teachers, form a working and learning community that co-creates new knowledge and shares experiences. The ultimate goal of the RLE is to inform decision making processes on innovative solutions towards a more sustainable development of the region.

The RLE works on a project basis. Most projects are derived from a collaboratively set long term regional knowledge-agenda. Projects are commissioned by one or more regional stakeholders and carried out in different compilations of parties. In most cases education is involved as one of the parties. In those projects in which education participates, students and their teacher(s) carry out a project as commissioned by one or more parties (i.e. external clients) and ideally in close collaboration with multiple stakeholders involved.

The students in the studied RLE 3 (Table 2.1) carried out projects in the RLE Noord Holland Noord. Commissioned by the village councils of three small rural villages, students made village appraisals for these villages. The students carefully listened to perspectives of multiple stakeholders with regard to the future of their village and surrounding region by interviewing locals. Next they translated the appraisal results into scenarios for the future development of, and cooperation between the villages aiming at becoming lively living areas. This translation was done in close consultation with the stakeholders. The results were published in a student report that has been discussed with the village councils and local community (Wageningen University, 2012). Teachers then further elaborated the student results into a more generally applicable method for mobilising supra-local citizen initiatives (Aalvanger & Beunen, 2014). The ambition behind this project was to inspire citizens to actively get involved in discussions on the future of their villages and feed these discussions with new collaboratively created knowledge.

This example shows how an RLE project as carried out in the RLE Noord-Holland Noord resulted in both student learning as well as "regional learning" i.e. regional innovation and participation and learning of all stakeholders involved.

Figure 2.1. The Province of Noord-Holland as Located in The Netherlands

Figure 2.2. Typical Noord-Holland Noord landscape

2. students are exposed to real-world, transdisciplinary problems in a real-world situation (Scholz & Steiner, 2015b) i.e. regional planning problems identified and commissioned by an external client. Working on the assignment engages students in authentic, wicked tasks and activities. Box 2.1 and Appendix 1 show examples of assignments that have been carried out in the RLEs included in this study;
3. knowledge is collaboratively constructed between students, between students and their teachers, and preferably between students, teachers and multiple stakeholders;
4. students work in student groups;
5. working in the RLE results in a realistic authentic product that has value for the external client(s) and contributes to regional development. In practice, deliverables vary as a result of agreements between the students, their teachers and the external client(s). Next to the product for the client, process reflection reports are required as a deliverable. Product and process deliverables are both part of the assessment, but assessment criteria and procedures vary between RLEs;
6. the teacher's role is to facilitate and/or coach the learning process instead of to transfer knowledge as an expert. Additionally, the teacher is also a learner, working in an almost equal relationship with the students to collaboratively tackle complex regional problems.

The RLE preferably has two additional design characteristics that are expected to explicitly stimulate students to work and learn across boundaries between different disciplines and different perspectives (Foorthuis et al., 2012; Meijles & Van Hoven, 2010):

1. students work in multidisciplinary student groups, which means that the groups consist of students from different study programmes i.e. disciplines;
2. students collaborate intensively with multiple stakeholders like researchers, policy makers, members of NGO's, entrepreneurs and/or citizens to enable the inclusion of diverse perspectives and interests when solving transdisciplinary, complex regional problems.

These last two characteristics are referred to as the boundary crossing learning environment characteristics.

The RLE compared to the planning studio and service learning

The RLE shares educational characteristics with the commonly used authentic planning studio, service learning environment and mixed variants of those. However, the RLE characteristics purposely differ from, and add to the existing authentic learning environments where it comes to explicitly addressing boundary crossing.

Providing insights in similarities and differences between the characteristics of the RLE, studio and service learning enables to use the results of this study both for the further educational development of the RLE, and, as requested for by various planning scholars, of the planning studio (Higgins et al., 2009; Long, 2012a, 2012b; Németh & Long, 2012) and service learning (Angotti et al., 2011; Roakes & Norris-Tirrell, 2000; Sletto, 2010).

For neither the RLE, the planning studio or service learning an internationally standardized pedagogy has been described. However, all three learning environments contain elements of social constructivist learning theories (Vygotsky, 1978), authentic learning (Herrington & Oliver, 2000), and experiential learning (Dewey, 1938). Students collaboratively construct knowledge in relation with other students, teachers and society, they work on real-world assignments and learn through experience (Watson, 2001).

The planning studio aims to expose students to a professional experience by introducing them to real-world problems in a quasi-real world situation, not necessarily contributing to society. The learning outcomes, although often not clearly described (Long, 2012b; Nemeth & Long, 2012), focus on student learning in the sense of the integration and application of theory (among others from support classes) into practice, and the development of various practical skills (Frank et al., 2014; Nemeth & Long, 2012). The planning studio mostly starts with an open-ended complex problem. The problem takes account of current issues in the real world with (often constructed) 'real clients', but is mostly described by the teacher, and not offered by actual, external clients and derived from urgent practice (Balassiano & West, 2012). Students work individually or in groups. The planning studio is finalized with a final presentation to faculty and/or the client, not necessarily with an authentic product that offers added value for a client. As a remnant from design studios, assessment often takes place through several rounds of formative assessments (jury-like crits) involving presentations of students and feedback of diverse assessors (peers, tutor, experts). Although the intention is to base assessment on absolute, criterion-referenced quality standards, standards still lack (Nemeth & Long, 2012). The teacher fulfils the role of expert, providing a flexible though strong instructional frame. Only recently, scholars advocate to conceive a broader role for stakeholders and to open studio courses for a mix of students from various disciplines (Balassiano, 2011; Long, 2012b).

We believe that the RLE adds three typical design characteristics to the current mainstream characteristics of the planning studio i.e. (1) students always work on real world transdisciplinary assignments identified by and relevant for one or more external stakeholders, (2) students work in groups, preferably multi-disciplinary groups and (3) students, their teachers, and multiple external stakeholders collaboratively construct

knowledge and mutually learn. Recapitulated, the RLE provides students an explicit collaborative 'boundary crossing' learning experience which does not necessarily has to be the case in the planning studio.

Service learning is defined as a pedagogy that aims to integrate meaningful community service with formal education (Giles & Eyler, 1994; Jacoby, 2014). Next to the objective of strengthening communities, student learning outcomes focus on civic responsibility, critical problem solving skills, adaption to challenging and unexpected situations, and critical reflexivity (Roakes & Norris-Tirrell, 2000; Sletto, 2010). In service learning, students learn how to use the knowledge and skills from a specific course in providing service. Learning outcomes are often closely connected to those of a related theoretical course. Students work individually or in groups on real world assignments that are in most cases currently relevant for the community (Harris, 2004; Sletto, 2010). The assignments are often, but not necessarily, open-ended and multi-disciplinary. They always address local or sub-local issues in a social context. Service learning allows students to work closely with community organizations on applied field projects. Knowledge construction explicitly takes place by structured reflective thinking, mainly between the students and their teacher. The final product provides added value to the community, and is presented to the client. Assessment criteria and procedures are not commonly defined (Harris & Irazábal, 2011). Teachers and students work in a master-apprenticeship model in which the teacher fulfils the role of facilitator of process and reflection (Harris, 2004; Roakes & Norris-Tirrell, 2000; Schön, 1987; Sletto, 2010). In planning education practice, many different service learning courses have been developed and evaluated, e.g. the service learning studio (Forsyth et al., 1999; Winkler, 2013) and the research seminar (Harris, 2004). In these service learning variants both faculty members and students maintain a close relationship with external organizations, and deliver a formal community service report.

Service learning environments and the RLE share the characteristic of students working on a real world assignment with actual relevance for one or more external parties. In both service learning and the RLE, contact with external parties is a prerequisite for a sufficient project result and an oral presentation of the final product to client and/or other external parties is part of the assessment. However, problems as addressed in the RLE are always demand-driven, instead of launched for the purpose of a (service learning) course, and always have a transdisciplinary, open-ended character. In addition, RLE students preferably work in multidisciplinary student groups. So far, working in multidisciplinary student groups is not regarded as a prerequisite for service learning. The process of reflection to transform an experience into learning, and thus stimulate reflective practice, is, to date, less pronounced in the RLE, while a core element of service learning. Recapitulated, the RLE adds to service

learning, as it does to the planning studio, a set of typical boundary crossing characteristics namely that students in the RLE (1) always work on a demand-driven, transdisciplinary assignment identified by one or more external actors, and (2) always work in groups, preferably multidisciplinary student groups. On the other hand, service learning could add to the boundary crossing learning potential of the RLE the element of systematic, critical reflection to explicate and learn from experiences across the boundaries.

2.4 Studying the learning potential of Regional Learning Environments

The use of the new RLE in planning education in the Netherlands is emergent. However, still unanswered is the effectiveness of the RLE in terms of students' competence development, and the actual added value of learning in multidisciplinary student groups and with multiple external stakeholders, i.e. the two typical boundary crossing characteristics. To investigate the effectiveness of the RLE in terms of student learning is important to confirm the hypothesized added value of this new learning environment, and add to the small record of systematic, large scale, quantitative studies on the effectiveness of studios and service learning (Angotti et al., 2011; Long, 2012a).

This study addresses four research questions:

1. To what extent do RLEs stimulate planning students to develop competencies identified as relevant for working in an RLE setting?
2. Do the two boundary crossing characteristics of RLEs (multidisciplinary student groups and multi-stakeholder collaboration) enhance student learning?
3. What learning outcomes as a result of working in multidisciplinary student groups and with multiple external stakeholders do teachers perceive?
4. What preconditions do teachers perceive for utilizing the learning potential of RLEs?

2.5 Method

This study has been carried out in a quasi-experimental mixed method pre- and post-test design combining quantitative data on students' competence development with student and teacher reports on learning outcomes of the RLE.

Participants

Five RLEs as implemented in different planning education programmes were monitored: three in academic study programmes ($n = 81$; 64; 52) and two in professional higher education programmes ($n = 15$; 13). Students in all the RLEs worked in student groups of mostly 5 or 6 students. Each student group worked on a different project assignment of which the results were meant to contribute to the

development of the respective region (see Appendix 1). Table 2.1 shows the general characteristics of the five RLEs and mean age and gender of their participating students.

To answer research question 3 and 4, 25 teachers participated in a semi-structured workshop. All teachers were experienced in the development and implementation of RLEs, including the five monitored RLEs.

Classification of students on boundary crossing learning environment characteristics

All studied RLEs met the general educational characteristics. The RLEs differed regarding educational level, study load, size of the student groups, number of students involved (see Table 2.1) and focus in content (see Appendix 1). To answer research question 2, individual students in every RLE were classified for the two studied boundary crossing design characteristics. A student was classified as 'working in a mono-disciplinary student group' when the student worked only with other planning students. A student was classified as 'working in a multidisciplinary student group' if the student worked with students from other study programmes (e.g. Landscape Architecture, Environmental Sciences, Management and Economics). A student was classified as 'working on a low level of multi-stakeholder collaboration' if the student only read information about the stakeholders and their opinions without contacting them personally or only asked the stakeholders informative questions that were answered without any discussion. A student was classified as 'working on a high level of multi-stakeholder collaboration' if the student discussed project-related issues with one or more stakeholders or worked together in collaborative working sessions with one or more stakeholders. The attribution of the classification for multi-stakeholder collaboration was based on three weighed ratings: (1) teachers' observations of the level of stakeholder collaboration during the projects (rating low or high), (2) researchers' observations of the level of stakeholder collaboration during the projects (rating low or high), and (3) students' reported level of stakeholder collaboration in an evaluation questionnaire. In this questionnaire the students ticked off how many stakeholders they collaborated with, and how the collaboration took place (ranging from 'finding information on the internet about this stakeholder' to 'collaborating with the stakeholder via personal contact during the whole project'). A scoring scheme translated these answers into six possible relationships for which scores 1-3 were classified as 'low level of collaboration', and score 4-6 as 'high level of collaboration'.

Table 2.1. Characteristics of and Developed Competencies in the Studied Regional Learning Environments

	RLE 1.	**RLE 2.**	**RLE 3.**	**RLE 4.**	**RLE 5.**
General characteristics					
Number of students (*n*)	81	15	52	64	13
Educational level	Academic	Professional Higher Education	Academic	Academic	Professional Higher Education
	Year 4 or 5	Year 3	Year 1	Year 2	Year 3
Study load	8 weeks fulltime	16 weeks 2 days/week	2 weeks fulltime	8 weeks 1 day/week	20 weeks 2 days/week
Student group size	5-7, mostly 6	6 or 9	6	5-6	3-4
Students' mean age	25	22	20	21	20
Students' gender [# (%)]	♂ 31 (38%) ♀ 50 (62%)	♂ 10 (67%) ♀ 5 (33%)	♂ 30 (58%) ♀ 22 (42%)	♂ 51 (80%) ♀ 13 (20%)	♂ 9 (69%) ♀ 4 (31%)
Classification					
Mono-/multi-disciplinary groups	Multi	Multi	Mono	Mono	Mono
Active stakeholder collaboration	Yes	Yes	Yes	No	No
Coaching intensity	High	High	Low	Low	Low
Results					
Amount and type of developed competencies as a result of paired sample *t*-tests[1]	All 9 competencies	5 out of 9 competencies Domain-specific professional expertise Deciding and initiating activities Collaborating and discussing Planning and organizing Acting customer oriented	4 out of 9 competencies Domain-specific professional expertise Creating and innovating Collaborating and discussing Investigating	3 out of 9 competencies Domain-specific professional expertise Collaborating and discussing Acting commercially	None
Effect size of competence development (in Cohen's d^2)	0.3 – 0.67 medium	0.69 – 1.29 medium to large	0.32 – 0.97 medium to large	0.39 – 0.64 medium	Not applicable

[1] $p < .05$ [2] $d < .2$ = small, $d \pm .5$ = medium, $d > .8$ = large

Classification of students on coaching intensity

Besides classifying for the above two typical learning environment characteristics, a classification for the independent variable 'coaching intensity' was added. This was done as observations of the RLEs illuminated coaching intensity as an important varying variable between the RLEs. Students in RLEs that were classified as 'low coaching intensity' only met their teacher coach once a week for a state of the art group discussion mainly focused on the product and the process towards a final result. Students in RLEs that were classified as 'high coaching intensity' followed an intensive parallel coaching trajectory in which their learning experiences with collaboration across boundaries were explicitly addressed and utilized to optimize the RLE product and process. Both in group and individual meetings with a teacher coach were organized purposely. The attribution of the classification for coaching intensity was based on the descriptions of instructional frameworks in the study manuals, and teachers' additional explanation to the researchers hereof.

Measuring competence development

To answer research question 1 and 2, a validated pre- and post-test questionnaire assessed the perceived level of domain-specific professional expertise and eight generic competencies (Table 2.2).

Table 2.2. Competencies as Assessed in Pre- and Post-Test[2]

No.	Competency
1	Domain-specific professional expertise
2	Deciding and initiating activities
3	Showing attention and understanding
4	Collaborating and discussing
5	Investigating
6	Acting commercially
7	Creating and innovating
8	Planning and organizing
9	Customer-oriented acting

This total of nine competencies was identified as relevant for working in RLEs by (1) a group of 56 academic planning students working in an RLE project that was used as a pilot project for the setup of this study (June, 2011), and (2) ten planning teachers experienced in working in RLEs including the five monitored RLEs. Their selection was based on a list of 25 generic competencies for Dutch vocational education

[2] For a description per competency, see Appendix 2.

(COLO, 2006) as developed on the basis of the SHL Universal Competency Framework (Bartram, 2011; www.cebglobal.com). Students and teachers were asked to rate each of the 25 competencies on relevance for working in the RLE on a 4-point scale (1. 'certainly not relevant' to 4. 'certainly relevant'). Nine competencies, including 'domain-specific professional expertise' were convincingly rated as 'certainly relevant' by the respondents. For this reason, these nine were selected for the purpose of this current study. The questionnaire, part of the validated competency measurement instrument COM (Khaled et al., 2014), consisted of a description of each of the nine competencies (Appendix 2) and 4-6 performance indicators per competency derived from this description. In both pre- and post-tests students awarded themselves a score for each performance indicator on a 10-point scale. A competence mean score was based on students' rating of the 4-6 performance indicators per competency. At the start of the project, directly after being informed about their project assignments, students filled out the pre-test. At the end of the project, right after the final presentation of the project result, they filled out the post-test. The scales were reliable ($\alpha > .80$). RLEs were compared on their development scores between pre- and post-test (dependent variables).

Measuring students' other learning outcomes

To answer research question 2 in terms of 'other learning outcomes', the post-test asked students the open question 'What did you learn more from your RLE project? Please write down as many of your ideas as possible regarding your learning in this project.'

Measuring teacher perceptions on student learning in the RLE

During a semi-structured workshop, teachers first individually and then in five groups of 4-6 participants wrote down experienced learning outcomes typically resulting from (1) working in multidisciplinary student groups and (2) multi-stakeholder collaboration in RLEs. Every statement was individually written on a post-it to allow coding and counting. Additionally, teachers wrote down statements regarding experienced preconditions for optimal learning in the RLE.

Analysis

Paired sample *t*-tests were used to calculate development of the students per RLE on the nine competencies (research question 1). Effect size for the paired sample *t*-tests was measured in Cohen's *d* with $d < .2$ showing a small effect, *d* around .5 showing a medium effect, and $d > .8$ showing a large effect (Cohen, 1988). Three multivariate General Linear Models (GLM) compared competence development across RLEs using mono-/multidisciplinary student groups, low/high multi-stakeholder collaboration, and

low/high coaching as independent variables (research question 2, quantitative part). Effect size for the GLMs was measured in partial Eta-Squared (partial η^2) with partial $\eta^2 \approx .01$ showing a small effect, partial $\eta^2 \approx .06$ showing a medium effect, and partial $\eta^2 \approx .14$ showing a large effect (Cohen, 1988).

The reported learning outcomes from the students (research question 2, qualitative part) were deductively coded on 'referring to working in multidisciplinary student groups', 'referring to collaborating with multiple stakeholders' or 'referring to other learning environment characteristics' (Miles et al., 2014). The inter-rater reliability (κ) of this coding step was 0.85 (two independent raters) which represents an almost perfect strength of agreement (Landis & Koch, 1977). After coding, the percentages per code were calculated for students that worked in either mono- or multidisciplinary student groups or with a low or a high level of stakeholder collaboration (i.e. the two typical boundary crossing learning environment characteristic). Finally, two illustrative examples of learning outcomes per category were chosen.

The statements resulting from the teacher workshop were first coded by the same two independent raters that coded the student learning outcomes. The raters used deductive coding (Miles et al., 2014) on learning outcomes resulting from either multidisciplinary group work or multi-stakeholder collaboration (research question 3), and open, inductive coding (Glaser & Strauss, 1967; Miles et al., 2014) on preconditions for utilizing the learning potential of RLEs (research question 4). The two raters clustered the codes into meaningful learning outcome and precondition categories, after which axial coding was used (Strauss & Corbin, 1998) with an inter-rater reliability (κ) of .88. Additionally, learning outcome statements were sub-coded (Miles et al., 2014) as representing one of the nine competencies as measured in the pre- and post-test or 'another learning outcome'. The inter-rater reliability (κ) of this coding step was .84. which also shows an almost perfect strength of agreement (Landis & Koch, 1977).

2.6 Results

In response to research question 1, results showed differences in competence development between the five RLEs. Competence development ranged from no significant development in RLE 5, significant development of three (RLE 4), four (RLE 3) and five (RLE 2) competencies, to significant development of all competencies in RLE 1 ($p < .05$, see Table 2.1 for developed competencies and effect sizes). Analyses did not show statistical differences in competence development per RLE for gender and age. Although not statistically analysed, the data in Table 2.1 suggest the absence of systematic differences in competence development for study load and educational level. In the four RLEs that showed competence development, 'domain-specific professional expertise' always developed and always developed the

most. The competency 'collaborating and discussing' also developed in all four RLEs that showed competence development.

In response to research question 2, regarding students' competence development resulting from three typical learning environment characteristics, GLM analyses showed a large (partial $\eta^2 \geq 0.14$) positive multivariate effect of the learning environment characteristics of:

1. working in multidisciplinary student groups ($F(9, 113) = 2.432, p < .05$, partial $\eta^2 = .162$). Competence development scores (post-test minus pre-test) were significantly higher for students working in multidisciplinary student groups for the two competencies 'deciding and initiating activities' and 'collaborating and discussing'. The trend showed a higher, but non-significant, development score for all competencies of students working in multidisciplinary student groups, except for 'domain-specific professional expertise';
2. a high coaching intensity ($F(9, 113) = 2.373, p < .05$, partial $\eta^2 = .159$). Development scores (post-test minus pre-test) were significantly higher for students working with a high coaching intensity for four competencies. These four competencies were 'deciding and initiating activities', 'showing attention and understanding', 'planning and organizing' and 'collaborating and discussing'. In addition, the trend showed a higher, but non-significant, development score for all competencies of students that worked with a high coaching intensity.

Multi-stakeholder collaboration showed no significant multivariate effect, but it did show a trend of higher, non-significant, competence development scores for all competencies of students working on a high level of stakeholder collaboration.

In response to research question 2 regarding students' other learning outcomes related to the typical learning environment characteristics, we found that students working in multidisciplinary student groups referred in 14% of the reported learning outcomes to learning from multidisciplinary group work. Students working in mono-disciplinary student groups did so in 7% of the reported learning outcomes. Students working on a high level of multi-stakeholder collaboration referred in 26% of the reported learning outcomes to learning from multi-stakeholder collaboration. Students working on a low level of multi-stakeholder collaboration did so in 27% of the reported other learning outcomes (see Table 2.3 for percentages and examples of reported learning outcomes).

Table 2.3. Percentages of Students' Reported 'Other Learning Outcomes' Referring to Multidisciplinary Group Work and Multi-Stakeholder Collaboration per Category of Learning Environment Characteristics (including two illustrative examples of reported learning outcomes per category)

Category	**# Students per category**	**# Excerpts per category of students**	**# (%) of Excerpts that refers to multidisciplinary group work**	**Illustrative examples**
Students working in multidisciplinary student groups	134	277	38 (14%)	I learned to collect and analyse information outside my own field of study. I learned how I am perceived by others.
Students working in mono-disciplinary student groups	87	81	6 (7%)	I learned to reformulate the unclear clients' assignment to make sure that we could work within our own professional domain. If you make plans, it is sometimes difficult to find the right necessary information in time.
TOTAL # students	221	358	-	
Category	**# Students per category**	**# Excerpts per category of students**	**# (%) of Excerpts that refers to multi-stakeholder collaboration**	**Illustrative examples**
Students working on a high level of multi-stakeholder collaboration	131	253	67 (26%)	I learned to better accept other people's view, but also to better defend my own perspective. I learned that it is necessary to attract the attention of as many as possible people in the area. Social media is of great value in this respect.
Students working on a low level of multi-stakeholder collaboration	57	99	27 (27%)	I learned how to adapt a project to changing clients' desires. I learned to ethically balance between what is good from my point of view and what the region desires.
Students working on an unknown level of multi-stakeholder collaboration	33	6	0 (0%)	-
TOTAL # students	221	358	-	

In response to research question 3 on teachers' perceived learning outcomes, we found six typical learning outcome categories resulting from working in multidisciplinary groups (Table 2.4).

Table 2.4. Learning Outcome Categories Typically Resulting from Multidisciplinary Group Work and Multi-Stakeholder Collaboration (*including one illustrative example of a teacher statement for each learning outcome category*)

Learning outcome categories typically resulting from multidisciplinary group work	
1	Developing knowledge within the own knowledge domain as a result of collaboration with students from other disciplines *Students learn to see the relevance of their own discipline*
2	Crossing the borders of your own discipline and learning from other disciplines *Students learn to speak each other's' professional languages*
3	Enriching the process by combining process approaches from diverse disciplines (including negotiation skills and assertiveness) *Learning to 'fight' for the importance of your own disciplinary knowledge*
4	Creating a better product by combining knowledge from diverse disciplines *Better solutions for a problem because the solution also has a multidisciplinary nature*
5	Increasing the performance level of collaboration and negotiation skills *Learning to record agreements*
6	Increasing insight into own abilities as a consequence of reflection with group members from other disciplines *Students get more insight in the strengths and weaknesses of all group members*
Learning outcome categories typically resulting from multi-stakeholder collaboration	
1	Realizing the importance of a clear articulation of the project assignment in consultation with all actors involved *Students learn to investigate the interest of the client*
2	Increasing sensitivity and openness to other interests and perspectives *Students learn to think from another persons' interest*
3	Finding ways to effectively deal with diverse interests and perspectives during the whole process *Students learn to think strategically, be political correct and tactful*
4	Increasing the performance level of collaboration skills *Dealing with a limited (less than expected) contribution of stakeholders*
5	Increasing the performance level of presentation skills *Presenting for a 'real' audience is more challenging than presenting at school*
6	Developing insight into the profession *Learning to know which issues are currently relevant in the professional practice*
7	Creating understanding of the applicability and value of domain-specific expertise in practice *Learning to see the societal relevance of your discipline*
8	Providing enriched motivation as a result of working on a realistic project relevant to other stakeholders *Students are motivated since this is the real world*

Eighty-five percent of the teacher statements in these categories related to one of the measured competencies. Fifty-three percent of these 85% related to 'domain-specific professional expertise', including statements like 'development of domain-specific professional expertise through explaining your own expertise knowledge to others'.

Next, we found eight typical learning outcome categories resulting from multi-stakeholder collaboration (Table 2.4). Fifty-nine percent of the teacher statements in these categories were related to the measured competencies (e.g. 'learning to acknowledge diverse, often conflicting interests' related to 'showing attention and understanding'). Other statements referred to additional learning outcomes such as 'developing insight into the profession' and 'finding ways to effectively deal with diverse interests and perspectives during the whole process'.

In response to research question 4, we deduced six categories of preconditions for using the learning potential of RLEs (Table 2.5). The largest numbers of statements were attributed to the precondition categories 'intensive process coaching' (10 out of 32) and 'real collaboration with the stakeholder' (7 out of 32).

Table 2.5. Categories of Preconditions for Optimal Learning in the RLE (*including one illustrative example of a teacher statement for each precondition category*)

	Precondition categories for optimal learning in the RLE
1	Intensive process coaching *Show students what they learn from the stakeholders*
2	Reflection to explicate the learning potential before, during and after the project *Students only learn if we organize process reflection*
3	Clarity about the project assignment for all parties involved *The assignment should be clear for the students, teachers and client otherwise students get easily demotivated*
4	Real collaboration with the stakeholders *Students should really be in contact with the stakeholders. Then they feel the relevance of solving the issue*
5	Students have basic time management and communication skills *Students should be able to well plan their work*
6	Practical preconditions such as flexible education schedules and willingness of the management to support the RLE *We need a more flexible school schedule when working in the RLE*

2.7 Discussion

Results for research question 1 show the RLE to be an effective learning environment for developing domain-specific professional expertise, as well as various generic competencies, all identified as relevant for working in RLEs by participating planning students and teachers. Four of five studied RLEs show significant competence development for three to nine competencies. Domain-specific professional expertise significantly developed and was the most developed competency in all four RLEs that showed development. This is a relevant finding with regard to concerns about students' development of professional knowledge and expertise in innovative and authentic learning environments for higher education such as competence-based education (Biemans et al., 2004) and problem-based education (Schmidt et al., 2006).
The competency 'collaborating and discussing' also developed in all four RLEs that

show development. This confirms the potential of the RLE for developing collaborative capacities of planners (Healey, 2003; Seltzer & Ozawa, 2002).

Answering the second research question, the study found that the typical RLE 'boundary crossing' learning environment characteristic of working in multidisciplinary student groups enhanced students' competence development. Working in multidisciplinary compared to mono-disciplinary student groups led to higher competence development scores, and to more student-reported learning outcomes referring to learning from working in a multidisciplinary setting. In response to research question 3, the study found that RLE teachers also identify student learning outcomes resulting from multi-disciplinary group work, in most cases related to one of the measured competencies, which underwrites the quantitative findings. This combination of quantitative and qualitative exposure of learning from working in multi-disciplinary groups supports the added value of this boundary crossing characteristic of the RLE (Akkerman & Bakker, 2011).

The second typical boundary crossing learning environment characteristic, working on a high level of multi-stakeholder collaboration, did not significantly enhance students' competence development more than a low level of collaboration. Also, the number of reported student learning outcomes referring to learning from multi-stakeholder collaboration did not differ for a high or a low level of multi-stakeholder collaboration. The lack of an enhancing effect of intensive multi-stakeholder collaboration for planning student learning is disappointing because this disputes the RLE to be an effective boundary crossing learning environment for planning education. Remarkably, the percentages of the total amount of student learning outcomes that referred to learning from multi-stakeholder collaboration (26 and 27% of the total number of excerpts) were much higher than the percentages of student learning outcomes that referred to learning from working in a multidisciplinary setting (14 and 7% of the total number of excerpts). This could be caused by the fact that students are impressed by what they learn from 'real life' external partners (in case of low intensive stakeholder collaboration from the external client), more than what they learn from their peers. This suggests a strong impact of learning from and with external stakeholders. Also, the participating teachers identified student learning outcomes resulting from multi-stakeholder collaboration. Different from multi-disciplinary group work, these learning outcomes were in only half of the cases related to one of the measured competencies. Teachers perceived students to learn a lot from multi-stakeholder collaboration. However the COM, as used in this study may not have measured these aspects quantitatively. Probably, students learned other things than, or next to, those measured in the COM. A second reason for the lack of a significant quantitative effect of intensive collaboration with multiple stakeholders could be that the learning potential of stakeholder collaboration was not explicated as a

specific learning objective in the studied RLEs, and discussed with the students. This idea was supported by the fact that the students who participated in the selection of competencies being relevant for working in the RLE before the start of this study (see Section 2.5 and Table 2.2), did not select the competency 'building relationships and networking' as being relevant for working in the RLE. Apparently, they seemed to not be aware, at least at the start of their project, of the relevance of this competence for working in the RLE. A third reason for the lack of effect could be that stakeholder collaboration was not explicitly addressed or object of coaching during the RLE process. Not explicitly aiming for and coaching multi-stakeholder collaboration in the studied RLEs contrasts with the results from research question 4 where participating teachers identified collaboration with stakeholders to be an important precondition for optimal learning in the RLE. Overlooking these considerations, and regarding the many promising reported student learning outcomes on learning with and from multiple stakeholders, we argue that the RLE contains an unused learning potential of multi-stakeholder collaboration caused by the lack of explicating learning with and from the stakeholders in the RLE.

Results for the added independent variable coaching intensity showed that working in RLEs with a high coaching intensity compared to a low coaching intensity led to higher competence development scores. This result adds significance to the statements of teachers, as a result of research question 4, that process coaching and reflection are important preconditions for using the learning potential of RLEs (Table 2.5*)*.

Looking to how the majority of the students per RLE was classified (see Table 2.1), might partly explain the differences in competence development per RLE. The two RLEs that showed most development (RLE 1 and RLE 2) both included all three typical characteristics. The three RLEs that showed the least development did not include the typical characteristics, except for stakeholder collaboration in RLE 3. This observed relation supports our statistical findings for the enhancing effect of two of the three typical characteristics, our identified unused learning potential of intensive stakeholder collaboration, and may explain differences in competence development between the studied RLEs.

Two limitations of the study may have influenced the results. First, competence development in this study was only measured by students' own perception thereof. This was a consequence of differences in assessment strategies per RLE, and as such the non-availability of comparable assessment data. It is disputed whether self-reports provide less reliable results than third party data do (Braun et al., 2012; Chan, 2009). However to be cautious, we decided to combine the quantitative measurements with qualitative student data on learning outcomes of the RLE, and with teacher data on student learning outcomes and preconditions for learning in the RLE. Next, to collect as objective as possible data, all measurements took place before the students were

graded on their RLE work, and both oral and written instructions stressed that the results of the measurements did not influence students' RLE grading. Second limitation of the study relates to the fact that the RLEs differed in more than the studied variables. For this reason it is not inconclusive to state that the results can completely be attributed to the three typical design characteristics.

However, the study obtained evidence for student learning in a quasi-experimental design, and as such meets the need for studies in planning education that go beyond the description of an educational innovation (Wu & Brooks, 2011). Implications of the results for planning education and future research will be discussed in the next concluding section.

2.8 Conclusions and implications

This study confirms the effectiveness of the new, authentic multi-stakeholder Regional Learning Environment (RLE) for planning students' learning. The study specifically shows the added value of the learning environment characteristic of 'working in multi-disciplinary student groups' and identifies the learning potential of 'intensive collaboration between students and multiple stakeholders'. These learning environment characteristics prompt boundary crossing, inherent to current planning practice. Additionally, this study found the learning environment characteristic of a high coaching intensity to be a precondition for boundary crossing learning in the RLE, and to enhance students' competence development in the RLE.

Having identified similarities between RLEs, planning studios and service learning, this study adds to the scientific debate and its practical implications on the optimization of studio and service learning pedagogy in planning education (Angotti et al., 2011; Long, 2012a, 2012b). First, the confirmation that working in multidisciplinary instead of mono-disciplinary student groups more strongly stimulates various competencies regarded as important for professional planners, gives an argument for more explicitly facilitating multidisciplinary group work in planning studio courses (Long, 2012b) and in service learning (Harris, 2004; Sletto, 2010). Secondly, the revealed importance of intensive process coaching and reflection to facilitate and explicate learning experiences in the RLE evidentially supports the important role that reflection has been given in service learning (Roakes & Norris-Tirrell, 2000; Sletto, 2010). For the future improvement of coaching and reflection in the RLE, especially with regard to students' collaboration with stakeholders, we suggest RLE teachers to make use of insights in systematic reflection strategies as extensively utilized in service learning environments. Thirdly and finally, although this study showed insignificant effects of multi-stakeholder learning for students' competence development, teachers supported the hypothesized learning potential of intensive collaboration with multiple stakeholders. Planning studios and service

learning are recommended, just like RLEs, to further experiment with using real world, demand-driven, transdisciplinary assignments, and collaborative knowledge construction between students, teachers and multiple stakeholders. This is meant to examine when and how multi-stakeholder collaboration fosters student learning. Our study suggests that the used competency measures may not have properly included indicators for students' learning from the collaboration with multiple stakeholders. Next, part of the learning outcomes of multi-stakeholder processes cannot be predicted beforehand due to unexpected learning opportunities during authentic collaborative trajectories. We suggest authentic learning environments in planning education to experiment with the acknowledgement of emerging learning surprises (Scardamalia et al., 2012) to gain insight into what students really learn from working and learning with other stakeholders. Allowing for such surprises, and trying to address these in learning objectives and assessment strategies could support students in their learning to plan for the 'undefined becoming' (Boelens & De Roo, 2014).

Looking ahead to future research and reviewing some limitations of this study, we suggest to carry out follow up studies to strengthen the effects of this study, and deepen understanding of the RLEs' learning potential, especially of its boundary crossing characteristics. These studies are specifically required for further investigation of the unexpected, insignificant findings of 'intensive collaboration between students and multiple stakeholders'. Adding the competency 'building relationships and networking' to the competence test would be interesting since this competency is likely to be directly influenced by working in the multi-stakeholder RLE. In addition, adding teacher ratings to the student reported competence levels could increase the reliability of the quantitative data. Next to the more large scale and quasi-experimental studies as described in this paper, more qualitative, in-depth studies could also shed interesting lights on actual learning processes taking place, enhancing or hampering learning in the RLE. Next, intervention studies, both quantitative and qualitative, could investigate whether active support of stakeholder collaboration effects student learning in the RLE. Both follow up studies and intervention studies can reveal our identified 'hidden' learning potential of stakeholder collaboration.

Beyond an effective innovation in planning education, the RLE can be positioned as a new model of knowledge production in planning practice (Foorthuis, et al., 2012). This supports the idea of different planning scholars to expand the boundaries of authentic learning environments in planning education outside the educational context (Angotti et al., 2011; Balassiano & West, 2012; Long, 2012b; Sletto, 2010; Winkler, 2013). The potential of this idea could be investigated by broadening the scope of effectivity studies from student learning outcomes to learning outcomes for all parties involved, and to results for spatial development.

In conclusion, RLE insights and experiences provide a range of opportunities for the future development of planning education on our way to educate collaborative, 'boundary crossing' planners.

Chapter 3.

Educating Collaborative Planners: Strengthening Evidence for the Learning Potential of Multi-Stakeholder Regional Learning Environments[3]

Abstract

Planning education needs effective learning environments that support students' 'boundary crossing' competence development. The multi-stakeholder Regional Learning Environment (RLE) is, by its typical design, hypothesized to foster boundary crossing. This quasi-experimental mixed method pre- and post-test study affirms the effectiveness of the RLE for stimulating competence development, and specifically shows the added value of three typical 'boundary crossing' RLE design characteristics i.e. 'working in multidisciplinary student groups', 'working intensively with multiple stakeholders', and 'a high coaching intensity'. Results strengthen previous findings, and contribute to the debate in planning education on an evidence-based pedagogical fundament for commonly used authentic learning environments.

Keywords: planning education; student learning; authentic learning environment; multi-stakeholder; boundary crossing

[3] This chapter is based on Oonk, C., Gulikers, J., & Mulder, M. (2016). Educating collaborative planners: Strengthening evidence for the learning potential of multi-stakeholder regional learning environments. *Planning Practice and Research*.

3.1 Introduction

Planning education needs effective learning environments that encourage students to cross the boundaries of disciplines and practices in preparation for a collaborative, 'boundary crossing' planning profession. The 'Regional Learning Environment' (RLE) has recently been established in various Dutch regions by multiple planning actors, including education and research, to work on sustainable regional development. The RLE is expected to stimulate boundary crossing learning. In the RLE, students work in groups on transdisciplinary (Scholz & Steiner, 2015b), regional planning problems identified by, and to be solved with actors in the field. Solving the transdisciplinary problems requires the co-creation of new knowledge between students on the one hand, and researchers, policy makers, members of NGOs, entrepreneurs and/or citizens on the other hand. The end result is meant to be of value for the external problem holder and to contribute to regional development. The RLE provides students with the opportunity to 'cross boundaries' between multiple disciplines and perspectives and learn from that (Akkerman & Bakker, 2011). As such, the RLE allows students to develop their abilities for working across boundaries (Walker & Nocon, 2007).

Evidence for the effectiveness of this new learning environment for student learning is needed to fund its reason for existence and strengthen its further development (Slavin, 2008). Confirming the effectiveness aligns with current debates in planning education that stress the importance of more in-depth pedagogical understanding of what works in learning environments as part of planning curricula (Angotti et al., 2011; Frank et al., 2014; Long, 2012a, 2012b). A previous study (Chapter 2) examined the effectiveness of the RLE for planning students' learning, and the added value of working in multidisciplinary student groups, with multiple stakeholders and with a high coaching intensity. These three learning environment characteristics were expected to stimulate learning across boundaries, and as such foster students' boundary crossing competence development. Overall, the five studied RLEs, in which a total of 225 students participated, resulted in significant learning gains for students. This previous study also showed that both working in multi- versus monodisciplinary student groups, and with a high versus a low level of coaching intensity, fostered learning. However, the expected positive learning effects of working intensively with multiple stakeholders were not found.

This previous result triggered further investigation since both planning theory and practice stress the undeniable importance of multi-stakeholder collaboration for the planning profession (e.g. Dalton, 2007; Edwards & Bates, 2011; Sletto, 2010). Encouraging students to work in close collaboration with multiple stakeholders is expected to stimulate their development of boundary crossing competence (Walker & Nocon, 2007; Wenger, 2000; see also Chapter 2). To strengthen evidence for the RLEs' effectiveness and further explore the partly surprising results of the previous

study with respect to learning with and from multiple stakeholders, this follow-up study examined student learning in seven other RLEs in which a total of 143 students participated.

On the basis of the combined results of the current study and the previous study, we discuss the effectiveness of the RLE for planning students' learning in relation to its three boundary crossing design characteristics. With regard to identified similarities between the RLE and other authentic learning environments as used in planning education, e.g. the planning studio and service learning environments (Section 2.3), results of the two studies contribute to the call for evidence-based pedagogical and didactical improvement of authentic learning environments as used in planning education worldwide (Angotti et al.,2011; Long, 2012a, 2012b).

This paper starts with positioning the planning profession in a boundary crossing perspective. Secondly, the educational design of the RLE will be explained, including its typical 'boundary crossing' learning environment characteristics (Akkerman & Bakker, 2011) that are supposed to stimulate nowadays planning competencies. These two descriptive sections introduce the accounts for the research questions and design of this follow-up study.

3.2 Theoretical framework

Boundary crossing as a key capability of current planners

The current planning profession requires professional planners to set up, facilitate and/or act in complex collaborative planning processes in which they collaborate with multiple stakeholders from diverse disciplinary backgrounds representing a diversity of interests (Allmendinger, 2009; Forester, 1999; Healey,1997; 2003; Innes & Booher, 1999; 2004). As such, planning professionals 'cross boundaries' (Akkerman & Bakker, 2011, p. 133). Boundary crossing at this place is a key concept for describing the 'efforts by individuals or groups at boundaries to establish or restore continuity in action or interaction across practices' (Bakker & Akkerman, 2013, p. 225). In a boundary crossing process we acknowledge that one person cannot be an expert in all sites, and that solving complex problems requires the collaborative creation of new knowledge across sites around the boundary, explicitly addressing differences between sites (Akkerman & Bakker, 2011). Boundary crossing competence is than described as 'the ability to function competently in multiple contexts' (Walker & Nocon, 2007, p. 178), and manage, switch between, and integrate multiple discourses and practices across social boundaries (Lansu et al., 2013).

Many scholars from the fields of planning, transdisciplinary sustainability research, communication and education have investigated professional tasks and competencies required for current professional planners, both from a theoretical and/or a practical perspective (e.g. Alexander, 2001; Dalton, 2007; Guzzetta & Bollens, 2003). Two key

professional tasks and required competencies to perform these tasks (Mulder & Winterton, 2017) can be extracted from relevant scholarly resources on this topic. Both tasks and related competencies carry elements of boundary crossing and boundary crossing competence, acknowledging that multi-stakeholder processes in today's planning aim at co-creating new knowledge across disciplinary professional boundaries.

The first key-task is to set up multi-stakeholder processes. To carry out this task, planners should be able to understand the field of actors and their interests (Healey, 1998, 2003; Schön, 1983), and the planning process in which these multiple actors are involved (Healey, 1998, 2003; Seltzer & Ozawa, 2002). Next, planners should be able to cultivate community networks (Forester, 1989; Greenlee et al., 2015) and organize effective organizational structures that promote collaboration (Alexander, 2009; Balassiano, 2011).

The second key-task is to act in and to facilitate multi-stakeholder processes. Competencies required to carry out this task mainly address communicative capabilities to be able to facilitate respectful and effective discussions within and between communities. Discussions in these processes are characterized by differing, sometimes competing and in time varying needs, intentions, values, norms and beliefs, and inequities in power (Healey, 1993). Facilitating planners should strategically approach the 'governance of place' (Healey 2003, p. 116), paying attention to both the qualities of place and process, embrace what is new and experimental, and anticipate political and economic pressure (Booher & Innes, 2002; Forester, 1989; Healey, 2003; Higgins et al., 2009). Participating in and/or facilitating these discussions require the competencies to understand and interweave knowledge of different disciplines (Akkerman & Bakker, 2011; Opdam et al., 2015; Seltzer & Ozawa, 2002; Umemoto, 2001); to listen carefully (Forester, 1989, 1999), to exchange values and beliefs, and use criteria for ideal speech (e.g. Habermas, 1984). While discussing, planners should be able to see multiple perspectives, to admit to differences, to enable others to communicate authentically, and to acknowledge different arguments in a plan (Booher & Innes, 2002; Healey, 1993; Higgins et al., 2009; Seltzer & Ozawa, 2002). Wiek et al. (2011a) add at this place the ability to help others switching quickly between scale levels in space and time. Talking about the decision-making phase in complex multi-actor processes, Balassiano (2011) mentions the ability to facilitate reflection that encourages regular and systematic evaluations of efforts and mutual learning. This would enable to make legitimate decisions that reflect a comprehensive understanding of values and issues and improve equity. To stimulate clarity and openness of planning processes, planners should also be able to write informative, engaging short pieces for the general public (Seltzer & Ozawa, 2002; Greenlee et al., 2015).

Boundary crossing in planning education

To prepare planning students to work in a collaborative boundary crossing context, planning education needs learning environments that support students to develop their boundary crossing competence (Booher & Innes, 2002; Bourner, 2010; Edwards & Bates, 2011). These learning environments should include learning elements that challenge students to adopt the above described tasks and competencies. That is, the learning environments should provide students optimal opportunities for learning 'at the boundary' (Akkerman, 2011; Angotti et al., 2011; Balassiano, 2011). In planning education, different authentic learning environments have been designed to stimulate planning students' boundary crossing tasks and competencies, such as the planning studio (Balassiano & West, 2012; Higgins et al., 2009; Long, 2012b) and service learning (Angotti et al., 2011; Roakes & Norris-Tirrell, 2000; Sletto, 2010). These learning environments comprise, to differing degrees but not always, real world planning problems, multi-disciplinary group work, involvement of external stakeholders and critical reflection on the learning experiences (see also Section 2.3).

Experiences of students and educators working in these authentic learning environments as used in planning education have broadly been described by scholars over the world, addressing a broad variety of design characteristics of these learning environments (Giles et al., 2001; Long, 2012b; Sletto, 2010; Ward, 1999). However, research on innovations in the design of these learning environments, e.g. on the impact of student-stakeholder collaboration, rarely articulates the educational theory that informs their design (Angotti et al.,2011; Billig & Eyler, 2003; Long, 2012a; Németh & Long, 2012). Consequently, the educational effectiveness of design innovations in terms of student learning outcomes has hardly been assessed, certainly not in terms of boundary crossing competence. This study, in combination with its predecessor as described in chapter 2, aims at more systematically confirming evidence for the effectiveness of an exemplary multi-stakeholder learning environment, i.e. the RLE, with its typical boundary crossing design characteristics, for planning students' learning. As such, this study starts to fill the evidence-based gap in contemporary planning education, and advocates the importance of explicitly including boundary crossing elements in authentic learning environments.

The Regional Learning Environment and its boundary crossing learning potential

Since 2005 various Dutch academic and vocational institutes for life science education participate in the multi-stakeholder Regional Learning Environment (RLE). The ultimate aim of the RLE is to collaboratively create new knowledge and expertise amongst participants from society and educational institutions that supports sustainable regional development and/or transition. From an educational perspective, the RLE is an authentic (compare e.g. De Kock et al., 2004; Herrington & Oliver, 2000;

Newmann & Wehlage, 1993), demand driven, collaborative learning environment providing rich opportunities for students from different study programmes, including planning students, to work in a boundary crossing context by explicitly addressing various disciplines and multi-stakeholder collaboration (Foorthuis et al., 2012; Meijles & Van Hoven, 2010). The project assignments in most cases originate from a long term regional knowledge agenda set for the regional development process. These agendas are the result of a continuing collaborative effort of multiple stakeholders all having an interest in the future development of a particular region. Box 3.1 illustratively describes working processes, examples of executed projects, and project deliverables in the RLE Salland, being representative for the RLEs included in this study. The next paragraph explicates the educational design characteristics of the RLE.

The authentic RLE is always characterized by the following learning environment characteristics. Students are exposed to a professional experience by introducing them to real-world problems in a real-world situation. They work on a transdisciplinary assignment from a real external problem holder (Scholz & Steiner, 2015b). The assignments concern regional planning problems identified by actors (persons or organizations) in the field. Working on the assignments always engages students in authentic, wicked tasks and activities.

Students work in groups as solving a transdisciplinary, complex problem with various possible solutions requires collaborative knowledge construction. Collaborative knowledge construction should involve the integration and co-creation of knowledge or, in Watsons' social constructivist words, the sharing or building of meaning via reflection on and articulation of different ideas and perspectives (Watson, 2001).

Working in the RLE results in a realistic authentic product that potentially has value for the external problem holder(s) and contributes to regional development and/or transition. This product is mostly presented to the external problem holder(s) in a final presentation. In practice, deliverables vary as a result of agreements between the students, their teachers and the external problem holder(s) (see Box 3.1 for examples of products). Next to the product for the external problem holder(s), process reflection reports, either on an individual or group level, are often required as a deliverable. Product and process deliverables are both part of the assessment, but assessment criteria and procedures vary between RLEs.

Box 3.1. Illustration of the State of Affairs in the RLE Salland

The RLE Salland

The region Salland located in the eastern part of the Netherlands copes with complex issues like economic and demographical decline, marginalization of agriculture, climate change and water management, loss of historic landscapes and biodiversity and recreational pressure. Acknowledging the need for a more bottom up and development-oriented spatial planning (Janssen-Jansen & Woltjer, 2010), the Regional Learning Environment Salland was established in 2007 by (semi)governmental, entrepreneurial, NGO and educational partners. The RLE as a learning community aims at the co-creation of new knowledge, methods and practical experience to support the future sustainable development of Salland by informing policy and legislation making. From the beginning, educational institutes, i.e. students and their teachers, participated in the co-creation of knowledge by carrying out diverse projects as part of a collaboratively set long-term regional knowledge agenda. Examples of projects (respective regional clients between brackets) carried out by students included in this study are a demographic scan of a small village (local municipality), advise on multifunctional use of former farms (a farmer and a regional farmers association), methods for anticipating local services decline (provincial government), and identification of locations for vital recreational and sports grounds respecting landscape and biodiversity values (local municipality and regional recreational board).

In solving the regional problems, students work in groups, often multidisciplinary groups. They actively use information from the region and collaborate with relevant stakeholders in the region. Teachers are, instead of knowledge experts, coaches for students' projects including students' working with external parties, and ideally also facilitators of learning processes amongst external parties.

During the year 2013/2014 several student groups worked on various projects in the RLE Salland. At the end of this year, students organized a regional conference to present their project results. All external stakeholders were invited. The programme included a key note of an external planning consultant on 'networking as essential capability in the RLE', followed by student led workshops in which they shared their results and invited the stakeholders to interactively deepen these results, discuss possibilities for the actual and sustainable uptake by the regional partners, and think about ideas for future collaborative knowledge creation. Results from the conference were translated in an updated version of the regional knowledge agenda and ideas for following student projects. Clients were offered products like consultancy reports, policy analyses and advise, budget calculations and/or landscape designs, often delivered in coherent combinations. To create new knowledge on a higher, cross-project level, a teacher in collaboration with thesis students combined experiences from several projects over years to write a practical manual for dealing with strict regulations for the re-use of former farm buildings in the Salland region (Lier, 2013).

Figure 3.1. Typical Salland Landscape

Figure 3.2. Typical Salland Farm

Figure 3.3. Typical Salland Village

The teacher's role is to facilitate and/or coach the learning process instead of transferring knowledge as an expert. Additionally, the teacher is also a learner, working in an almost equal relationship with the students to collaboratively tackle complex regional problems. In some cases the teacher is responsible for the quality assurance of the final product towards the external problem holder(s).

From a boundary crossing perspective, the RLE preferably has three additional design characteristics (Foorthuis et al., 2012; Sletto, 2010; Wesselink et al., 2011):

1. students work in multidisciplinary student groups, which means that the groups consist of students from different study programmes i.e. disciplines;
2. students intensively collaborate with multiple stakeholders like researchers, policy makers, members of NGO's, entrepreneurs and/or citizens. Multi-stakeholder collaboration is needed to solve a transdisciplinary, regional problem with an unknown answer. All parties involved have different stakes in, and perspectives on the issue at hand;
3. students are intensively coached on explicating learning across boundaries. Teachers structurally stimulate and support students to jointly reflect on working across the boundaries of disciplines and perspectives, and explicate learning thereof.

Finding evidence for planning students' learning in the RLE

Dutch planning schools practice the RLE since 2005. From the beginning, RLEs delivered useful products, and students, teachers and multiple stakeholders reported valuable learning results from working in the RLE. However, a systematic investigation of the effectiveness of the RLE for planning students' learning is lacking hitherto. In search for more evidence-based educational practices, empirical evidence for the RLEs' effectiveness is essential (Slavin, 2008). To build evidence for student learning in the RLE related to its learning environment characteristics, and more specifically for the effect of the typical boundary crossing learning environment characteristics, a previous quasi-experimental mixed method study has been carried out (Chapter 2). This previous study examined 225 students (N = 225) participating in five RLEs, and either working in mono- or multidisciplinary student groups, with a low or a high stakeholder collaborative intensity, and with a low or a high coaching intensity. The previous study than compared planning students' learning in terms of competence development (quantitative part) and reported other learning outcomes (qualitative part) in five RLEs in which the students differed in the extent to which they worked with these three typical boundary crossing learning environment characteristics. Results showed significant growth of professional expertise and several generic competencies in four out of the five studied RLEs (see Table 2.1). Next, the expected effects of working in multidisciplinary groups and with a high coaching level

were found, while effects of intensive multi-stakeholder collaboration were not revealed, neither in quantitative nor in qualitative data. Contemplating this unexpected result in the light of the crucial importance of multi-stakeholder collaboration for planning, and the expectation that this collaboration could optimally be trained in a real-life multi-stakeholder learning environment, triggered a further examination of student learning in the RLE. We decided to carry out a follow-up study to further explore and strengthen evidence for students' learning in the RLE, and for the added value of typical boundary crossing characteristics.

This follow-up study examines seven other RLEs. The study firstly re-investigates if working in an RLE stimulates the development of planning students' professional expertise and generic competence (hypothesis 1). Next, it assumes that planning students' competence development in the RLE is strengthened by the learning environment characteristic of 'working in multi-disciplinary student groups' (hypothesis 2), 'a high level of multi-stakeholder collaboration' (hypothesis 3) and 'a high coaching intensity' (hypothesis 4). The research questions for this follow-up study are to what extent these hypotheses can be supported, and to what extent the findings differ from the findings of the previous study. In other words, do we reaffirm competence development across RLEs? And next, do we now find a differential effect of all three typical 'boundary crossing' learning environment characteristics on student learning? Results of the study will show further evidence for the added value of the RLE and its typical learning environment characteristics.

3.3 Methodology

This study was designed, similar to its predecessor (Chapter 2), in a quasi-experimental mixed-method pre- and post-test design investigating student learning in a sample of seven RLEs. The method section consecutively describes the RLEs and its participants, the data sources, and the way in which the data have been analysed.

The RLE and its participants

Seven RLEs, as implemented in different planning education programmes, were monitored: two in academic study programmes (n = 23; 13) and five in professional higher education programmes (n = 33; 25; 22; 14; 13). To make this selection, teachers from eight different planning programmes who actively participate in RLEs were contacted at the start of the study (Summer, 2012). Seven out of eight contacted teachers agreed to participate in the study with a specific RLE project. The selection finally included five RLEs running in Dutch planning schools during the academic year 2012-2013 (see Table 3.1; RLE 1-5) and two during the first semester of the academic year 2013-2014 (see Table 3.1; RLE 6 and 7). To guarantee anonymity, the

RLEs are identified by number. Table 3.1 shows the characteristics of the participating students (N = 143) in the seven monitored RLEs.

Table 3.1. General Characteristics and Classification of the Studied RLEs

	RLE 1.	RLE 2.	RLE 3.	RLE 4.	RLE 5.	RLE 6.	RLE 7.
General characteristics							
Number of students (*n*)	23	22	13	33	13	25	14
Educational level	Academic Year 4 or 5	Professional Higher Education Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3	Academic Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3
Study load	8 weeks fulltime	20 weeks half-time	20 weeks half-time	2 weeks fulltime	5 weeks fulltime	20 weeks half-time	20 weeks half-time
Student group size	5-7, mostly 6	4-5	4-5	6	7	3-5	3-4
Students' mean age	24	22	23	23	20	21	22
Students' gender [# (%)]	♂ 8 (35%) ♀ 15 65%)	♂ 20 (91%) ♀ 2 (9%)	♂ 11(85%) ♀ 2 (15%)	♂ 18 (55%) ♀ 15 (45%)	♂ 8 (62%) ♀ 5 (38%)	♂ 18 (72%) ♀ 7 (28%)	♂ 4 (29%) ♀ 10 (71%)
Classification							
Mono-/multi-disciplinary student groups	Multi	Multi	Multi	Multi	Mono	Multi	Mono
Active stakeholder collaboration	Yes	Yes	Yes	No	No	Yes	Yes
Coaching intensity	High	Low	High	Low	Low	Low	Low

To check if the studied RLEs met the general RLE learning environment characteristics (see Section 3.2) various data sources were triangulated. Observations, interviews with teachers, document analyses and students' post-test scores (as described below) on propositions regarding the learning environment characteristics of the RLE, confirmed that all studied RLEs met these RLE design characteristics. The RLEs differed regarding educational level, study load, size of the student groups and total number of students involved (Table 3.1).

RLEs also differed in the extent to which they fulfilled the boundary crossing learning environment characteristics. Students in every RLE were classified as working (1) in a mono- or multidisciplinary student group, (2) at a low or a high level of multi-stakeholder collaboration and (3) with a low or a high degree of coaching. In mono-disciplinary student groups only planning students participated. In multidisciplinary student groups planning students collaborated with students from other study programmes (e.g. Landscape Architecture, Environmental Sciences, Forestry and Nature Conservation, Management Studies). For the purpose of

classifying students as having worked at a low or a high level of stakeholder collaboration, students were asked several questions in a post-test questionnaire regarding their collaboration with various external stakeholders. A student was classified as working at a low level of multi-stakeholder collaboration if the student only read information about the stakeholders and their opinions without contacting them personally, or asked the stakeholders informative questions that were answered without any discussion. A student was classified as working at a high level of multi-stakeholder collaboration if the student discussed project related issues with multiple stakeholders or really worked together in collaborative working sessions with multiple stakeholders during the project. Students were classified as working with a low degree of coaching when they only met their teacher/coach once or twice a week for a group discussion mainly focused on the progress towards a final result. Students in RLEs with a high degree of coaching followed an intensive parallel coaching trajectory in which learning experiences across the boundary were explicitly addressed and utilized to optimize the RLE product and process. Based on the majority of individual student classifications for a boundary crossing learning environment characteristic in an RLE, every RLE was generally classified for all three boundary crossing characteristics (Table 3.1).

Data sources

A validated pre- and post-test questionnaire (Khaled et al., 2014) assessed students' perceived level of domain-specific professional expertise and nine generic competencies (Table 3.2; Appendix 2). Nine of this total of ten competencies were identified by 56 planning students and ten RLE teachers as crucial and typical in the context of RLEs and used in a pre- and post-test questionnaire in the previous study (Chapter 2). Remarkably, this selection did not include the competency 'Building relationships and networking', although we regard this competency as to be crucial in stakeholder collaborative projects. To make sure that we collected as many as possible indicators for the effect of multi-stakeholder collaboration on student learning, after the unexpected absence of it in the first study, we decided to add the competency 'Building relationships and networking' to the questionnaire used in this follow-up study.

Table 3.2. Competencies as Assessed in Pre- and Post-Test[4]

No.	Competency
1	Domain-specific professional expertise
2	Deciding and initiating activities
3	Showing attention and understanding
4	Collaborating and discussing
5	Investigating
6	Acting commercially
7	Creating and innovating
8	Planning and organizing
9	Customer-oriented acting
10	Building relationships and networking

The questionnaire consisted of a description of each of the 10 competencies (see Appendix 2) and 4-6 performance indicators per competency (e.g. 'When working with others, I actively contribute to our meeting' (for 'Collaborating and discussing') or 'I show understanding for other peoples' views' (for 'Showing attention and understanding'). In both pre- and post-tests students awarded themselves a score for each performance indicator on a 10-point scale. A competence mean score was based on students' rating of the 4-6 performance indicators per competency. At the start of the project, directly after being informed about their project assignments, students filled out the pre-test. At the end of the project, right after the final presentation of the project result, they filled out the post-test. The scales were reliable ($\propto > .80$), except for one scale. The non-reliable scale became reliable ($\propto > .80$) after the deletion of one item. RLEs were compared on their development scores between pre- and post-test (dependent variables).

To enrich the quantitative data on student learning with qualitative data, the post-test asked students to answer the open question 'What did you learn more from your RLE project? Please write down as many of your ideas as possible regarding learning in this project.' The answers provided additional insights into students' 'other learning outcomes'.

Analysis

Paired sample *t*-tests were used to calculate development of the students per RLE on the ten competencies, comparing pre- and post–test scores on the competency scales. Effect size for the paired sample *t*-tests was measured in Cohen's *d* with $d < .2$ showing a small effect, *d* around .5 showing a medium effect and $d > .8$ showing a large effect (Cohen, 1988).

[4] For a description per competency, see Appendix 2

Three multivariate General Linear Models (GLMs) compared competence development as a function of the three boundary crossing learning environment characteristics using mono-/ multidisciplinary groups, low/high multi-stakeholder collaboration, and low/high coaching intensity as independent variables. Effect size for the GLMs was measured in partial Eta-Squared (partial η^2) with partial $\eta^2 \approx .01$ showing a small effect, partial $\eta^2 \approx .06$ showing a medium effect and partial $\eta^2 \approx .14$ showing a large effect (Cohen, 1988).

The reported learning outcomes from the students were coded using deductive coding (Miles et al., 2014) on 'referring to working in multidisciplinary student groups', 'referring to collaborating with multiple stakeholders' or 'referring to other learning environment characteristics'. We did not analyse the students' reported learning outcomes on the third independent variable 'coaching intensity', since teacher coaching was not expected to be explicitly reflected in the student reported learning outcomes. The coding work was partly carried out by the first two authors independently in order to determine an interrater reliability score (Cohen's Kappa (κ)). This score (κ) was 0.90 which represents an almost perfect strength of agreement (Landis & Koch, 1977). Coding differences between the two raters were discussed until agreement, after which the first author accomplished the remaining coding work. After coding, the percentages per code were calculated for students who worked in either mono- or multidisciplinary student groups or with a low or a high level of stakeholder collaboration . This was done to examine if these different groups reported different learning outcomes in relation to these boundary crossing learning environment characteristics. To illustrate students' reports, two representative examples of learning outcomes per category were chosen. Finally, the findings of these analyses were compared to those of the previous study.

3.4 Results

Results of this follow-up study

Results confirmed hypothesis 1 by showing significant competence development in six out of the seven RLEs (see Table 3.3).

Competence development ranged from no significant development (RLE 7), via few developed competencies (# = 3 in RLE 4 and 6), to significant development of (almost) all competencies (RLE 2 (# = 8), RLE 5 (# = 8), RLE 1 (# = 9) and RLE 3 (# = 10)). Effect size of the competence development ranged from medium to large.

Table 3.3. Characteristics of and Developed Competencies Including Effect Size in the Studied RLEs

	RLE 1.	RLE 2.	RLE 3.	RLE 4.	RLE 5.	RLE 6.	RLE 7.
General characteristics							
Number of students (*n*)	23	22	13	33	13	25	14
Educational level	Academic Year 4 or 5	Professional Higher Education Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3	Academic Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3
Study load	8 weeks fulltime	20 weeks half-time	20 weeks half-time	2 weeks fulltime	5 weeks fulltime	20 weeks half-time	20 weeks half-time
Student group size	5-7, mostly 6	4-5	4-5	6	7	3-5	3-4
Students' mean age	24	22	23	23	20	21	22
Students' gender [# (%)]	♂ 8 (35%) ♀ 15 (65%)	♂ 20 (91%) ♀ 2 (9%)	♂ 11(85%) ♀ 2 (15%)	♂ 18 (55%) ♀ 15 (45%)	♂ 8 (62%) ♀ 5 (38%)	♂ 18 (72%) ♀ 7 (28%)	♂ 4 (29%) ♀ 10 (71%)
Classification							
Mono-/ multi-disciplinary groups	Multi	Multi	Multi	Multi	Mono	Multi	Mono
Active stakeholder collaboration	Yes	Yes	Yes	No	No	Yes	Yes
Coaching intensity	High	Low	High	Low	Low	Low	Low
Results							
Developed competencies as a result of paired sample *t*-tests[1]	All competencies except for Acting customer oriented	All competencies except for Planning and organizing and Building relation-ships and networking	All competencies	3 out of 10 competencies Domain-specific professional expertise Deciding and initiating activities Planning and organizing	All competencies except for Collaborating and discussing and Acting customer oriented	2 out of 10 competencies Collaborating and discussing Investigating Acting commercially	None
Effect size of competence development (in Cohen's d^2)	05 – 1.2 medium to large	0.62 – 1.21 medium to large	0.8 – 1.79 large except for 1x $d = 0.65$	0.39 – 0.48 medium	0.61 – 1.24 medium to large	0.47 – 0.57 medium	Not applicable

[1] $p < .05$ [2] $d < .2$ = small, $d \pm .5$ = medium, $d > .8$ = large

The RLEs showed differences with respect to which competencies they stimulated. 'Domain-specific professional expertise' and the generic competencies 'Deciding and initiating activities', 'Investigating' and 'Acting commercially' developed in almost all RLEs. The competency 'Building relationships and networking', added to the test of the previous first study, developed in three RLEs. Results did not show differences in competence development per RLE for gender and age.

Hypotheses 2, 3 and 4 were all confirmed by GLM analyses showing a large (partial $\eta^2 \geq 0.14$) positive multivariate effect of all three independent boundary crossing learning environment characteristics on competence development, that is of:

1. multidisciplinary student groups ($F(10, 111) = 2.736$, $p < .05$, partial $\eta^2 = .198$);
2. a high level of multi-stakeholder collaboration $F(10, 111) = 1.975$, $p < .05$, partial $\eta^2 = .151$); and
3. a high coaching intensity ($F(10, 111) = 2.339$, $p < .05$, partial $\eta^2 = .174$).

This means that, measured across the seven RLEs, all three boundary crossing learning environment characteristics more strongly stimulate students' competence development than their antagonists. These findings were strengthened by the results of the qualitative analysis of students' reported learning outcomes related to the boundary crossing learning environment characteristics. Students working in multidisciplinary student groups referred in 18% of the reported learning outcomes to learning from multidisciplinary group work. Students working in mono-disciplinary student groups did so in 5% of the reported learning outcomes. Students working at a high level of multi-stakeholder collaboration referred in 38% of the reported learning outcomes to learning from multi-stakeholder collaboration. Students working at a low level of multi-stakeholder collaboration did so in 10% of the reported other learning outcomes (see Table 3.4 for percentages and illustrative examples of reported learning outcomes).

Comparing the results of the two successive studies

A comparison between the results of the previous study 1 (Table 2.1; see also Chapter 2) and this follow-up study 2 (Table 3.3) showed the following. In both studies all RLEs, except one, showed competence development. The average amount of significantly developed competencies over the RLEs was 44% in study 1 and 59% in study 2. In both studies 'Domain-specific professional expertise' developed in almost all RLEs. With respect to generic competence development, almost all RLEs in study 1 developed the competence 'Collaborating and discussing', while study 2 found the competencies 'Deciding and initiating activities', 'Investigating' and 'Acting commercially' to develop in almost all RLEs. Additionally, the overall effect size of the competence development was higher in study 2.

Where study 1 only found a positive effect of working in multi-disciplinary student groups and a high coaching intensity on student learning, study 2 corroborated all three independent variable effects including a large positive effect of a high level of multi-stakeholder collaboration both in quantitative and in qualitative data. Percentages of student reported other learning outcomes referring to multi-disciplinary group work were almost identical for the two distinguished categories in both study 1 and study 2. For excerpts referring to multi-stakeholder collaboration, the percentages were almost

identical for the two categories in study 1 (26 and 27%), but differed in study 2 (38 and 10%) (Tables 2.3 and 3.4).

Table 3.4. Percentages of Students' Reported 'Other Learning Outcomes' Referring to Multidisciplinary Group Work and Multi-Stakeholder Collaboration per Category of Learning Environment Characteristics (including two illustrative examples per category).

Categories	**# Students per category**	**# Excerpts per category of students**	**# (%) of Excerpts that refers to multidisciplinary group work**	**Illustrative examples**
Students working in multidisciplinary student groups	116	231	41 (18%)	I learned how to better collaborate with people from different disciplines. I learned to rely on the skills of group mates.
Students working in mono-disciplinary student groups	27	66	3 (5%)	I learned how to communicate with people from different backgrounds. Just make sure you have the right knowledge and skills to adapt to each situation.
TOTAL # students	143	297	-	
Categories	**# Students per category**	**# Excerpts per category of students**	**# (%) of Excerpts that refers to multi-stakeholder collaboration**	**Illustrative examples**
Students working on a high level of multi-stakeholder collaboration	97	199	75 (38%)	It is important to maintain contacts with the client and stakeholders to prevent for misunderstanding. I learned how to deal with the criticism you have to withstand during and after a community discussion meeting.
Students working on a low level of multi-stakeholder collaboration	46	98	10 (10%)	My task was to contact the stakeholders. I am no longer afraid to call to complete strangers. We learned that working for a real external client is serious business.
TOTAL # students	143	297	-	

3.5 Conclusion

This study confirms the hypothesis that the RLE stimulates planning students' competence development. As such, the study provides evidence for the effectiveness of RLEs in the sense of developing both domain-specific professional expertise and generic competence of planning students. Although the pattern of competence development differs per RLE, six out of the seven studied RLEs show significant competence development. The competency 'Building relationships and networking' significantly developed in three out of the seven RLEs (Table 3.3). The average amount of developed competencies per RLE and effect sizes for development are higher than in the similar previous study (see Table 2.1 and Chapter 2). This reconfirms and strengthens findings from the previous study that found competence growth in four out of five RLEs.

The three identified typical 'boundary crossing' learning environment characteristics of working in multidisciplinary groups, a high level of multi-stakeholder collaboration and a high coaching intensity had a large positive effect on competence development. This confirms hypothesis 2, 3 and 4, meaning that all three boundary crossing characteristics stimulate student learning in the studied RLEs. Qualitative data on students' reported learning outcomes as a result of working in multi-disciplinary groups and with multiple stakeholders corroborated the effects of these learning environment characteristics. Findings on the positive effects of the three 'boundary crossing' learning environment characteristics add to the findings of the previous study, in which only multi-disciplinary student groups and a high coaching level showed a positive multivariate effect.

Repeated and additional evidence for student learning in the RLE exposes the potential of the RLE to prepare planning students for their key professional tasks in setting up and facilitating multi-stakeholder processes for which they should be able to work across the boundaries of multiple practices, disciplines, and perspectives of a variety of stakeholders involved (Booher & Innes, 2002; Bourner, 2010; Edwards & Bates, 2011).

3.6 Discussion

The confirmation of student learning in the RLE is important on planning educators' way to further develop effective boundary crossing learning environments for future planners. More specifically, the fact that both domain-specific professional expertise and various generic competencies are stimulated in RLEs, even more in the presence of various boundary crossing learning environment characteristics, supports the added value of RLEs for planning education. These findings also challenge the design of, often used, other authentic learning environments in planning education, like studios or

service learning, to more explicitly incorporate these boundary crossing learning environment characteristics.

The fact that the amount of developed competencies and the effect size of development is higher in the second follow-up study, in comparison to a previous study as carried out a few years earlier (Chapter 2), could indicate that slight educational improvements of the RLE over time sort their effect. Our observations of the studied RLEs suggest that the design and implementation of the RLEs have improved in sense of e.g. clarity in assignments and working processes, and professional development of teachers in their coaching role. This implies that paying careful attention to the instructional design of RLEs, their implementation, and the role teachers play in these environments, can affect the amount and type of competencies to be developed. Future research should support the further instructional design of the RLE, and the implementation of its typical boundary crossing learning environment characteristics, by obtaining more in depth insight in the actual teaching and learning processes in the RLE.

Both studies strongly confirm the added value of working in multi-disciplinary student groups for student learning in the RLE. This finding argues for an attempt to work as much as possible in multi-disciplinary groups in authentic learning environments, although this is often hard to organize in higher education settings. We even pose an argument for a duple effect of this learning environment characteristic on students' boundary crossing competence. Students first get the opportunity to cross boundaries of disciplines in their relatively safe in-school group environment, and together prepare for boundary crossing in the out-of-school transdisciplinary settings in which they will participate.

In contrast to the first study, this study also shows a large positive effect on competence development of intensive multi-stakeholder collaboration, confirming our initial expectations. Unexpectedly, the competence 'Building relationships and networking' developed in only three RLEs while we would expect this to develop in all RLEs, and certainly in the RLEs with a high level of multi-stakeholder collaboration. Our explanation for this finding is that students do not optimally make use of learning from, and together with, multiple stakeholders. This explanation is prompted by the fact that learning objectives, assessment criteria and teacher support do not explicitly pay attention to multi-stakeholder collaboration and learning from multiple stakeholders. Students are often sent into the field without being properly prepared for the range of stakeholders involved, the perspectives these stakeholders represent, and the way students can mobilize and actively involve stakeholders in their projects. As Akkerman (2011) previously stressed that boundary crossing does not happen easily and needs explicit support, future research should focus on examining the effects of active and explicit support of student-stakeholder collaboration.

A high coaching intensity had a large positive effect on student learning in both studies. We stress the promising value of intensive coaching, at least by stimulating critical reflection and explicating learning processes and experiences, for boundary crossing learning processes to actually occur (Akkerman & Bakker, 2011; Bakker & Akkerman, 2013; Sletto, 2010). Even more, explicating learning amongst all parties involved in the RLE would contribute to the ultimate aim of the RLE to collaboratively create new knowledge and expertise that supports sustainable regional development and/or transition by learning from and with each other (Foorthuis et al., 2012).

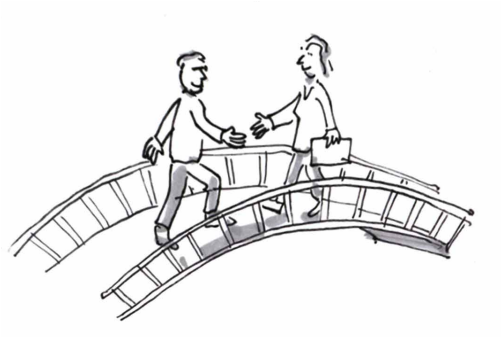
Limitations of this study are at first related to the comparison of the seven studied RLEs. The RLEs were actual learning environments in educational practice. As a consequence, the RLEs differed with respect to more than the three independent variables. They differed for example for the level of education, position of the RLE in the curriculum, duration of student projects, size of the student groups, specific learning objectives and assessment criteria. Though the effects of gender and age were controlled for, the other differing variables were not taken into account, while they might have influenced which competencies developed, and the degree to which these competencies developed. Excluding effects of the other varying elements would require an experimental design, which would be at the expense of the authenticity of the RLE. This study at least moves away from being just exemplary having used a quasi-experimental design, that we regard as the highest achievable type of systematic investigation (Wu & Brooks, 2011). A second note of caution should be made for the validity of the *t*-tests regarding the small numbers of participating subjects in some of the RLEs. Since we found highly significant results, despite these small numbers, in 10 of 12 examined RLEs, we think we found a real indication for the RLEs' overall effectiveness. Finally, we realize that the choice for a systematic, basically quantitative investigation disabled for in-depth insights in what really happened in each RLE. As said above, future in-depth case studies could expose more detailed knowledge on students' learning as a result of the typical characteristics of the RLE.

Having confirmed the effectiveness of the RLE on the basis of two successive studies, we recommend planning educators to consider the inclusion of authentic multi-stakeholder learning environments in their curricula. To boost the development of planning relevant competencies in these learning environments, we recommend to let students work in multi-disciplinary student groups, to facilitate and stimulate intensive collaboration with external stakeholders, and to organize an accommodating coaching trajectory to explicate learning from and between different disciplines and stakeholders. This study allows for providing evidence-based recommendations to innovate planning education and thereby contributes to the call for a better pedagogical fundament for innovations in authentic learning environments as used in planning

education (Angotti et al., 2011; Balassiano & West, 2012; Long, 2012a, 2012b; Németh & Long, 2012). From an educational research perspective, this study and its predecessor add to the recently launched theoretical debate and call for empirical studies delivering insights in the functioning of boundary crossing learning in education (Akkerman & Van Eijck, 2013; Bakker & Akkerman, 2013; Bronkhorst & Akkerman, 2016).

Chapter 4.

Stimulating Students' Boundary Crossing Learning in the Multi-Stakeholder Regional Learning Environment[5]



Abstract

Boundary crossing, i.e. working and learning across practices, is needed to tackle complex problems and should therefore be facilitated in higher education. The Regional Learning Environment (RLE), an authentic, multi-stakeholder learning environment practiced in Dutch higher education, offers students ample opportunities to develop boundary crossing competence through multi-stakeholder collaboration. However, the RLE appears to non-optimally stimulate learning with multiple stakeholders. This quasi-experimental intervention study (N = 122) investigates the effect of explicit support of student-stakeholder collaboration in the RLE, by means of workshops, on (1) students' self-efficacy for stakeholder collaboration, (2) the amount of reported student-stakeholder collaborative activities, and (3) reported boundary crossing learning mechanisms. Results show that a series of two workshops stimulates the amount of reported collaborative activities, and activates planning students' boundary crossing learning in terms of reflection and transformation. Findings inform the future evidence-based development of authentic multi-stakeholder learning environments and operationalise the theoretical concept of boundary crossing.

Keywords

boundary crossing, higher education, authentic, regional learning environment, multi-stakeholder collaboration, student learning

[5] This chapter is based on Oonk, C., Gulikers, J., & Mulder, M. (under review). Stimulating students' boundary crossing learning in the multi-stakeholder regional learning environment.

4.1 Introduction

Today's world is full of complex issues that society cannot face without integrative and collaborative approaches. Examples of these issues are population growth, economic decline, climate change, the availability of energy, and the spatial consequences thereof. Finding solutions for these transdisciplinary problems requires collaboration between multiple stakeholders who represent various practices, disciplines and perspectives (Scholz & Steiner, 2015b). This is not an easy task (Akkerman, 2011; Engeström et al., 1995). All stakeholders involved need 'boundary crossing competence' which means the ability to operate and communicate across different practices (Walker & Nocon, 2007).

To develop future professionals' boundary crossing competence, education worldwide should facilitate effective learning environments in which students optimally learn with and from multiple stakeholders (e.g. Webb & Burgin, 2009; Wenger, 2000). This is certainly valid for higher education programmes whose graduates will collaborate with multiple stakeholders in their professional lives.

Various existing authentic learning environments in higher education, e.g. the studio, service learning and mixed variants of these, potentially foster students' learning from the collaboration with multiple stakeholders (e.g. Angotti et al., 2011; Brandt et al., 2013; Jacoby, 2014; Long, 2012b). This learning is supposed to happen if students are able to effectively cross the boundaries of practices, disciplines and perspectives between themselves and those of diverse other stakeholders. Over the years a huge body of literature has been published on students' learning experiences in studios and service learning environments (e.g. Balassiano, 2011; Cameron et al., 2001; Giles et al., 2001; Harris, 2004; Roakes & Norris-Tirrell, 2000; Senbel, 2012; Sletto, 2010; Yorio & Ye, 2012). However, knowledge on what students learn from their collaboration with stakeholders related to how these authentic learning environments enable this learning, is limited (Webb & Burgin, 2009). Four learning mechanisms as distinguished in the boundary crossing learning theory of Akkerman and Bakker (2011), that is identification, coordination, reflection and transformation, are expected to offer a useful framework to develop boundary crossing supportive learning activities, and gain insight in what and how students learn from their collaboration with actors across their own boundaries.

The Dutch authentic multi-stakeholder Regional Learning Environment (RLE) is expected to foster learning from students' collaboration with multiple stakeholders. However, our two previous studies on student learning in the RLE (Chapter 2 and 3) did not unambiguously confirm this. One of the supposed reasons for the unambiguous learning effect of intensive stakeholder collaboration was the lack of support thereof.

This quasi-experimental intervention study hypothesizes the effect of explicit support of student-stakeholder collaboration in the RLE, by means of workshops, on

students' 'boundary crossing' activities and learning processes. Results of the study contribute to the body of knowledge on learning across practices, and facilitate the design of effective boundary crossing learning environments in higher education. The next two sections provide theoretical insights in boundary crossing learning, and explain the way boundary crossing learning is supposed to happen in the RLE.

4.2 Theoretical framework: boundary crossing learning

Different stakeholders who collaborate in multi-stakeholder processes represent various practices each with their own disciplinary knowledge, perspectives on the issue at hand, and stakes in its solutions (Akkerman & Bakker, 2011). Boundaries between these various practices often lead to 'discontinuity in action or interaction' (Akkerman & Bakker, 2011, p. 133). This possibly hinders progress, learning and knowledge creation in the multi-stakeholder processes. However, boundaries also appear to be powerful places to learn. At the boundaries of different practices people are challenged to unravel the mystery of 'otherness', to explore the edge of their own competence, to revisit their own realities and expand their horizons (Wenger, 2000, p. 233).

Instead of looking at a learner as being a single object who learns in one single context at a time, educational scholars recently started to theorise an individual learner as being part of different practices simultaneously (Akkerman & Van Eijck, 2013; Bronkhorst & Akkerman, 2016; Konkola et al., 2007). In this multisystemic perspective on learning, learning is seen as a process that can move across multiple contexts (Bronkhorst & Akkerman, 2016). Linking the various contexts through dialogue, and explicating boundaries between them, appears to be important for a learner since it enables to create continuity in learning between various contexts (Akkerman, 2011). This continuity positively influences interest development and the motivation for further learning (Bronkhorst & Akkerman, 2016).

The concept of boundary crossing is used to describe the cognitive processes that occur when learners operate across different practices. According to Engeström et al. (1995), learners combine ingredients from these different practices to achieve hybrid, i.e. cross-practice, solutions. Akkerman and Bakker (2011) identify four learning mechanisms, including associated sub-processes, that can express what the learning potential of boundary crossing entails. The first learning mechanism called *identification* involves the questioning of the own and others' core identities, and the mutual complementarity of different practices. Identification leads to insights into what the diverse practices concern, not necessarily to actual collaboration. *Coordination*, the second mechanism, expresses what people learn from seeking communicative connections between diverse practices or perspectives, e.g. by contacting each other to exchange relevant information or by using languages from

different practices. These connections can be established by effective means and procedures that allow different practices to communicate efficiently in distributed work. These means and procedures are called boundary objects as soon as they appear to contribute to the effectivity of two or more practices while maintaining their own identity in the various practices (Star & Griesemer, 1989). Where coordination takes place, dialogue between parties is established only as far as necessary to maintain the work flow. *Reflection*, the third mechanism, contains perspective making and taking. People come 'to realize and explicate differences between practices and thus to learn something new about their own and others' practices' (Akkerman & Bakker, 2011, p. 144). *Transformation*, the fourth learning mechanism, involves joint work at the boundaries between practices, combining ingredients from different practices into something new (i.e. hybridization). Transformation results in new knowledge creation, innovation and, ideally, to changes in existing practices or to new hybrid practices.

We regard boundary crossing and its learning mechanisms as a promising learning objective for higher education students to pursue in a multi-stakeholder learning environment. But, learning at the boundaries does not happen easily and needs explicit support (Akkerman & Bakker, 2011; Ludvigsen et al., 2010; Wenger, 2000). Whether explicit support stimulates students' boundary crossing activities and learning is a question that has not yet been studied in the context of higher education (Akkerman & Van Eijck, 2013; Bakker & Akkerman, 2014). In earlier studies, the theoretical concept of boundary crossing is found to provide a good lens for understanding learning that occurs when people learn across practices (e.g. Akkerman & Bruining, 2016; Bakker & Akkerman, 2014; Cremers, 2016; Flynn et al. 2016). However, the identification and operationalisation of the four boundary crossing learning mechanisms as published by Akkerman and Bakker (2011) has so far not been followed by large-scale empirical studies that systematically verify the existence of the four learning mechanisms in higher education students' working across practices, let alone after explicit support of their boundary crossing work (Bakker & Akkerman, 2014).

This intervention study uses boundary crossing theory to develop workshop-based support of students' learning with and from multiple stakeholders in a higher education, multi-stakeholder leaning environment. Next, the four boundary crossing learning mechanisms will be operationalised into a concrete analytical frame that serves the analysis of differences in students' boundary crossing learning processes after none or explicit support thereof.

4.3 Boundary crossing learning in the Regional Learning Environment

Regional Learning Environments (RLEs) are set up in the Dutch life sciences sector by educational institutes in collaboration with various community partners. The general

aim of the RLE is twofold, namely (1) to support students' and other parties' learning in the sense of integrated use and development of domain-specific expertise and professional skills, and (2) to contribute to sustainable regional development. Many Dutch institutes for higher and vocational education incorporated RLE projects in their curricula, including almost all Dutch schools for Urban and Landscape Planning education, being the subject of this study.

In the RLE students work in groups on real world regional, i.e. supra-local, problems together with various regional stakeholders like local and regional authorities, semi-governmental bodies, entrepreneurs, research institutes, NGO's and citizens (Foorthuis et al., 2012; Meijles &Van Hoven, 2010). All stakeholders have an interest in the problem at hand. Solving the problem requires the integration and/or co-creation of new knowledge between students and multiple regional stakeholders. The end result is meant to be of value for the external problem holder and to contribute to sustainable regional development or even transformation.

The RLE provides students with the opportunity to cross boundaries between multiple practices, disciplines and perspectives and learn from that. As such, the RLE is expected to stimulate boundary crossing learning. Moving towards the ultimate transformative aim of the RLE requires high levels of boundary crossing i.e. collaboration across boundaries to integrate domain-specific expertise and various perspectives into new innovative knowledge or practices. An RLE contextualised interpretation of the four boundary crossing learning mechanisms (Akkerman & Bakker, 2011; Gulikers & Oonk, 2016a) shows what these high levels of stakeholder collaboration require from the students. At first, referring to *identification*, students should recognise their own knowledge and skills, and identify the disciplines, perspectives, interests of, and mutual relationships between the stakeholders involved. Ideally, they are able to clarify complementarity of and/or boundaries between their own and others' possible contributions and match mutual expectations. Next step, referring to *coordination*, is to contact the stakeholders and set up effective and efficient means of working together, possibly using boundary objects to facilitate this collaboration. For effective collaboration students need to understand the (disciplinary) languages of the stakeholders, and to control working agreements. Thirdly, referring to *reflection*, high levels of collaboration require students to recognize the characteristics of other persons and practices, learn from that, even facilitate mutual learning, and reconsider the own practice as a result of something learned from the other person or practice. Fourth and finally, referring to *transformation*, students have to integrate ideas into new, ideally transformative, knowledge and practices. They express the intention to, or actually, establish new feasible practices, enthuse stakeholders for these new practices and stimulate follow ups.

However, this ideal image of student-stakeholder collaboration is not yet common practice in the RLE, despite the added value that teachers allot to this learning environment characteristic of the RLE. Previous studies examining the effectiveness of RLEs revealed that students and teachers did not optimally utilize the learning potential of the RLE to learn with and from multiple stakeholders (Chapter 2 and 3). These ambiguous findings seemed to be caused by the fact that learning from and with stakeholders was, in none of the studied RLEs, an explicit learning objective, nor was it actively stimulated or supported by teachers.

We hypothesize that explicit student support of their stakeholder collaborative activities in the RLE by means of workshops benefits students' self-efficacy for carrying out stakeholder activities during their RLE projects, the amount of student-initiated collaborative activities, and the adoption of boundary crossing learning mechanisms. The effect of more or less explicit support will be examined in this intervention study. The research questions for the study are the following. Does explicit workshop-based support of student-stakeholder collaboration in the RLE result in:

1A. more self-efficacy for student-stakeholder collaborative activities during the on-going RLE projects?

1B. more student reported collaborative activities between students and stakeholders?

1C. differences in student reported boundary crossing learning mechanisms?

The next section explains the design of the study.

4.4 Methods

This study has been carried out in a quasi-experimental intervention design, assigning higher education students, mainly Urban and Landscape Planning students, participating in eight RLEs to three experimental conditions.

Intervention

The intervention consisted of the exposure of students to none, one or two workshops student-stakeholder collaboration during their RLE projects. First, two workshops were designed based on the boundary crossing theory (Akkerman & Bakker, 2011) and proven tools for stakeholder collaboration (e.g. Bryson, 2004; Freeman, 1984; Webb & Burgin, 2009). The workshops were designed in such a way that they specifically addressed student-stakeholder collaborative activities needed in different stages of the RLE projects, and stimulated boundary crossing learning mechanisms at stake in these stages.

Workshop 1 was scheduled at the beginning of the RLE project, shortly after the students were informed about their assignment by the external client, but before the

identification of, and actual collaboration with other stakeholders started. Workshop 1 included activities addressing the learning mechanisms identification and coordination. These mechanisms were expected to be crucial to occur in the beginning of the collaboration process. Examples of activities were a stakeholder force field analysis and a networking role play. Workshop 2 was scheduled halfway the RLE project, after the students had identified and mobilised the stakeholders involved, and practiced to collaborate with them. In most cases at this stage of their projects, students did not have a clear view on the possible transformative outcomes of their projects. Workshop 2 included activities addressing the learning mechanisms reflection and transformation. These mechanisms were expected to be crucial to address a few weeks after the start of the collaboration process. Examples of activities were a review of stakeholder collaborative actions so far, based on a set of reflective questions, the simulation of an agitated stakeholder meeting, and a brainstorm on an impactful, project-finalizing stakeholder collaborative activity meant to trigger transformation in the region.

A draft-design of both workshops was pilot-tested and evaluated in a group of planning students (n = 13) working in an RLE during the academic year 2012/2013. The evaluation results were used to modify the workshop design. The modified draft-design was pilot-tested and evaluated in two other groups of planning students (n = 15; 25) working in RLEs during the academic year 2013/2014. The evaluation results of the modified draft-design were used to make up the final design of the two workshops.

To control for differences in teaching style, all workshops were facilitated by the first author, who in all cases performed in the role of a guest teacher. The design of the 4-hour workshops was identical in all cases, although the content of the activities was tailored to the specific RLE-projects that the students were working on. To check the fidelity of the intervention, all workshops were evaluated. Individual evaluation forms asked students to score 27 statements on the usefulness and satisfaction of the workshops using a 5-point Likert scale (totally disagree – totally agree). Average evaluation scores for workshop 1 (n = 76) were: M_usefullness = 4.03, SD = .711; M_satisfaction = 3.96, SD = .824. Average evaluation scores for workshop 2 (n = 60) were: M_usefullness = 4.2, SD = .84; M_satisfaction = 3.87, SD = .791.

Participants

Students from five Dutch spatial planning schools (N = 122), working in eight different RLEs during the academic years 2014/2015 and 2015/2016, participated in either no workshops (n = 30), workshop 1 (n = 36), or workshop 1 and 2 (n = 56) during their RLE projects (see Table 4.1). A pre-test questionnaire checking for students' expectations on collaboration with other people during their oncoming projects showed that the students in the three conditions did not differ in the degree to

which they were tuned into working with external stakeholders. During their RLE projects, students worked in groups of 3, 4 or 5 students on a complex regional sustainability issue, assigned by an external client. Finding solutions for the issue required the involvement of various stakeholders next to the client. The mean age of the students was 21.5 (SD = 2.213).The ratio of participating males and females was 75 / 25%.

Table 4.1. General Characteristics of the Studied RLEs

	RLE 1. Planning School A 2014/2015	**RLE 2.** Planning School B 2014/2015	**RLE 3.** Planning School C 2014/2015	**RLE 4.** Planning School D 2014/2015	**RLE 5.** Planning School E 2014/2015	**RLE 6.** Planning School A 2015/2016	**RLE 7.** Planning School E 2015/2016	**RLE 8.** Planning School B 2015/2016
General characteristics								
Number of students (*n*)	17	11	12	12	25	18	21	6
Educational level	Professional. Higher Education Year 3	Professional Higher Education Year 3	Academic Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3	Professional Higher Education Year 3
Study load	20 weeks fulltime	20 weeks fulltime	8 weeks fulltime	9 weeks fulltime	20 weeks fulltime	20 weeks fulltime	20 weeks fulltime	20 weeks fulltime
# projects within RLE	4	3	1; divided into 4 sub-tasks	1; divided into 3 sub-tasks	7	4	6	2
Student group size	4-5	3-4	3-4	4-5	4-5	4-5	4	3
Students' mean age (M) and (SD)	M = 21.65 (SD = 2.94)	M = 21.55 (SD = 1.44)	M = 20.67 (SD = 1.07)	M = 21.17 (SD = 1.75)	M = 21.3 (SD = 1.94)	M = 22.5 (SD = 2.71)	M = 21.0 (SD = 2.18)	M = 22.67 (SD = 2.58)
Students' gender [# (%)]	♂ 12 (71%) ♀ 5 (29%)	♂ 6 (55%) ♀ 5 (45%)	♂ 10 (67%) ♀ 5 (33%)	♂ 9 (69%) ♀ 4 (31%)	♂ 24 (71%) ♀ 10 (29%)	♂ 16 (89%) ♀ 2 (11%)	♂ 16 (70%) ♀ 7 (30%)	♂ 5 (83%) ♀ 1 (17%)
Conditions								
No workshops	n = 1	n = 1	n = 1	-	-	-	n = 21	n = 6
Workshop 1	n = 9	n = 2	n = 1	n = 2	n = 19	n = 3	-	-
Workshop 1&2	n = 7	n = 8	n = 10	n = 10	n = 6	n = 15	-	-

Data sources

To answer research question 1A, a post-test questionnaire included eleven statements addressing the self-efficacy for various student-stakeholder collaborative activities during the projects (e.g. 'During the project I felt able to enthuse stakeholders to contribute to the project.' and 'During the project I could contribute to the organisation of one or more stakeholder collaborative activities.'). Students scored their level of agreement for each of the eleven statements on a 5-point Likert scale (totally disagree – totally agree). The scale was reliable ($\alpha = .861$).

Student answers on three open questions in the post-test questionnaire enabled a comparison of the amount of reported student-stakeholder collaborative activities over the three conditions (research question 1B), and an elucidation of adopted boundary crossing learning mechanisms (research question 1C). The first open question asked students for their overall RLE learning experiences. Student answers on this first

question were expected to reveal various learning experiences that could refer to their collaborative activities and/or adopted boundary crossing learning mechanisms. The second open question asked students to make a learning history about the peaks and troughs in working with other people in the project. This second question was expected to highlight critical moments in students' collaborative activities and to stimulate the students to report on those, whether or not in terms of boundary crossing learning mechanisms. The third open question asked students how they would approach a new, similar project in the future. This question was added after personal communication with experts in boundary crossing education research (personal communication, January 2015), and based on the following assumption: if students have really gained a certain degree of boundary crossing competence, they are expected to also adopt this competence in a future situation. Thus, students who adopt more boundary crossing learning mechanisms during their project are expected to report more boundary crossing learning mechanisms if they are asked how to approach a new similar project in the future.

Analysis

An ANOVA compared students' scores on the eleven statements addressing self-efficacy for student-stakeholder collaborative activities and indicated differences in the level of self-efficacy between the three conditions (research question 1A).

The analysis of the qualitative data, i.e. student reports on the open questions from the post-test, consisted of two parts informing (1) research question 1B on student-stakeholder collaborative activities, and (2) research question 1C on reported boundary crossing learning mechanisms. Each preparatory activity before the actual coding work for the respective part was carried out in close collaboration between the first two authors of the paper. A next activity was not carried out before both researchers agreed upon decisions in the former step. The actual coding work was partly carried out by the two researchers independently in order to determine interrater reliability scores (Cohen's Kappa (κ)) for each coding part. After the determination of almost perfect Kappa's, the first author accomplished the remaining coding work.

First, to answer research question 1B, each separate meaningful expression in a student post-test report referring to a mental or physical activity (or something learned thereof) was coded 'referring to a stakeholder collaborative activity (done or intended)' or 'referring to another activity' or 'not referring to an activity'. The interrater reliability (κ) for this coding step was 0.87 which represents an almost perfect strength of agreement (Landis & Koch, 1977). After the coding was done, a Pearson chi-square test tested differences between the conditions in types of reported activities.

Secondly, to answer research question 1C, we used a multi-rater deductive coding process (Gilgun, 2011; Miles et al., 2014) to analyse the three types of student post-test reports on the four boundary crossing learning mechanisms and on associated sub-processes. We started to develop a preliminary coding scheme based on a selection of literature on boundary crossing learning mechanisms and first attempts to operationalise the theoretical concepts into coding frameworks (Akkerman & Bakker, 2011; Cremers, 2016, p. 94). The preliminary coding scheme included the four boundary crossing learning mechanisms and associated characteristic sub-processes. Because none of the existing coding frameworks was used in the context of student-stakeholder collaboration, we expected the need to modify the preliminary framework to optimise its use in our study. Based on the preliminary coding scheme, 12 raters (ten students from a Master degree programme 'Learning and Innovation' who were following a curricular course on boundary crossing, and the two researchers) coded the same random selection of data per condition. Each separate meaningful expression of a student referring to a mental or physical effort (or something learned thereof) was coded one of the four learning mechanisms, and an associated process, or 'another effort or learning process' and an associated sub process. The initial interrater reliability of this coding step was almost perfect ($\kappa = 0.85$) on the level of the boundary crossing learning mechanisms, and substantial ($\kappa = 0.66$) on the level of associated sub-processes. A discussion between the twelve raters on the results of this pre-coding round, led to a contextualised adjustment of the preliminary coding scheme to optimise its use in the context of student-stakeholder collaboration. The resulting final coding scheme (Table 4.2) was used to determine the final interrater reliability between the two author raters on both the level of boundary crossing learning mechanism ($\kappa = 0.98$), and the level of associated sub process ($\kappa = 0.89$). Finally, the first author of the study coded all qualitative post-test data using the final coding scheme, and selected illustrative examples for each code (Table 4.2).

After the coding was done, a Pearson chi-square test tested differences between the conditions in amounts of excerpts per learning mechanism. Next, differences between the conditions on both the level of boundary crossing learning mechanisms as well as on the level of associated characteristic sub-processes were interpreted.

Table 4.2. Boundary Crossing Coding Scheme Contextualised in the Multi-Stakeholder Regional Learning Environment (including illustrative examples of student reports per sub-process)

Learning mechanism and associated characteristic sub-process	**Description of the process** ***Illustrative example (experimental condition as derived from (0,1 or 2 workshops))***
Identification (I)	
I_Knowing Yourself	Knowing and/or explicating the own expertise and limitations thereof *The fact that our group consisted of four agricultural students also contributed to our agricultural project assignment (1)*
I_Knowing the Stakeholders	Identifying which stakeholders are relevant in the light of the project assignment *Already at the first day of the project, you should identify the stakeholders. (0)*
I_Knowing Other Perspectives	Identifying stakeholders' knowledge, interests, perspectives, and mutual relations *Make sure that you know the interests of each actor and the relationships between the actors. (1)*
I_Clarifying Complementarity	Clarifying the complementarity of and/or boundaries between the own and others' possible contributions (i.e. knowledge, skills etc.) *Sometimes you need a lot of parties to realise the intended result. (0)*
I_Exploring Mutual Expectations	Exploring and tuning mutual expectations at the beginning of a project *The client, the teachers and we; we all had different ideas on what and how to do it. We had to align the ideas. (1)*
Coordination (C)	
C_Contacting for Connection	Contacting stakeholders *The client, the students and the teacher coach should frequently be in contact. (1)*
C_Collaboration	Collaborating (including talking) with the stakeholders *I learned how to involve citizens in shaping the project. (2)*
C_Using a Boundary Object	Using and/or explicating the importance and use of a boundary object (including the organization of activities that facilitate collaboration, e.g. a brainstorm session or a design workshop with village inhabitants) *As part of our study we organised a brainstorm session for the village residents. (1)*
C_Translating	Understanding the (languages of the) stakeholder *The communication was tough; we did not understand the intentions of the client. (1)*
C_Controlling Agreements	Controlling working agreements on mutual tasks *The client and we should have kept each other better informed. (2)*
Reflection (R)	
R_Recognizing Others	Recognizing and making explicit the characteristics of another person or practice *There are different levels in the concept of a 'hippy'. Some people go as far as they can in ecology and sustainability, others go less far. (1)*
R_Learning from Another	Explicating something learned from another person or practice *Nothing is possible, particularly innovative thinking. They have to defend themselves to the local council, so their will is law. (1)*
R_Perspective Making	Reconsidering the own perspective as a result of something learned from another person or practice *Then we unplugged because the clients were nothing more than negative and did not communicate; they chose for another line of reasoning. (2)*
R_Facilitating Perspective Making	Facilitating others' learning and/or perspective making *I learned how to open up the clients' mind for other peoples' ideas. (2)*
R_Mutual Learning	Explicating mutual learning *The assignment was clear for both sides and so far fine for both parties. (1)*

Transformation (T)	
T_Intending the Creation of a New Practice	Expressing the intention to create a new practice *Next time I would try to establish a real connection with the project area. (1)*
T_Envisioning New Practices	Describing visions on new practices *Due to using the local village park as an impetus, it appeared that there were a lot of possibilities to renew the village. (2)*
T_Establishing New Practices	Integrating interests and perspectives into new realistic practices, and establishing these practices *Apparently, we opened up a lot of possibilities in the area and brought together various parties. (2)*
T_Enthusing Others for A New Practice	Enthusing stakeholders for a suggested new practice *I learned how to enthuse neighbourhood citizens. (0)*
T_Stimulating Follow Ups	Inciting and stimulating follow ups for the new practice *During the project you already need to make sure that after the project something will really be realized. (1)*
Other Learning Processes (O)	
O_Project Management	Processing and managing the student group process *You should make a planning and distribute tasks. (2)*
O_Personal Development	Learning for personal development *I learned to take more initiatives from myself. (0)*
O_Multidisciplinary Group Work	Explicating something learned from another students' discipline *Because of our different backgrounds we sometimes clashed. (2)*
O_Remaining Learning Processes (Referring to e.g. project assignment, methods, supervision)	Remaining other learning processes not to be coded another 'Other Learning Process' *The teacher changed the assignment and because of that everything became very unclear. (0)*

4.5 Results

Answering research question 1A, the ANOVA showed no significant differences in the self-efficacy for student-stakeholder collaborative activities between the three conditions (M = 3.6, SD = .578; M = 3.5, SD = .616; M = 3.3, SD = .818 for conditions 0, 1, and 2 respectively).

Answering research question 1B, the Pearson chi-square test showed that the types of reported activities significantly differed between the conditions (χ^2 (6, N = 1876) = 49.50, $p < 0.001$). Table 4.3 provides further insights in the results for research question 1B. The percentages of reports on *done* student-stakeholder collaborative activities were almost similar in condition 0 (15%) and condition 1 (16%), and highest in condition 2 (25%). The percentages of reports on *intended* future student-stakeholder collaborative activities slightly increased over the conditions (10, 12 and 15% for condition 0, 1, and 2 respectively). In condition 2, students referred more often (48%) to a stakeholder collaborative activity instead of to another activity as students did in condition 0 (32%) and 1 (34%).

Table 4.3. Amount of Reported Student-Stakeholder Collaborative Activities as a Percentage of All Reported Excerpts per Condition, and of All Reported Activities

	No Workshops	**Workshop 1**	**Workshop 1&2**
Total # excerpts = 1876	# excerpts = 481	# excerpts = 546	# excerpts = 849
Percentage of total amount of excerpts per condition referring to:			
Stakeholder collaborative activity_*done*	15	16	25
Stakeholder collaborative activity_*intended in the future*	10	12	15
Other activity	53	55	43
Not referring to an activity	22	17	17
TOTAL	100	100	100
Stakeholder collaborative activity as a percentage of total percentage of activities	32	34	48

Answering research question 1C, the Pearson chi-square test showed that the reported learning mechanisms significantly differed between the conditions (χ^2 (8, N = 1876) = 67.86, $p < 0.001$). Table 4.4 provides further insights in the results for research question 1C. Students' adoption of the *identification* and *coordination* learning mechanisms hardly differed over the three conditions (12%, 13%, and 10% for condition 0, 1 and 2 respectively). The amount of excerpts referring to *reflection* increased over the conditions (6%, 11% and 19% for condition 0, 1 and 2 respectively). Where *transformation* was hardly addressed in condition 0 and 1(both 1%), this percentage was, although still low, at least four times higher (4%) in condition 2. The percentage of excerpts referring to other, non-boundary crossing learning processes decreased from 66% in condition 0, via 60% in condition 1, to 51% in condition 2.

With respect to the adopted sub-processes per learning mechanism, a few results were striking. In all three conditions more than half of the excerpts for *identification* were sub-coded *exploring mutual expectations.* Almost all these excerpts concerned expectation management in the triangle students, teachers, and external client(s). For *coordination* in condition 2 the sub-process *translating* was coded two and three times more often compared to condition 0 and 1 respectively. The higher scores on *reflection* in condition 2 manifested themselves in higher scores on the sub-processes *perspective making* and *facilitating perspective making.* For *transformation* we saw more emphasis on *intending the creation of a new practice* in condition 0 and 1, for *envisioning new practices* in condition 2.

Table 4.4. Percentages of Excerpts Referring to Boundary Crossing Learning Mechanisms (Akkerman & Bakker, 2011) and to Other Learning Processes (including percentages for distinguished sub processes per learning mechanism)

	No Workshops	**Workshop 1**	**Workshop 1&2**
Total # excerpts = 1876	# excerpts = 481	# excerpts = 546	# excerpts = 849
Identification (I)	*12.47*	*12.64*	*10.13*
I_Knowing Yourself	0	7.25	0
I_Knowing the Stakeholders	13.3	13.04	16.28
I_Knowing Other Perspectives	23.3	20.29	18.60
I_Clarifying Complementarity	10	5.80	1.16
I_Exploring Mutual Expectations	53.3	53.62	63.95
Coordination (C)	*14.55*	*15.38*	*15.78*
C_Contacting for Connection	15.71	23.81	11.94
C_Organizing Collaboration	24.29	33.33	21.64
C_Using a Boundary Object	30	29.76	37.31
C_Translating	7.14	5.95	15.67
C_Controlling Agreements	22.86	7.14	13.43
Reflection (R)	*5.82*	*10.62*	*18.50*
R_Recognizing Others	28.57	37.93	15.92
R_Learning from Another	46.43	37.93	37.58
R_Perspective Making	14.29	10.34	29.30
R_Facilitating Perspective Making	10.71	12.07	17.20
R_Mutual Learning	0	1.72	0
Transformation (T)	*1.46*	*1.47*	*4.12*
T_Intending Creation of New Practice	14.29	25	5.71
T_Envisioning New Practices	0	12.5	22.86
T_Establishing New Practices	0	12.5	5.71
T_Enthusing Others for a New Practice	71.43	25	40
T_Stimulating Follow Ups	14.29	25	25.71
Other Learning Processes (O)	*65.70*	*59.89*	*51.47*
O_Project Management	39.56	50.15	53.78
O_Personal Development	6.96	13.15	8.24
O_Multidisciplinary Group Work	0.32	1.83	0
O_Remaining Learning Processes (referring to e.g. project assignment, methods, supervision)	53.16	34.86	37.98

4.6 Concluding discussion

This study allows for two main conclusions. At first, a series of at least two boundary crossing based workshops student-stakeholder collaboration as part of an eight, nine or twenty weeks multi-stakeholder RLE project, stimulates the amount of students' reported stakeholder collaborative activities, and the adoption of the boundary crossing learning mechanisms reflection and transformation. The workshop series does not increase self-efficacy for stakeholder collaboration during an on-going RLE project. Secondly, it is possible to operationalise boundary crossing theory into a contextualised coding frame that facilitates the exposure of students' boundary crossing learning in a multi-stakeholder learning environment. These findings inform

both boundary crossing learning and theory. This section successively discusses the results for the three research questions, implications and limitations, and provides suggestions for future research.

Self-efficacy for stakeholder collaboration

The insignificant effects of the workshops on self-efficacy for student-stakeholder collaboration reject our hypothesis, and are also in contrast with the high average student scores on the usefulness of both workshops in preparing them for their stakeholder collaborative activities. These findings require further considerations.

We did not use a validated instrument to test self-efficacy. Although the used scale was reliable and tailored to the particular context of functioning (Bandura, 2006), we may not have measured the intended construct in the right way. At first, the used items referred to various aspects of students' felt ability to work with the stakeholders during their projects, without explicitly linking this ability to the workshops. More explicit links between the questionnaire and the workshop activities might have resulted in other findings. Secondly, the used items referred to students' felt ability to work with the stakeholders *during* their current project. Scores might have been different if we would have asked the students if working in an RLE influenced their self-efficacy for working with stakeholders in an imaginary *new* project.

Student-stakeholder collaborative activities

The findings that students in condition 2 reported more *done* student-stakeholder collaborative activities and more stakeholder activities compared to non-stakeholder activities, suggest that students in the two workshop condition became more open for stakeholder collaboration compared to the students following none or only one workshop. This effect cannot be attributed to differences in starting level of stakeholder awareness since we controlled for that aspect. Neither can it be caused by differences in self-efficacy. We suggest that the reflection and transformation activities of the second workshop specifically stimulated students' awareness of the importance of collaboration with the stakeholders. This aligns with the found stimulating effect from workshop 2 on reflection as exposed as a result from the boundary crossing analysis discussed in the next section.

Students' boundary crossing learning

The workshops hardly made a difference in the adoption of students' *identification* and *coordination* learning mechanisms. The non-differences between condition 1 and 2 could be attributed to the fact that both student groups were equally supported in conducting identification and coordination activities (by workshop 1 activities). However, the non-difference between condition 0 on the one hand, and condition 1 and

2 on the other hand, implicates that this study does not allow to determine any intended effect of workshop 1.

All conditions showed that more than half of the excerpts for *identification* referred to the sub-process *exploring mutual expectations*. This is on the one hand positive since expectation management influences the whole RLE project process (Gulikers & Oonk, 2016a). However, it also reveals the novice level of the students, who wanted to clarify everything at the beginning of their project, showing ignorance to the high uncertainty levels and constant changes in these types of complex projects in real life (Scholz & Steiner, 2015b, 2015c).This challenges the design of workshop 1. The workshop should support the students in finding a balance between discussing mutual expectations with the partners involved, and leaving room for necessary adjustments of expectations during an RLE learning trajectory that is full of unexpected 'learning surprises'.

When reporting *coordination*, students in condition 2 reported much more *efforts of translation*, i.e. efforts to understand the (languages of the) stakeholders. We consider this to be a side effect of workshop 2 in which the students extensively reflected on the collaboration and (often tough) communication with the stakeholders, and discussed follow-up actions to improve their communication.

Workshop 1, and the series of workshop 1 and 2 together, seem to trigger *reflection* increasingly, although this learning mechanism was not specifically addressed in workshop 1. This implies that workshop support stimulates reflective mechanisms anyway. The remarkable high amount of excerpts referring to the reflection sub-processes *perspective making* and *facilitating perspective making* in condition 2 compared to condition 1, suggests that explicit reflective activities trigger these sub-mechanisms. This is a promising finding regarding the suggested pre-conditional value of perspective making for transformation (Cremers 2016, p. 109).

Although the percentage of excerpts on *transformation* was four times higher in condition 2 compared to condition 0 and 1, this percentage is too low to draw conclusions about the effectiveness of the workshops for facilitating the ultimate transformative aim of the RLE. Low transformative awareness, intentions and activity, relate to our observation that RLE projects, although real life in nature, suffer from the boundaries that students feel between school and the real world. In most RLEs the school is the only and final responsible party in the assessment of students' work, and thus in their study progress. This does not stimulate the students to feel equally responsible for both school projects and real-world project outcomes and follow ups thereof. This may hinder transformation, for which improvement than is more a matter of institutional redesign of the RLE as of redesigning the workshops.

The decreasing amount of excerpts referring to *other learning processes* from condition 0 to condition 2, shows that the workshops engaged students increasingly

with boundary crossing processes. This supports our findings that the workshops raised students' awareness of the importance of boundary crossing in multi-stakeholder processes.

Implications for the educational design of multi-stakeholder learning environments

The proven effect of workshop-based support of student-stakeholder collaboration informs the future pedagogical and didactical design of the RLE, and of similar learning environments as used in higher education programmes in which students are supposed to actively collaborate with and learn from multiple stakeholders (e.g. Angotti et al., 2011; Brandt et al., 2013; Jacoby, 2014; Long, 2012b; Trencher et al., 2015). Intervening in students' learning processes with these types of boundary crossing workshops is useful to make students aware of the mechanisms that underlie working across boundaries, and therewith optimise students' collaborative practices. In addition, explicating boundary crossing and its four learning mechanisms in student-stakeholder collaborative projects enriches essential reflection processes in multi-stakeholder learning environments (e.g. Eyler, 2002; Jacoby, 2014; Sletto, 2010).

Our results suggest that a series of minimally two workshops is needed to trigger students' learning and working with external stakeholders. Moreover, as short courses and workshops have little impact on students' practice (e.g. Moon, 2001), we promote that support of student-stakeholder collaboration is more effective when it parallels the whole RLE project, and is closely aligned to its processes and phases, as it was in our study. Such integrative processes facilitate ongoing reflection on learning and working processes that were previously found to be a critical element in this type of experiential learning (Webb & Burgin, 2009).

In our study, the involved coaching and/or supervising RLE teachers in most cases excused to be present during the workshops, despite agreements made before the workshops that they would join. Consequently, the teachers were not able to relate to and further build on the workshops in their coaching during the RLE projects, hampering student-stakeholder processes to be continuously stimulated throughout the projects.

Translating the results of this study into practice, an effective stakeholder collaborative intervention in a multi-stakeholder learning environment consists of a workshop trajectory of at least two workshops in a one semester project in the presence of engaged RLE teachers. Regular reflection sessions are included to facilitate the translation of what is learned in the workshops into practice, and back into future collaborative steps.

Implications for theory: exploring and operationalising boundary crossing learning

The study shows that triangulating three types of student reports (overall learning experiences, peaks and troughs in the project process and future approaches) as done in this study provides rich data on the occurrence of boundary crossing learning mechanisms in a learning environment that aims to facilitate learning across boundaries. Moreover, the translation of theoretical boundary crossing concepts into a contextualised coding framework appeared to facilitate grasping the studied mechanisms. Both these methodological findings address the call for more systematic empirical studies that uncover and operationalise the theoretical concepts of boundary crossing in working and learning across contexts (Akkerman & Bakker, 2011; Bakker & Akkerman, 2014; Bronkhorst & Akkerman, 2016; Edwards, 2012).

Limitations of the study

A few limitations of the study, may have influenced the results.

At first, students from RLE 1, 2, and 5 (see Table 4.1) were not randomly assigned to conditions. Students voluntarily chose to participate in workshop 2. This may have slightly biased the positive effect of condition 2, because these volunteers may have been more eager to learn.

Secondly, filling out the individual post-test questionnaires took place in two different circumstances, either before or after students' final RLE exams. This may have influenced students' answers. However, to guarantee as objective answers as possible, we stressed to the students that our measurements were totally unrelated to their RLE assessments.

Thirdly, the whole study was based on indirect measures of boundary crossing. Students *could* refer to boundary crossing in their reports on the open questions. In case they did not do so, they may still have experienced boundary crossing processes. Adding more direct measurements, e.g. questions explicitly addressing boundary crossing and/or observations, would have strengthened the study.

Fourth, the study only used data on students' learning processes and not on learning results of the RLE. Large differences between the studied RLEs in assessment strategies hindered us to use learning results as a comparable measure.

Future research

The results of this study incite at least two main directions for future research.

First, relating learning processes to learning outcomes of 'boundary crossing learning environments' would enable to investigate if and how students' boundary crossing activities effect their learning outcomes, e.g. students' project results or boundary crossing competence development. Engeström et al. (1995) mention that when the learner is part of different practices simultaneously, the learner combines

ingredients from different practices to achieve hybrid solutions. This study shows that students did hardly come to any transformation, i.e. the intended hybrid results of the RLE, during their mostly 20 weeks projects. Future research should pay attention to what is needed to stimulate higher education students' transformative results. One suggestion in this respect is to investigate the effect of diminishing the felt boundaries between school and the real world on students' transformative capacities (Bronkhorst & Akkerman, 2016). This could be done e.g. by clearly explicating learning outcomes related to student-stakeholder collaboration, and by stimulating and capturing learning surprises, i.e. emerging learning opportunities, resulting from stakeholder collaboration (Scardamalia et al., 2012). Our ultimate aim eventually is to support students in their development towards transformation agents (Rosenberg Daneri et al., 2015) which they hardly showed to already be in this study.

A second target for future research lies in the professionalization of both teachers and stakeholders, who also need support to be able to effectively work in university-community partnerships (Brundiers et al., 2013). A focus group discussion on effective student-stakeholder support, held with 14 RLE teachers after the closure of the eight studied RLEs (February 2016), showed that teachers were mainly occupied with organisational aspects of school-stakeholder collaboration, and showed yet limited openness for the further development of actual student-stakeholder support. Next, our observations of RLE practices show stakeholders' concerns on how to optimally collaborate with the students, i.e. novices that stakeholders are not used to work with. All partners need to become more aware of, open to, and equipped with capabilities for boundary crossing learning towards transformation. One student (RLE 6; two workshop condition; see Table 4.1) perfectly portrayed where we would finally like to end up in the attempts to effectively support boundary crossing working and learning in multi-stakeholder learning environments:

> People should definitely cross lines to really transform the region. I'm not afraid to cross the line and collaborate with the unknowns, since I feel skilled to do so.

Chapter 5.

Teachers as Brokers: Adding an Out-of-School Perspective to Higher Education Teacher Profiles[6]

Abstract

Higher education institutions are increasingly engaged with society but lack teacher profiles that support an out-of-school oriented performance of teachers. Little is known about teacher requirements to perform well at the interface of university and society. This study develops a role, task and competence profile for teaching in the exemplary, out-of-school oriented multi-stakeholder Regional Learning Environment (RLE). This was done in a descriptive, qualitative design, using a document analysis, and teacher interview and focus group data.

The resulting RLE profile offers nine roles, nineteen tasks, and 24 competencies, the majority of which are new to existing higher education teacher profiles.

Starting a scholarly debate on out-of-school additions to existing teacher profiles, the paper develops an argument for adding the role of broker, including boundary crossing competence, and a collaborative learning attitude, to existing profiles. Practically, the resulting RLE profile is a useful source for identifying teacher requirements in out-of-school learning settings and developing consequential professionalization trajectories.

Keywords

higher education; university-society engagement; teacher professional development; competence; teacher profile

6 This chapter is based on Oonk, C., Gulikers, J., Wesselink, R., Beers, P., & Mulder, M. (submitted). Teachers as brokers: Adding an out-of-school perspective to higher education teacher profiles.

5.1 Introduction

Higher education institutions nowadays are demanded to be relevant to, and engaged with, society (OECD-IMHE, 2012; European Union, 2013). This demand has its foundation in the idea that academia and society could mutually learn from each other when working in transdisciplinary collaborative processes facing societies' complex problems (Scholz & Steiner, 2015b). Society benefits from knowledge produced in academia, whereas higher education students and faculty staff benefit from working on real life projects to acquire professional skills and enrich their practical experience (Lansu et al., 2013; Rosenberg Daneri et al., 2015; Trencher et al., 2013).

However, collaboration and mutual learning between higher education institutions and society requires a lot from stakeholders, students and faculty staff involved (Webb & Burgin, 2009; Chapter 4). The school doors, representing a boundary between the relatively safe and autonomous school world and the complex multi-stakeholder society, literally have to be opened to start mutual exchange. Opening school doors challenges school management and teachers who both need to develop the willingness and ability to connect to society, create university-community partnerships, contribute to research agendas, develop real life learning activities and start to collaborate with external stakeholders, while guiding the students through the multi-stakeholder processes.

Since the last decade of the 20th century, the mutual benefits of university-community partnerships and the design of authentic learning environments in which students and faculty staff collaborate with partners out-of-school, received increasing attention in scholarly debates (e.g. Guzmán-Valenzuela, 2015). However, studies contributing to this debate only pay oblique attention to what is required from teachers to perform in university-community collaborative practices (Brundiers et al., 2013; Stauffacher et al., 2006). Until the date, a systematic identification of roles and tasks that teachers fulfil in a university-community collaborative learning environment, and the competencies that teachers should master to carry out these tasks, has not been done. Moreover, existing higher education teacher profiles (e.g. Giles et al., 2008; Tigelaar et al., 2004), providing generic frameworks for tasks and/or competencies of current teachers, do only slightly address out-of-school oriented elements. In addition, in case the profiles do address relations with the outside world, they mostly refer to external, one-to-one relations of teachers with e.g. workplace supervisors, guest speakers, suppliers or inspection officers. If universities want to meet the demand of society-engagement, teachers should be prepared for out-of-school collaborative practices. A better understanding of responsibilities and requirements for teacher performance in an out-of-school setting is needed to inform current and future teachers' professional development.

In the Dutch, authentic, multi-stakeholder Regional Learning Environment (RLE) multiple stakeholders, including local and regional governmental officials, entrepreneurs, employees from NGO's, citizens, and university staff and students co-create new knowledge towards sustainable regional innovation. This descriptive, qualitative study investigates teachers' roles, tasks and competencies required in the RLE, first aiming at creating a comprehensive teacher profile for teacher performance in this exemplary out-of-school oriented learning context. What is needed for out-of-school ready teachers? The study secondly aims to identify out-of-school oriented gaps in existing higher education profiles, and does recommendations for filling these gaps. What teacher responsibilities and capabilities do we require from teachers when working in an out-of-school oriented learning setting next to what we already expect from them in an in-school oriented setting? The two research questions that guide the study are:

1. What are the roles, tasks and competencies of higher education teachers in the out-of-school oriented, multi-stakeholder RLE, and
2. What out-of-school oriented roles, tasks and competencies does the resulting RLE profile add to existing generic higher education teacher profiles?

Before the methods and results of this study will be explained, the next three sections provide context information and insights from two literature surveys that together help to develop empirically based reference frames required to answer both research questions. For guiding our identification of the roles, tasks and competencies in the exemplary Regional Learning environment (research question 1), we first describe the educational design of, and working processes in, the RLE. For the purpose of finding indications about the type of teacher requirements we may expect to find in the RLE, the second section describes a literature search for indications of teacher requirements in earlier studies on working and learning in other university-community settings. For identifying new out-of-school teacher requirements as an addition to existing generic higher education teacher profiles (research question 2), the third section describes a systematic analysis of these existing profiles being examined on their explicit reference to out-of-school oriented roles, tasks and competencies.

5.2 The Regional Learning Environment as an exemplary university-community learning environment

The RLE as established in the Netherlands since 2005, is a real-world, multi-stakeholder learning environment in which stakeholders from government, businesses, non-governmental organizations, research and education, learn and co-create new knowledge aiming to stimulate sustainable regional innovation (Foorthuis et al., 2012; Meijles & Van Hoven, 2010). Since 2005, 13 RLEs, operating as long-term partnerships in 13 different Dutch regions, have been established. Stakeholders

collaborate on various projects in different team constellations. In most cases, education, i.e. students and/or teachers, is one of the project partners.

From an educational point of view, the RLE provides an authentic, multi-stakeholder learning environment for both higher and vocational education students and teachers from various educational programmes (e.g. De Kock et al., 2004; Herrington & Oliver, 2000). The RLE is characterized by the following educational design characteristics. The students and their teachers work on complex transdisciplinary regional problems in a real life context that require collaboration with multiple stakeholders, including their diverse perspectives and interests (Scholz & Steiner, 2015b). These problems, translated into project assignments, are always identified and commissioned by an external client from the region. The students work on the assignments in student groups, preferably in multi-disciplinary student groups including students from different educational programmes (Chapters 2 and 3). Working on the assignments engages students and teachers in authentic, transdisciplinary tasks and activities (Scholz & Steiner, 2015b). The RLE work results in various types of realistic authentic products that have value for the external client(s) and, ideally, contribute to regional development. All parties involved, i.e. students, teachers, as well as other stakeholders, are expected to learn and collaboratively create new knowledge. Box 5.1 provides an exemplary illustration of activities and output of one RLE i.e. the RLE Peat District.

Teachers can potentially be involved in all steps of the RLE working process (see Appendix 3 for a detailed description of the RLE working process) ranging from initiating networks, organizing learning activities, coaching students to facilitating other RLE actors' collaborative processes. This obviously implies that teachers fulfil different, and over time varying, roles and tasks for which they need to master several competencies. Teachers need to leave the school to participate in an out-of-school learning community. At the same time, teachers retain their original responsibilities such as supervising students and assessing their learning results, though these duties might get different meanings in the RLE context. So, working as a teacher in the RLE requires new out-of-school oriented responsibilities next to performing previously established roles for supporting students' mostly inner-school oriented learning processes. Regarding the broad repertoire of teachers' tasks in the RLE, the RLE provides an insightful context for creating a full teacher profile for out-of-school oriented learning settings. To develop an idea of what might be expected from teachers in out-of-school collaborative learning settings, the next section describes indications for teacher requirements as found in earlier studies on working and learning in other university-community settings.

Box 5.1. Exemplary Illustration of Activities and Output of the RLE Peat District

The RLE Peat District

The Peat District, located in the northern part of the Netherlands, is expected to favour from innovative ideas for facing regional problems related to economic and social decline, decreasing landscape and biodiversity values and climate issues. In 2005, partners from local and regional government, entrepreneurs, research, and education formed the Steering Group Peat District and collaboratively developed and adopted the ”Knowledge and Innovation Agenda for the Peat District”. The Agenda set the most important issues to be tackled, and associated project programmes, a business model for working in the RLE, and a declaration of intent to work together in a multi-year partnership. A regional contract, signed by all partners in 2008 to confirm their commitment, was the starting point for RLE projects in order to execute the various project programmes e.g. on new agribusiness models, water management, and regional imaging and marketing. Next, the contract included agreements on monitoring and evaluation of methodologies used, and knowledge dissemination. The projects were carried out in various constellations of partners, mostly including students and/or teachers. To date more than 100 research projects have resulted in new co-created knowledge, as expressed in reports, toolboxes, and practical implementations. Examples of results are a cost-profit analysis of climate-neutral farms and bio-based economy initiatives of farmers, a technical report on fresh water distribution in the region, and concrete ideas on eco-tourism development of shipping waters. Also new practical networks of groups of stakeholders were established, and a follow up Innovation Programme 2012-2020 was launched focusing on agriculture, water management and energy supply (Boetzkes et al., 2014; Foorthuis et al., 2012).

5.3 Indications for teacher roles in university-community learning settings

The creation of a comprehensive out-of-school oriented teacher profile was never the main objective of studies on working and learning in university-society settings (Brundiers et al., 2013). However, the studies provide many oblique indications for out-of-school oriented teacher roles, and associated tasks and competencies. Reviewing recent lines of reasoning in educational scholarship on building university-community partnerships (e.g. on transdisciplinary learning, learning for sustainable development, boundary crossing), and the design of out-of-school oriented learning environments in higher education (e.g. service learning), reveals seven prominent teacher roles and associated tasks and capabilities. These seven roles, i.e. broker, manager, facilitator of multi-stakeholder processes, expert, translater, student project coach and learner, will be explained below, adding exemplary references in which these seven roles are described. Referencing is not intended to be complete as no systematic review was done.

An overarching role with importance for working across the boundaries of educational institutions with other out-of-school partners, is the role of *broker*, also called boundary crosser or bridge builder (Akkerman & Bakker, 2011; Wenger, 2000). The broker participates in various practices simultaneously and provides a participative connection between different practices (Akkerman & Bakker, 2011; Brandt et al., 2013; Fortuin & Bush, 2010; Walker & Nocon, 2007; Wenger, 2000). At

the same time, brokers are held accountable for responsibilities in their own original practice (Wenger, 2000). Brokers have to master boundary crossing competence, also called transboundary competence, which means that they are able to manage, switch between and integrate multiple discourses and practices across social boundaries (Lansu et al., 2013; Walker & Nocon, 2007). Educational studies that describe the role of broker in university-community partnerships often refer to the teacher/researcher in collaboration with stakeholders from society, but not so often to the teacher working with students and community partners simultaneously (Brundiers et al., 2013).

The role of *manager* is described where it comes to building partnerships with public and/or private organisations outside the educational context, either for economic, research and innovation and/or educational purposes (Lansu et al., 2013). Equivalents for the manager and his tasks are the Transacademic Interface Manager (Brundiers et al., 2013), the project manager (Brundiers & Wiek, 2011), the connector (Whitmer et al., 2010) or the director (Trencher et al., 2013). The manager builds and maintains networks (Ruskovaara et al., 2014) and creates and manages projects (Brundiers et al., 2013), including opportunities for student participation (Rosenberg Daneri et al., 2015). A well performing manager is required to have a basic understanding of out-of-school, real world, topics at stake, to be visionary and entrepreneurial and to master adaptive communication and negotiation skills (Brundiers et al., 2013). The manager should also possess project management skills as to be well-organized and to be able to manage resources and monitor and evaluate processes (Brundiers & Wiek, 2011; Brundiers et al., 2013; Forsyth et al., 1999; Jacoby, 2014).

Either combined in the role of manager (e.g. Brundiers et al., 2013) or described separately (e.g. Stauffacher et al., 2006) is the role of *facilitator of multi-stakeholder processes.* The facilitator, also called empowerer (Trencher et al., 2013), enables and catalyses a continuous collaborative process among different communities, including students, in order to coach participants in conducting participatory research, co-produce knowledge and stimulate social learning (Meijles & Van Hoven, 2010; Sandmann et al., 2009; Wals et al., 2009). The facilitator is approachable, empathic and open, and masters sensitivity, mediation and conflict-resolution skills (Brundiers & Wiek, 2011; Klein et al., 2011).

Trencher et al. (2013) also describe the knowledge *expert* in out-of-school partnerships when teachers/researchers use their content expertise not only in-school, but also in real life projects. Teachers create, demonstrate and diffuse cutting edge innovative ideas, and influence developmental and governing trajectories by advising appropriate implementation strategies. Forsyth et al. (1999) highlight the time-consuming responsibility of expert-teachers in the service-learning studio for double-checking and finishing up loose ends of final student products before presenting them

to the community. For the role of expert, making scientific knowledge understandable for non-experts and inciting community knowledge ownership by joint knowledge generation are regarded as two important capabilities for the out-of-school expert (Peer & Stoeglehner, 2013; Trencher et al., 2013).

Studies on the educational design of university-community learning arrangements enlighten the teachers' role as a *translater* of community demands into educational assignments and the curriculum (Rosenberg Daneri et al., 2015). The teacher in this role is regarded to set objectives for student and community learning simultaneously, develop real life learning activities that provide opportunities for student input in real life stakeholder collaborations, implement these activities into the curriculum, adapt to misalignment of community and educational timelines and develop practice-based assessments (Jacoby, 2014; Rosenberg Daneri et al., 2015).

The teacher also performs in the role of *student project coach,* or tutor, as known from in-school pedagogical settings (e.g. De Bruijn & Leeman, 2011; Wesselink, 2010). However, this role includes new tasks when coaching students' community collaborative projects in university-community learning environments (Stauffacher et al., 2006). Students should acquire participatory competence enabling them to e.g. translate scientific knowledge into community engagement, get such engagement and respond to unpredictable process dynamics (Lieblein et al., 2012; Webb & Burgin, 2009; Wiek et al., 2011b). Teachers' tasks comprise to organise and guide consequential dynamic learning processes (Sletto, 2010) in which teachers act amidst students and stakeholders, including their expectations and perspectives. Teachers are expected to coach students in a participative manner on internal and external collaboration, offer a programme of supportive workshops on different collaborative issues (Vilsmaier & Lang, 2015) and ensure students' critical reflection (Sletto, 2010; Stauffacher et al., 2006). Identified crucial competencies for the out-of-school oriented student project coach encompass the ability to facilitate group processes aligned with understanding of transdisciplinary, or equivalent multi-stakeholder, learning approaches (Rosenberg Daneri et al., 2015; Stauffacher et al., 2006). Studies on service learning, regarded as a deeply rooted and broadly studied university-community learning environment (Giles & Eyler, 1994; Jacoby, 2014), highlight the crucial essence of critical reflection in student learning from working with community partners, and the subsequent role and capabilities of the student project coach as a facilitator of reflection. Service learning draws on John Dewey (1933) in defining critical reflection as 'the active, persistent and careful consideration of any belief or supposed form of knowledge' (Dewey, 1933, p. 9). Facilitating reflection comprises guiding students through the ongoing process of (re)considering their values, beliefs and acquired knowledge. This would enable them to question their a priori assumptions, recognize complexity and reconsider how their practices relate to others'

practices (Jacoby, 2014). Regarded as a key in mastering the facilitation of reflection (Jacoby, 2014; Sletto, 2010) are the ability to organise reflection (when, where, whom involved?), to ask the right questions at the right moment, to show respect for viewpoints, to balance challenge and support and to openly discuss subjectivity (Jacoby, 2014; Sletto, 2010).

The teacher in the role of *learner* is seen as crucial in education in general, and even more explicit, in transdisciplinary research and education (e.g. Forsyth et al., 1999; Klein et al., 2011; Lang et al., 2012; Lansu et al., 2013; Stauffacher et al., 2006). All teachers are expected to be open to learning, to actively reconsider own practices as a result of the learning, and to contribute to mutual learning processes between all actors involved.

Although covering a broad range of teacher roles and requirements, these indications are in most cases by-products of studies that had no teacher-central focus. Our study aims at systematically identifying roles, tasks and competencies in order to provide one full teacher profile for an exemplary out-of-school oriented learning environment, i.e. the Regional Learning Environment. Involvement in the RLE exposes teachers to both the elements of building partnerships, and facilitating learning amidst students and various external partners; these are elements that are also apparent in the above identified roles. As such, the RLE is expected to be a suitable exemplary learning environment for the creation of a full out-of-school oriented teacher profile.

This set of three theoretical sections ends with a section on the lack of above mentioned kinds of out-of-school oriented roles, tasks and competencies in existing generic higher education profiles. This analysis is used as input for research question 2.

5.4 The lacking out-of-school perspective in existing higher education teacher profiles

Higher education worldwide does not have a tradition of using quantitative standards and evaluation criteria for the quality of teaching. Instead, every institution is responsible for its own teaching quality and should set the bar internally (OECD-IMHE, 2012). There is however much policy debate on what high quality teaching involves (OECD-IMHE, 2012; European Union, 2013), leading to increasing country specific attempts to translate these debates into guiding competence frameworks for higher education teachers. Policy debates also prompted scientific research on teacher roles, tasks and competencies for various educational approaches and settings. Teacher profiles and/or competence frameworks inform teacher professionalization and evaluation trajectories (Mulder, 2017; Tigelaar et al., 2004), and support educational institutions and their teachers to adapt to a certain educational approach or innovation.

As such, the profiles are expected to contribute to the quality of education (Wesselink, 2010).

This study starts from the idea that existing higher education teacher profiles pay little attention to teacher requirements for performing in an out-of-school, university-community learning setting. This idea was evaluated before the start of the actual study, to confirm in advance the added value of this study, and to provide an empirically based reference frame for comparing the RLE profile developed in this study with existing teacher profiles. To carry out this evaluation in a systematic way, the following steps were taken. First, because this study was carried out in a Dutch context, the two guiding national policy frameworks for teacher competencies at both higher vocational level (Onderwijscoöperatie, 2014) and university level (VSNU-NOA, 2016) were analysed by systematically identifying all roles, tasks and/or competencies that explicitly refer to out-of-school oriented aspects of teachers' work. Next step was a literature search for generic higher education teacher profiles as described for current higher education in peer-reviewed journals. The search started from the profile of Tigelaar et al. (2004) to make sure that we started the evaluation with the first profile as developed in response to the latest influential educational innovation towards more student-centred social-constructive education (Tigelaar, 2004). University-society collaborative learning environments, including the RLE, fit in this educational approach (Rosenberg Daneri et al., 2015; Stauffacher et al., 2006). Studies that cited the study of Tigelaar et al. (sources: ERIC, Google Scholar, SCOPUS) were checked for offering generic profiles until saturation was reached. This resulted in four studies providing generic teacher profiles for higher education teachers, albeit for a specific educational approach within higher education. These profiles were analysed in the same way as the policy frameworks. Table 5.1 summarizes the resulting analysis by showing per teacher profile the percentages of out-of-school oriented items on the total of presented items, and a description of the out-of-school oriented items as found.

The Dutch 'Wet Bio', i.e. the law on professions in education as published in the Dutch Government Gazette 2005, 460 (Staatsblad van het Koninkrijk der Nederlanden, 2005), states the capability requirements for all Dutch teachers in primary, secondary, and vocational education. The most updated version of the law, to be effective from 2017 onwards, was used for analysis in this study (Onderwijscoöperatie, 2014). The law distinguishes 54 capability requirements divided into five competence domains. Seven requirements explicitly refer to out-of-school relations of the teacher, albeit one-to-one relations with professionals for e.g. practical knowledge updates or arranging students' work placements, and not multiple relations of teachers occurring in multi-stakeholder university-society learning settings.

Table 5.1. Roles, Tasks and Competencies Explicitly Referring to and Regarded as Relevant for Working in an Out-of-School Oriented Setting as Found in Six Selected Higher Education Teacher Profiles (including percentages of out-of-school oriented items per profile)

Selected teacher profile **# out-of-school oriented items as part of total # items (%)**	**Roles, tasks, and/or competencies explicitly referring to working in an out-of-school oriented setting**
Onderwijscoöperatie, 2014 7 out-of-school oriented competencies on a total of 54 competencies (13%)	A competent teacher: -is able to collaborate with colleagues in, and if relevant, outside the school, and to align his professional acting with them -is able to link his domain-specific knowledge and skills to the professional practice -has actual knowledge of the professions and associated required competencies for which he prepares his students -is able to contribute to an actual curriculum in collaboration with colleagues in- and outside the school -is able to maintain and use contacts in the professional field for which he educates -is able to design and supervise student learning at the workplace in collaboration with professionals at the workplace -is able to align his pedagogical interventions with other people, among whom professionals at the workplace
VSNU-NOA,,2016 9 out-of-school oriented performance indicators (in competence domains 'vision' and 'external awareness') on a total of 192 performance indicators (5%)	A competent teacher: -explores sources of inspiration; orientates on visions regarding his position or profession -explicates national and international future opportunities for the faculty -formulates his own mission or objectives in the light of internal and external developments -explicates how to change the organisations' strategies to be able to adequately react on internal and external developments -knows current news topics related to his position and profession -informs himself on economic, social, domain-specific and other developments -knows about developments in neighbouring disciplines -translates societal developments into the own profession -has external contacts that inform him on societal trends relevant for the own profession
Tigelaar et al., 2004 1 out-of-school oriented competency on a total of 21 competencies (5%)	A competent teacher: -has knowledge of new developments in his or her subject
Gilis et al., 2008 2 out-of-school oriented performance indicators on a total of 46 performance indicators (4%)	A competent teacher: -knows his discipline and developments in the field and is able to judge the relevance of such developments for his own teaching -knows the relevance of his own course component for the profession and stimulates students to acquire a critical attitude and a commitment based on an insight into their future profession
Wesselink, 2010 6 out-of-school oriented tasks on a total of 26 distinguished tasks (23%)	The teacher in the role of: -expert follows developments in businesses, organisations and society and translates these to his own educational practice -coach reflects with students on their future profession, being aware of his own view of that profession -researcher keeps himself informed about research in his profession -manager informs stakeholders in a professional way and uses relevant information from them -manager establishes and maintains relationships with organisations -manager involves relevant persons from practice in student assessment procedures.
Smith & Simpson,1995 2 out-of-school oriented competencies on a total of 34 competencies (6%)	A competent teacher: -communicates important values inherent to the discipline or profession -advises students of career opportunities in the discipline or profession

From 2011, universities in the Netherlands are recommended to use the university competence instrument as developed by the Association of Universities in the Netherlands (VSNU-NOA, 2016) to support HRM and professionalization trajectories. The instrument includes 32 competence domains covering six performance indicators each, and sets selections of required competence domains for 115 distinguished university staff positions. The selected competencies for a respective position are regarded key to perform this position within the university context. Eight competence domains, including six performance indicators each, are required for teaching positions. Two of these eight competence domains include out-of-school oriented performance indicators where it comes to putting problems in a more encompassing framework, formulating a mission based on external developments, and explicating organisational strategies that enable to react on external developments. However, these out-of-school oriented performance indicators are limited to being informed about societal and expertise related developments, and the use of this knowledge for the own or organisations' performance. The indicators do not explicitly refer to collaboration with any people from the broader framework. Remarkably, networking competence and customer oriented acting, two other competencies from the instrument that imply an explicit out-of-school focus, are not regarded as required for teachers and researchers but only for supporting staff positions.

Continuing with the scholarly profiles, Tigelaar et al. (2004) developed a competence framework for teaching in student-centred education starting from a combination of earlier frameworks from the literature, followed by a pedagogical expert validation thereof. The resulting framework distinguishes seven teacher roles (e.g. organiser, lifelong learner) each including three rated 'most important' competencies (Tigelaar et al. 2004, p. 262). Only one of the 21 important competencies includes an out-of-school reference, i.e. that the teacher should have knowledge of new developments in his or her subject.

Gilis et al. (2008) also developed a competence profile for teaching in student-centred education. Instead of starting from existing profiles that were validated by pedagogical experts, as Tigelaar et al. (2004) did, Gilis et al. used teacher interview data to construct the profile. Their analysis resulted in 15 competencies divided over three competence domains (i.e. professional attitudes related to teaching, didactic competencies, and subject matter competencies), and 46 performance indicators providing in-depth insights in the teacher-student relationship and expected teacher acting as a result thereof. Two of the 46 indicators, i.e. knowing about developments in the field and about the relevance of the own course for the profession, refer to the out-of-school world. As in Tigelaars' (2004) and the VSNU-NOA (2016) profile, also in Gilis' profile, the two out-of-school oriented items are limited to knowledge on

developments in the professional field, and do not include collaborative capabilities with external partners (Gilis et al. 2008, p. 546).

Wesselink (2010) developed a generic job profile for teachers in competence-based secondary and higher vocational education, which is also an example of a socio-constructivist educational innovation. The profile includes five teacher roles covering a total of 26 tasks. Six of these 26 tasks include an out-of-school orientation, albeit again limited to knowledge from the profession and contacts with parents and workplace organisations only, not explicitly with multiple stakeholders from the field (personal communication, June 1, 2016).

Since the profile search starting from Tigelaar et al. in 2004 only resulted in European profiles, and it was regarded as to be useful to add non-European insights, SCOPUS and ERIC were searched on hits for the combination of the keywords 'teacher profile', and 'higher education', in the latest time range from 1990 to date. This search resulted in one non-European generic profile which was included in the selection and analysed, adding insights from the US (Smith & Simpson, 1995). In this US profile, two of the 34 expert-panel validated competencies make an explicit reference to relations between teachers and the out-of-school, professional, world.

The majority of the existing profiles only refer in 4-6% of their included items to out-of-school oriented duties and/or capabilities (Table 5.1). This confirms our initial idea that existing generic higher education teacher profiles offer only limited insight in what is required from teachers to work in out-of-school settings. Existing profiles were created from an in-school perspective and did not intend to cover out-of-school oriented requirements (Gilis et al., 2008; Tigelaar et al., 2004). This study is a first attempt to fill the out-of-school oriented gap in existing teacher profiles deemed crucial in upcoming university-society engagement.

5.5 Methods

The study was carried out in a qualitative, descriptive design. To answer research question 1, RLE teachers' roles, tasks and competencies were identified through a document analysis complemented with the analysis of teacher interview and focus group discussion data. All data were analysed in a multi-rater, theory informed, open coding process (Miles et al., 2014). To answer research question 2, additions of the resulting RLE teacher profile to existing higher education teacher profiles were determined after comparing the resulting profile with the literature analysis of existing profiles as described in the theoretical part of this paper (see also Table 5.1).

Developing an RLE teacher profile

To be able to develop a comprehensive RLE teacher profile, an appropriate understanding of all responsibilities and requirements for teachers in the RLE context

is needed. Using working processes in an organisation, including responsibilities and requirements of employees in these processes, is regarded as an effective approach for creating a job competence profile (Dubois, 1993; Mulder et al., 2005; Wesselink, 2010). This approach involves the structuring of a profession (in this study the teacher), based on working processes in a certain context (in this study the RLE) into main roles, associated tasks and competencies that need to be mastered to perform a certain role and/or set of tasks (Mulder 2014, p. 125). A quick scan of the collected data for this study revealed clear roles, tasks and competency descriptions to occur. A *role* was then defined as a label for a meaningful cluster of tasks, and helpful in structuring tasks as found in the data. A *task* was defined as an activity that was carried out, or supposed to be carried out, by a teacher executing a step in the working process of the RLE (see Appendix 3). A *competency* was defined as an integrated cluster of knowledge, skills and attitudes enabling a person to perform a certain task or a set of tasks associated to a role (Mulder, 2014; Mulder & Winterton, 2017). The three constructs of role, task and competency were used as basic codes of the constructed coding frame.

A document analysis followed by the analyses of teacher interviews and focus group discussions was conducted to identify all elements of the RLE teacher profile. We opted for a document analysis on all kinds of practical documents, since the RLE was a new learning environment on which few scientific papers had been written. The available documents were practical working documents (e.g. business plans, communication brochures, evaluation reports) produced as a result of, and referring to, the working processes in the RLE. The documents included many expressions from teachers, and other involved practitioners talking about teachers, on their duties and abilities. We preferred to use secondary data from documents above primary teacher inquiry data, because the documents were expected to reflect a broad range of relative objective, well thought-out opinions of many teachers and other practitioners involved, which we did not expect to reveal through direct teacher inquiry. By mirroring the draft-profile resulting from the document analysis to primary teacher data from interviews and focus groups, we expected to have used an optimal combination of methods to make up an RLE teacher profile at this stage.

Document analysis

The website www.dewerkplaats.eu (later transferred into www.groenkennisnet.nl) was used as a basic source for the selection of the documents. This website was the main official communication medium for the RLE that all RLE practitioners used to upload their public documents. All complete working documents put on the website, from the start of the RLE in 2005 to 2011, were included in the selection. The final selection

included 95 documents different in type e.g. business plans, information brochures and films, annual reports and evaluation reports.

From all documents, each meaningful expression from a teacher, or from another RLE practitioner referring to a teacher task or ability, was extracted and described as a single excerpt. This resulted in a document of 677 meaningful excerpts. Each excerpt was categorised by the first author as a role, task, competency or a combination of these.

All excerpts categorised *role* were openly coded by the first author (Strauss 1987, p. 58). Each excerpt containing a new role description was attributed a new role label. All excerpts categorised *task* were coded in the same way. In each case the excerpt provided a link between a task and a role, the task was associated to a role (e.g. 'the student project coach should support students in finding the right persons and organisations'). In case this link was not provided in the data (e.g. 'you should monitor the quality standard for the project as set at the start'), the task was put in a box 'non-role-associated tasks'. All excerpts categorised *competency* were first coded in the same way, after which one aggregating step was built in by combining detailed descriptions of competencies into more generally defined competencies (e.g. 'listening well to all people involved' and 'being able to give other people room to express themselves' were labelled 'social skills to communicate with different stakeholders'). This was done to prevent for a long list of detailed competencies but construct a list of clear, distinctive competencies. In each case, the excerpt provided a conditional link between a competency, and a role and/or task, the competency was regarded useful for the performance of, and associated to that role and/or task. In case links between competencies and roles and/or tasks were not provided in the data, the competencies were put in the box 'non-associated competence domains'.

To increase the reliability of the coding work, two co-authors coded a randomly selected 10% of the role and task excerpts (Cohens' $\kappa = 0.82$), and coded for the full competency aggregating step ($\kappa = 0.72$). These two inter-rater reliability scores represented an almost perfect respectively substantial strength of agreement (Landis & Koch, 1977). The three raters discussed differences until they reached consensus. The document analysis resulted in a draft RLE teacher profile.

Interviews and focus group discussions

To validate the draft teacher profile six interviews with RLE teachers ($n = 6$) and 13 focus group discussions with RLE teachers and school managers ($n = 78$) were conducted. The interviewees were asked two open questions i.e. 'which roles and tasks should the RLE teacher perform in the RLE?', and 'which competencies should be mastered to execute these tasks?'. The focus group discussions used the World Café method (Brown & Isaacs, 2005), all with a focus on experienced and expected roles,

tasks, and competencies of RLE teachers. Transcribing all interview and focus group discussion data into meaningful excerpts resulted in 422 excerpts. These excerpts were categorised and coded in the same way as the excerpts from the documents. In case a coded role, task or competence was similar to one found trough the document analysis, it was neglected. In case a coded role, task or competency appeared to be an addition to the draft-profile, it was added and marked as an addition. The interview and focus group data were only used to add to the draft-profile. The elements identified through the thorough document-analysis were kept intact despite they did not reveal from the interview and focus group data.

Determining the added value of the RLE profile

To determine how the constructed profile added to existing profiles for teaching in higher education, a systematic comparison was made between the newly constructed profile and results from the analysis of existing profiles (see Table 5.1). A task or competency was given the label 'new' if there was no equivalent found in one of the existing profiles, and a label with the reference for the existing profile if an equivalent was identified in that existing profile. A task or competency was given the label 'in-school' if the task or competency did not include a specific out-of-school focus. For in-school RLE tasks and competencies we could not determine whether these were new or had their equivalents, since we only analysed the existing profiles on out-of-school oriented elements. In case an unambiguous choice for a label could not be made based on the descriptions, the respective task or competency was assigned two labels. A role was regarded as an addition to existing profiles if the majority of the associated tasks and competencies received the label 'new'.

5.6 Results

The document analysis resulted in a draft RLE teacher profile including eight roles, one to four tasks per role and 24 competencies, that were all associated to one or more roles. The analysis of the interview and focus group data resulted in one additional role (i.e. Learner in a Learning Network), one task for this role, and an additional task for the role of Learning Project Developer. No additional competencies were found. The draft profile was adapted to the findings from the interviews and focus group discussions, which resulted in the final RLE teacher profile for working as a higher education teacher in the multi-stakeholder RLE (see Table 5.2 and Table 5.3, both at the end of Chapter 5). This answered research question 1.

Answering research question 2 on what the resulting RLE teacher profile adds to existing generic teacher profiles, it was found that 11 of 19 (58%) tasks and 13 of 24 (54%) competencies were not identified in existing higher education profiles (see Table 5.2 and Table 5.3). Five of 19 (26%) tasks were labelled both new and already

found, due to ambiguous descriptions. For the roles of Business Developer, Learning Project Developer, Process Facilitator, Actor and Expert the majority of tasks was labelled 'new'. These five roles are regarded to be an addition to known roles for higher education teachers.

The Business Developers' task to initiate, build and maintain strategic networks is regarded as new from the broad multiple stakeholder network point of view, but also found in Wesselinks' (2010) *manager* who is expected to establish and maintain relationships with out-of-school organizations. Although in Wesselinks' profile these relations are mostly one-to-one relations with workplace organisations, different from the multiple interrelated relations in the RLE, networking tasks for both the RLE Business Developer and Wesselinks' *manager* show similarities. The Student Project Coach is a known role for higher education teachers, and not identified new to existing profiles. However, the role comprises new task elements when performed in the RLE where teachers work with students from various disciplines and educational levels in one student group. The role of Learner has also been identified before (Onderwijscoöperatie, 2014; Tigelaar et al., 2004; VSNU-NOA, 2016), but in the RLE includes the new task element of active learning from the collaboration with multiple external stakeholders.

The thirteen competencies labelled 'new' mainly comprise capabilities for working in a multi-stakeholder setting and flexibly switching between educational and out-of-school requirements. 63% of the associations made in the data between roles and new competencies, referred to new, instead of known, roles (see Table 5.3).

5.7 Conclusion and discussion

This study confirms a limited out-of-school oriented focus in existing higher education profiles. Higher education institutions, although demanded to be relevant to and engaged with society, are currently not supported by evidence-based insights in responsibilities and requirements for teachers in out-of-school collaborative settings. To address this gap, this study at first provides a primary out-of-school oriented teacher profile based on teacher roles, tasks and competencies for an exemplary out-of-school oriented learning setting, i.e. the RLE. Secondly, the resulting RLE teacher profile offers a set of out-of-school oriented roles, tasks and competencies that appear to be new to existing comprehensive higher education teacher profiles. This discussion section reviews the developed RLE teacher profile, and develops an argument for what elements of this exemplary RLE profile should be added to existing generic, mostly in-school oriented, higher education teacher profiles. This in order to make these existing profiles properly address out-of-school teacher requirements. Next, this discussion section illuminates limitations and implications of the study.

Reviewing the developed RLE teacher profile

The five new roles of Business Developer, Learning Project Developer, Process Facilitator, Actor and Expert, as identified in the RLE, mainly comprise organisational responsibilities, translating external demands into learning activities and curricula, and tasks related to facilitating and performing in multi-stakeholder processes. Although these roles and associated tasks are new to systematically developed teacher profiles, many of them have been recognised in several studies on working and learning in university-society settings as described in our theoretical framework (Section 5.3). Organisational tasks, attributed to the RLE Business Developer, were reflected in the role of manager. The RLE Learning Project Developer has similar tasks as the translater. The Process Facilitator and Expert roles also raised from previous studies. The role of Actor, acting as an equal partner besides the other out-of-school participants, seems to be a role not recognised before. Although teachers appear to experience the role of actor as challenging and time-consuming, performing in this new actor role is suggested an attractive opportunity in the light of practice-based professionalization of teachers. Teachers' exposure to real life practices guarantees their actual feeling with the profession they are educating for (Gulikers et al., 2008). Having a constant foot in practice is at least crucial for vocational teachers (De Bruijn & Leeman, 2011).

Remarkably, the teachers' student-coaching tasks, including coaching students when collaborating with external partners and crucial accompanying reflection activities (Sletto, 2010), receive relatively little attention in the RLE. The level of attention to coaching is at least low compared to elaborate descriptions on, the importance of, coaching practices in reviewed studies on other out-of-school learning environments (e.g. Jacoby, 2014; Stauffacher et al., 2006; Vilsmaier & Lang, 2015). A previous study on student learning in the RLE highlighted a high coaching intensity to be a precondition for student learning in the RLE (Chapter 2). Low attention for student-coaching might be due to the developmental stage of the RLE. Setting up the RLE including collaborations with external partners, seems to require a lot from the teachers on the more macro level (Foorthuis et al., 2012), inciting roles like Business Developer and Learning Project Developer, before being ready for the micro level that encompasses project-executing and student-coaching tasks.

Repeating the study on more recent documents and interview data, that are expected to reflect a more established status of the RLE, may reveal more teacher-student coaching tasks. This is an important suggestion for future research as students, novices in their collaboration with stakeholders, appear to learn more from their collaborative work with stakeholders in case they are intensively supported by their teachers (Chapter 4).

The new competencies, not identified in existing higher education teacher profiles, appear to mainly comprise 'brokering' elements. The competency descriptions are full of verbs that are typically used when referring to building bridges between various practices and perspectives like connecting, exchanging, switching, adapting and aligning. These competencies, recapped in the concept of boundary crossing competence (Walker & Nocon, 2007), are regarded as necessary for the role of broker. This role has been mentioned above to be an overarching role for working as a teacher in out-of-school oriented settings (Akkerman & Bakker, 2011; Brandt et al., 2013; Engeström et al., 1995; Wenger, 2000).

Adding an out-of-school perspective to existing higher education teacher profiles

Regarding the fact that our resulting out-of-school profile was based on one exemplary learning environment, and was compared to mainly European, in-school oriented, generic higher education profiles, we do not suggest to add all identified new elements to existing generic higher education teacher profiles in an attempt to guarantee their out-of-school focus. However, to start a necessary scholarly debate on what elements to add, we suggest to at least add the role of broker. The broker, as argued to be an overarching role for many of the new RLE roles, constantly interlinks practices for which he needs to master boundary crossing competence (Akkerman & Bakker, 2011; Walker & Nocon, 2007). This brokering role and its associated tasks and competencies seem to capture what is most crucial for performing in any kind of out-of-school collaborative setting in higher education: connecting practices.

Another more overarching new competence element that we suggest to add to existing profiles is the collaborative learning attitude i.e. the ability and willingness to stimulate collaborative learning. Table 5.3 (Competency code U1) shows that this competency is linked to five of the nine RLE roles, of which four new roles, and is as such representative for an out-of-school orientation. Existing higher education profiles limit the teachers' learning capabilities to the teachers' own personal and domain-specific development (Tigelaar et al., 2004), while out-of-school activities are likely to strongly benefit from an attitude towards stimulating everyone's learning (e.g. Wals et al., 2009).

Final remarks on limitations and implications

With respect to the RLE profile, some reserve is required to the validity of the results. The profile is based on just one exemplary university-society learning setting, and is created on the basis of a document analysis. This may have limited or over-emphasized some roles, tasks and/or competencies. However, the document-based draft-profile was complemented with interview and focus group data, which did not largely change the draft-profile. The resulting profile is considered to be empirical and

reflecting the worker's meaningful experience of work (McLagan,1980). Moreover, the profile was corroborated by a literature review on out-of-school oriented teacher responsibilities in other university-community learning settings in which much overlap was found with the developed RLE profile. In view of these considerations, we suggest this RLE teacher profile to be a useful source for further studies and practical use.

The RLE profile can be used as a starting reference for higher education institutions involved in other out-of-school learning environments to investigate teacher profile elements that might be of importance in their contexts. Are these roles, tasks and competencies relevant in our context? Do we identify additional roles, tasks and competencies? Do we want all our teachers to fulfil all these roles, or do we better divide these roles across teaching teams? Which competencies need to be developed amongst teaching staff, and what should professionalization trajectories look like? Thus, we argue that using the exemplary RLE profile to reflect on teacher performance in all kinds of out-of-school learning environments offers ample opportunities for required out-of-school professional development of individual teachers and teacher teams.

In conclusion, this study provides a first full out-of-school oriented higher education teacher profile, and suggestions for out-of-school oriented additions to existing generic higher education teacher profiles. The study feeds required scholarly debates on both out-of-school elements in future higher education teacher profiles, as well as on teacher professional development in the context of out-of-school learning settings. Teachers as brokers, who master boundary crossing competence and show a collaborative learning attitude, are expected to serve higher education institutes' engagement with society.

Table 5.2. Roles and Tasks of Higher Education Teachers in the Regional Learning Environment (*Italic = added as a result from the interview and focusgroup data analysis)* Including the Label 'New', 'In-School Oriented' or 'A Reference to the Existing Higher Education Teacher Profile that Contains its Equivalent'

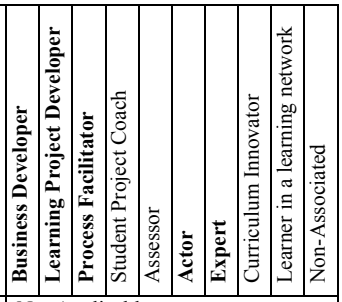
Role (**Bold** = **addition to existing profiles** (see Table 5.1))	**Tasks**	**Label for addition to existing teacher profiles** (seeTable 5.1)
1. Business Developer	a. To initiate, build and maintain strategic networks in the region	New; Wesselink, 2010
	b. To contribute to the preparation of the regional knowledge agenda	New
	c. Acquisition of project assignments in which students can participate	New
	d. Organization of the RLE working process	New
2. Learning Project Developer	a. Translation of a regional demand (mostly an item from the regional knowledge agenda) into one or more feasible project assignments for various educational programmes	New
	b. Planning and organization of student projects (i.e. scheduling, staffing and financing)	In school
	c. Supporting students and stakeholders in the articulation of real world project assignments	New
3. Process Facilitator	a. Management of expectations with respect to involved clients, educational institutions and students	New
	b. Facilitating mutual learning in a transdisciplinary learning network with project members from different disciplines and educational levels	New
	c. Facilitating reflexive monitoring in a transdisciplinary network	New
	d. Controlling the commonly set working agreements and quality standards	New
4. Student Project Coach	a. Supervision of student projects in terms of a content oriented, methodological and process oriented guidance of student project teams often consisting of students from various disciplines and educational levels	New In school
5. Assessor	a. Assessment of a student project in the light of both the educational requirements and the requirements of the client	Wesselink, 2010
6. Actor	a. To participate in projects as an equal partner in relation to other actors	New
7. Expert	a. To develop and distribute co-created knowledge and research methods	New
	b. To upgrade or translate project results of students into a useful product for the client	New
8. Curriculum Innovator	a. Transfer of (in RLE projects) co-created new knowledge into other curricular courses	New; VSNU-NOA, 2016
	b. Structural embedding of the RLE into the curriculum and into the institutional organization	In school
9. Learner in a learning network	*a. To be an active and collaborative learner*	New In school

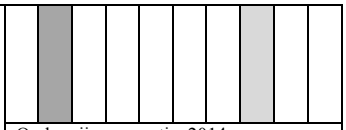
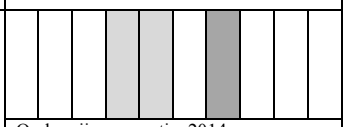
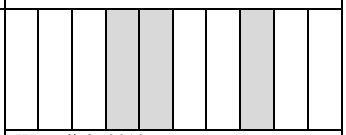
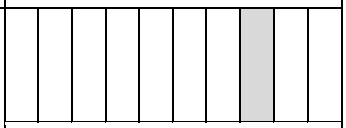
Table 5.3. Competencies Required from RLE teachers (*including two illustrative examples of performance indicators per competency*), Roles to which Associated in the Data and References to Existing Higher Education Teacher Profiles that Contain an Equivalent Competence.

Competence code	Description Competence *(including two illustrative examples of performance indicators)*	Roles as associated to in the data **New Role as Asscociated to** Known Role as Associated to Competency Not Associated to a role in the data									
New; not identified in existing higher education teacher profiles		**Business Developer**	**Learning Project Developer**	**Process Facilitator**	Student Project Coach	Assessor	**Actor**	**Expert**	Curriculum Innovator	Learner in a learning network	Non-Associated
A	Capabilities to act effectively within the complex and dynamic system of a transdisciplinary learning environment in which wicked societal issues are faced[7] *The Business Developer has the ability to adapt to unpredictable and uncertain situations that occur in the dynamic RLE* *The Actor is able to think outside his own frame of reference, dares to take risks and takes responsibility for his own acts*										
B	Capabilities for a positive and effective way of dealing with a variety of stakeholders *(sub-labelled into B1, B2, and B3)*	Not Applicable									
B3	Being able to connect various stakeholders *The Business Developer is able to create a feeling of ownership amongst the stakeholders* *RLE business is teamwork; you should continuously show the willingness to cooperate (Non-associated to a role)*										
C	Being able to continuously switch between and serve educational and stakeholders' interests *The Student Project Coach is able to continuously align his student supervisory approaches with regional interests* *The Expert is able to show respect for the concerns of the client*										
E	Acquisition skills *The Business Developer has a natural ability to support other actors in clarifying their demands* *The Student Project Coach masters acquisition skills at such a level that he can support students in developing acquisition skills*										

[7] Associated system characteristics: 1. Structural changes are needed; 2. The changes cannot be directed; 3. The effects of changes are uncertain (Rotmans et al., 2001).

F	Being able to use and practically apply domain-specific expertise in a transdisciplinary collaborative learning environment *The Student Project Coach is able to combine his basic domain-specific expertise with skills needed in a transdisciplinary professional context* *The Actor is able to apply his own knowledge, methods and techniques for developing innovative practices*										
G	Being able to facilitate learning processes of all actors involved including the design and use of reflexive monitoring *The Process Facilitator is able to create a respectful, safe and open working environment* *The Learner in a learning network is able to make others aware of their learning processes*										
K	Being able to perform expectation management between student, teacher and client(s) *The Process Facilitator shows respect for both the clients' and students' interests* *The Process Facilitator knows the possibilities and constraints of both the client and the students*										
L	Capabilities to, throughout a project, align a student assignment in the light of both the regional demand and students' learning needs and capacities *The Process Facilitator dares to adapt mutual expectations while keeping focused on the agreed end result* *The Student Project Coach is able to serve both students' development and regional innovation*										
M	Being able to monitor the quality standard as set in consultation with the stakeholders, and increase the quality of products to be delivered *The Process Facilitator is able to continuously monitor that the risks and energy that local stakeholders put in the project are in line with the quality of the end product* *The Expert is willing to take over a stagnated project and put effort and time in quality increase of the products*										
O	Capabilities for stimulating knowledge creation and dissemination *The Expert is driven to create new knowledge, or contribute to knowledge creation, and is not quickly satisfied with already existing solutions* *The Expert has up-to-date professional expertise and is able to quickly deepen this expertise*										
Q	Leadership in inner and out-of-school working processes *The Business Developer is willing and able to take the lead in the start up of an RLE working process* *The Curriculum Innovator is not afraid of his team manager*										
S	Procesmanagament of project teams (student- and other teams) *The Process Facilitator shows his involvement, and is able to get, and keep the other actors involved* *The Student Project Coach is sensitive for the atmosphere and culture*										
U	Learning	Not Applicable									
U1	Expressing a collaborative learning attitude *The Expert shows openness for exchange and learning from good practices elsewhere* *The Learner is able to listen with respect for what he does not understand*										

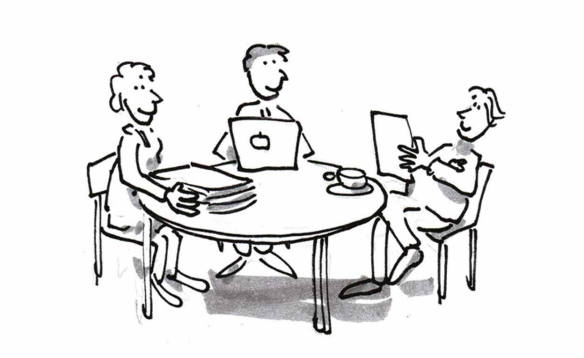
Already identified in existing higher education teacher profiles (including references to existing profiles in which an equivalent has been found)		
B	Capabilities for a positive and effective way of dealing with a variety of stakeholders *(sub-labelled into B1, B2, and B3)*	Not Applicable
B1	Knowledge of the relevant social system, in casu relevant external stakeholders and their practices *The Business Developer has an up-to-date network both in and outside the school* *The Learning Project Developer knows the crucial actors needed to articulate student assignments*	Gilis et al., 2008; Onderwijscooperatie, 2014; Smith & Simpson, 1995; Tigelaar et al., 2004; VSNU-NOA, 2016; Wesselink, 2010
B2	Social skills to communicate with different external stakeholders *The Business Developer is able to put himself into the values, interests and feelings of other people* *The Process Facilitator listens well and is able to give people with different opinions room to express themselves*	Onderwijscooperatie, 2014; Wesselink, 2010
D	Substantive understanding of RLE project topics and RLE project-proposals *The Business Developer understands regional development processes* *The Actor understands broadly oriented demands from the region, and is able to unravel these into concrete project-proposals*	Onderwijscooperatie, 2014; Gilis et al., 2008; Tigelaar et al., 2004; VSNU-NOA, 2016
H	Capabilities to effectively implement the RLE within the school organization *The Learning Project Developer knows many people from both educational and stakeholders' organizations, and at both strategic and operational levels* *The Curriculum Innovator has the willingness and takes initiative to align planning and content of the curriculum with practice*	VSNU-NOA, 2016

I	Capabilities to translate a project theme as identified in the region in a workable[8] student assignment while maintaining its authenticity *The Learning Project Developer has market knowledge to assess whether a regional demand is authentic* *The Curriculum Innovator is able to translate a regional project theme into smaller sub-projects that can be implemented in the curriculum*	 Onderwijscooperatie, 2014
J	Being able to coach student-stakeholder collaborative projects *The Student Project Coach has a huge repertoire of questions available, and is able to ask the right questions at the right moment to both students and other actors involved* *The Expert is able to leave room for students' input over privileging his own input*	 Onderwijscooperatie, 2014
N	Being able to assess student learning outcomes of RLE projects *The Assessor has practice-oriented knowledge with which he assesses project results in its practical context* *The Curriculum Innovator has insight in the contribution of RLE learning to the competence development of a group of students.*	 Wesselink, 2010
P	Being able to translate RLE experiences into new learning activities (curricular and extra-curricular) *The Curriculum Innovator does not think from fixed frameworks The Curriculum Innovator masters creativity skills to translate RLE project outcomes in new learning activities*	 Onderwijscooperatie, 2014

[8] Workable means in this case fitting the learning needs and capacities of the students who are expected to carry out the project.

Chapter 6.

General Discussion



6.1 The context of this thesis

Higher education students, at least in the life sciences, will inevitably collaborate with multiple stakeholders during their professional futures. Multiple stakeholders, defined as persons or parties with an interest in an issue at hand (Freeman, 1984), from both academia and society are expected to co-create new knowledge when collaboratively facing present complex societal problems. Working in multi-stakeholder settings requires all actors to cross boundaries between multiple disciplines and perspectives for which they need to master boundary crossing competence. To develop higher education students' boundary crossing competence, higher education curricula should include effective learning environments in which boundary crossing working and learning are addressed. The authentic, multi-stakeholder Regional Learning Environment (RLE), as developed from 2005 in the Netherlands, was expected to have the potential to stimulate higher education students' ability to work and learn with multiple stakeholders. In the RLE, students, researchers, and various societal actors like the (semi)government, businesses, NGO's and citizens, co-create new knowledge towards sustainable regional development. The learning potential of the RLE had not been systematically investigated.

The key objective of this thesis was to find evidence for the effectiveness of the authentic, multi-stakeholder Regional Learning Environment for higher education students' learning in relation to its multi-stakeholder design characteristics. This objective was met by answering two general research questions, namely (1) what do students learn in the RLE, and (2) which learning environment characteristics effectively support student learning in this multi-stakeholder learning context? First motive behind this objective was the lack of an evidence-based pedagogical fundament for this new Regional Learning Environment. So called 'evidence' for the RLEs' effectiveness was until now only built on exemplary, diffused experiences in RLE practice with highly motivated students and enthusiastic teachers, school managers and the external stakeholders involved. The second motive behind the objective was that similar authentic multi-stakeholder learning environments as used in higher education, e.g. service learning and the studio, lacked systematic evidence for student learning as a result of multi-stakeholder design characteristics. Existing authentic learning environments could benefit from this RLE investigation regarding similarities between these existing learning environments and the RLE.

Over the course of the studies, boundary crossing theory, or more specifically the idea of explicitly using the learning potential of boundaries (Akkerman & Bakker, 2011), appeared to serve as a useful framework for the studies in this thesis. Akkerman and Bakker launched a scholarly debate on how boundaries carry learning potential for education, and suggested to design studies that further explore the potential of boundaries instead of presuming boundaries to be hurdles. The idea of further utilizing the learning potential of boundaries seemed to fit the investigation of the learning potential of the RLE. The RLE was explicitly expected to carry boundary crossing learning potential due to apparent boundaries between the multiple disciplines and practices that had to be crossed. Two typical examples of such boundaries in the RLE are the ones between students' multiple disciplines when working in multi-disciplinary student groups, and the boundaries between multiple practices of students, teachers and various stakeholders from outside the school. Boundary crossing theory then informed our identification of two typical boundary crossing RLE design characteristics, i.e. 'working in multi-disciplinary student groups' and 'working intensively with multiple stakeholders'. These design characteristics were used as independent variables in the first two studies, when studying the effects of the RLE on student learning. Next, boundary crossing theory, and specifically its four identified learning mechanisms (Akkerman & Bakker, 2011), was operationalised in the third study to develop student-stakeholder collaborative workshops, used as an intervention, and grasp students' boundary crossing learning processes.

Urban and Landscape Planning students are deemed to be the ultimate 'boundary crossers' when performing in their future multi-stakeholder collaborative planning

profession (Healey, 1993). This challenges Planning education to address the development of boundary crossing competence in their curricula, which is by far not always the case (Edwards & Bates, 2011; Frank et al., 2014). This thesis chose planning students as the main subjects of study, supposing that the pedagogical improvement of the multi-stakeholder RLE, i.e. the expected outcome of the thesis, would in any case benefit planning education.

Three empirical studies and one descriptive study have been carried out to answer the general research questions of this thesis. The first three quasi-experimental studies in this project (Chapter 2, 3 and 4) directly built upon each other, and together measured the RLEs' effectiveness, related to its boundary crossing characteristics, for student learning. The fourth descriptive study (Chapter 5) viewed the RLE from the perspective of the teacher and examined what roles, tasks and competencies teachers need to effectively work and support student learning in an RLE. This fourth study was related to the first three in the sense that teachers fulfil a crucial role in supporting student learning in the RLE, and as such enhance the RLEs' effectiveness.

This general discussion chapter opens with the main conclusions of this thesis (Section 6.2). In this section, we revisit Figure 1.1 from the introduction (Section 1.6) that was used to introduce the four studies in this thesis, and the variables as examined, in a contextualised 3P model (Biggs, 2003, p.19). Figure 6.1 re-illustrates the variables with which we operationalised the concept of effectiveness in this thesis (see Figure 6.1; I-XI). The explanatory text in section 6.2 recaps the main conclusions of the thesis by showing all findings for these variables and their examined relations. The next section 6.3 reflects on our own experiences with doing seven years of research in the RLE to explain several aspects of the RLE design and implementation that we believe to impact its effectiveness. Section 6.4 illuminates the strengths and limitations of the thesis, and discusses factors that could have influenced our conclusions on the RLEs' 'boundary crossing' effectiveness for student learning. Having reviewed the conclusions, strengths and limitations of the thesis enables us to put the research and its results in a broader perspective. We did confirm the effectiveness of the RLE for the learning of a selected group of students (i.e. higher education planning students), based on a chosen set of variables. However, student learning is not the only aim of the RLE. The RLE should also stimulate learning for various other actors, and is intended to result in regional innovation. Questions addressing this RLEs' broader learning potential will be discussed in section 6.5. Section 6.6 discusses suggestions for future research by combining suggestions that have already been expressed directly relating to the arguments in sections 6.3, 6.4 and 6.5, with remaining suggestions. Figure 6.1 illustrates the position of all suggestions for future studies in the contextualised 3P-model, and therewith relates them to the main findings of the thesis (see Figure 6.1; A-K). The general discussion chapter finalises with considerations on theoretical and

practical implications of the results (Sections 6.7 and 6.8), and a final reflective word (6.9).

6.2. Main conclusions

This section recaps the main conclusions of this thesis. To support the understanding of the findings, and their relationships, we re-use the contextualised 3P model (Biggs, 2003, p. 19) as used to introduce the variables to be examined in this thesis (see Section 1.6, Figure 1.1), and describe our findings for all eleven studied variables (see figure 6.1; I-XI).

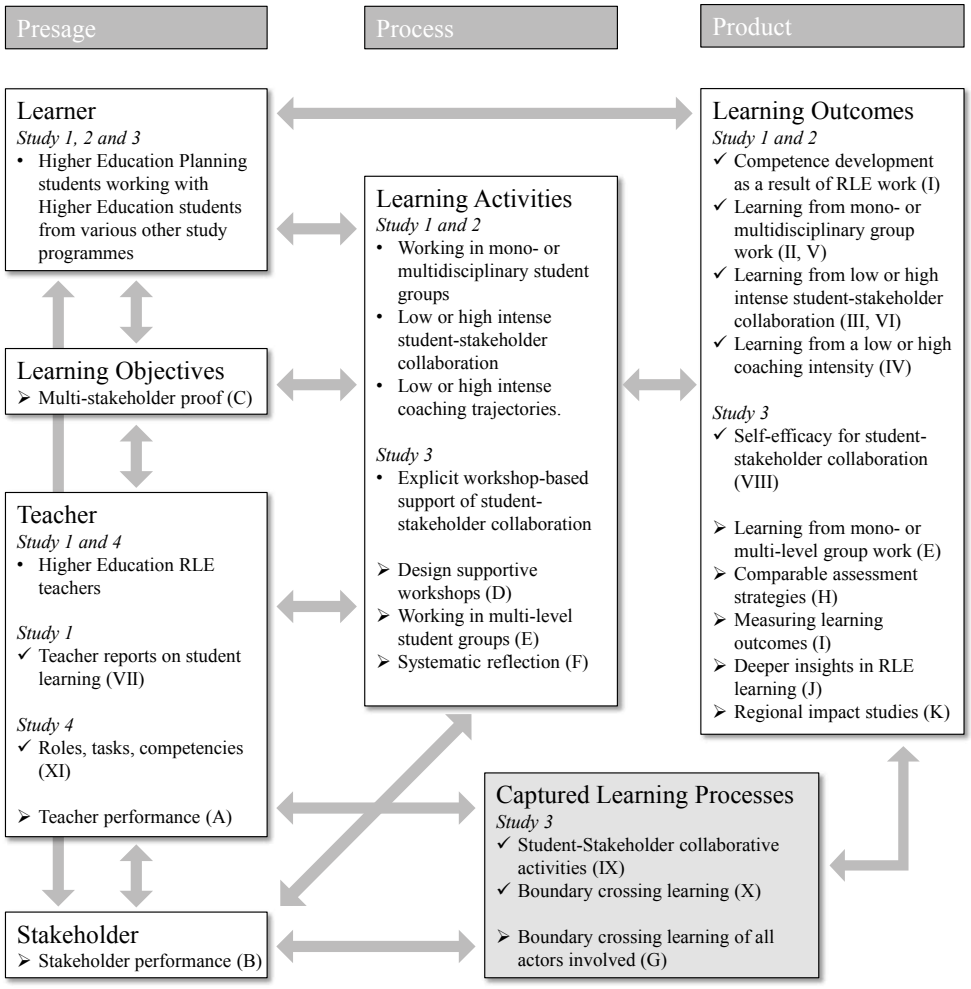


Figure 6.1. Alignment of the Results and Suggestions for Future Studies Matched to Biggs' 3P Model for Constructive Alignment (2003, p. 19)
✓ = Studied variable (I–XI) ➢ = Suggestion for future research (A–K).

Educational effectiveness of the RLE, to which this thesis aims to find evidence for, was in this thesis operationalised by the variables I-XI (see Figure 6.1):

- students' development of domain-specific professional expertise and generic competencies in the RLE in general (study 1 and 2): I;
- students' competence development as a result of the RLEs' typical design characteristics, i.e.:
    - working in multi-disciplinary student groups (study 1 and 2): II;
    - intensive collaboration with multiple stakeholders (study 1 and 2): III;
    - high coaching intensity (study 1 and 2): IV;
- students' reported learning outcomes as a result of:
    - working in multi-disciplinary student groups (study 1 and 2): V;
    - working at a high level of student-stakeholder collaboration (study 1 and 2): VI;
- teachers' reports on student learning and preconditions for learning in the RLE (study 1): VII;
- students' self-efficacy for student-stakeholder collaboration (study 3): VIII;
- types of reported student-stakeholder collaborative activities (study 3): IX;
- boundary crossing working and learning as a result of support thereof (study 3): X; and
- required teacher roles, tasks and competencies (study 4): XI.

The main conclusion is that the RLE is an effective learning environment for higher education students' development of domain-specific professional expertise and various generic competencies. Competence development in the RLE is significantly strengthened by the learning environment characteristic of working in multi-disciplinary student groups, compared to working in mono-disciplinary student groups. This finding is strongly confirmed by student reports on their learning from working in multi-disciplinary student groups, and by teacher reports on student learning and preconditions for learning in the RLE. Although teacher reports also illuminate the importance of the typical RLE characteristic of intensive collaboration with multiple external stakeholders for student learning, this is only significantly confirmed in one out of the two studies that examined student learning as a result of highly intensive collaboration with the multiple stakeholders compared to low intensive collaboration. Teacher reports also illuminate a high coaching intensity as a crucial factor for enhancing students' learning in the RLE. The enhancing effect of a high coaching intensity, compared to a low coaching intensity, on students' competence development is significantly confirmed in both study 1 and study 2. To further investigate the unexpected, ambiguous findings with regard to the learning potential of intensive student-stakeholder collaboration, we developed student-stakeholder workshops that

were intended to stimulate student learning from working with stakeholders. In this thesis (study 3) explicit support of student-stakeholder collaboration in the RLE, by means of workshops, does not significantly improve students' self-efficacy for collaboration with stakeholders. However, explicit support stimulates the amount of reported collaborative activities, and activates students' 'boundary crossing' learning. Finally, to effectively perform in the multi-stakeholder RLE, teachers should fulfil a set of new out-of-school oriented, mainly 'brokering', roles for which they need to master various boundary crossing competencies. These new roles, like for instance business developer and actor in a real-life multi-stakeholder project, including their required competencies, are not yet part of existing comprehensive higher education teacher profiles.

6.3. Other influential factors for students' boundary crossing learning in the RLE

Our seven years of research experience in the RLE, reported in observations, field notes, and reflections, illuminated at least four other aspects of the RLE design and implementation that seemed to influence students' boundary crossing learning. Though these aspects were not objects of study, they came up alongside the direct results of our studies and suggest various opportunities for future research and practical implications for the further pedagogical design of the RLE.

At first we found that RLEs largely differ in the amount and type of learning objectives they set for the students. Learning objectives of the studied RLEs ranged from only describing the final product that had to be delivered, via acquiring domain-specific knowledge (e.g. the student is able to define key concepts of spatial planning), and objectives regarding teamwork and project management, to, in rare cases, more stakeholder oriented objectives (e.g. being able to make a stakeholder analysis; being able to deal with multiple commissioning clients). The studied RLEs set varying combinations of these objectives. However, in most RLE cases the learning objectives did not cover the broad variety of learning opportunities of the RLE; the objectives hardly addressed stakeholder collaboration. Moreover, the learning objectives were often not clearly explicated to, and discussed with the students. It is commonplace that clearly formulated learning objectives, and related clear assessment strategies, direct and stimulate student learning (Gulikers et al., 2008), even more so in challenging learning environments such as multi-stakeholder learning environments (Stauffacher et al., 2006; Trencher et al., 2015). So more specifically, if RLEs want to make use of their multi-stakeholder collaborative learning potential, RLEs should at least explicate corresponding supporting learning objectives. Stauffacher et al. (2006) state for their RLE-comparable 'Transdisciplinary Case Study' that learning objectives for communication processes between students, teachers and stakeholders play a key role

in transdisciplinary learning environments, even for solving complex sustainability problems in general. Which learning objectives best serve the boundary crossing learning potential of the RLE, and whether they indeed do so, are relevant questions for further investigation.

A second influential aspect, maybe slightly contradictory to the first that argues to more explicitly express learning objectives, is the idea of leaving room for 'learning surprises' in the RLE. The studied RLEs with their unpredictable authentic learning processes, appeared to provide for the emergence of new, not foreseen, learning opportunities, so called 'learning surprises'. For example, one of the studied RLE projects aimed at economic revitalisation of a small village. The client commissioned the students to make a design for the renovation of a village park in a participatory trajectory with the community. The renovated park was expected to perform as a catalyst for further economic revitalisation of the village. In the course of the project, a local shop owner offered the project group the possibility to use a part of his building to establish a local community centre. The project focus changed, and the students unexpectedly had to make a business and management plan for this community centre, that has now become key in further social and economic re-development of the village. In this example, some of the original learning objectives, e.g. with regard to developing a participatory design trajectory, could not be met anymore, whereas other new learning opportunities were not captured into prescribed learning objectives. One participating student in study 3 illustrated in a quote the possible added value of working with an emancipatory approach in the use of learning objectives in the RLE:

> I learned how to work with people from practice. Now I know that projects may run differently from what you would expect. At school you always work on the 'perfect project' for which everything is clear. Our RLE project showed us how this can be completely different. At first instance, the project did not seem to be instructive at all, but finally we learned a lot more than usually, specifically in how to prevent for misunderstandings between the different parties involved.

Learning surprises are characteristic to and necessary for transformative processes (e.g. Beers et al., 2010; Tschakert & Dietrich, 2010), as aimed at in the RLE, and cannot and should not always be captured and limited as learning objectives before the start of a project (Stauffacher et al., 2006; Tynjälä et al., 2003). Bronkhorst and Akkerman (2016, p. 28)) plead for more 'degrees of freedom' in education to allow for learning taking place outside of school, and some alteration of content and outcomes leaving open what is, in first instance, valued and validated. To give way to learning surprises and breakthroughs in the RLE, we suggest to experiment with the

'emergence approach' as launched by Scardamalia et al. (2012, p. 240). This approach is meant to enrich a more traditional way of educational design by means of 'working backwards from goals' (Scardamaliaa et al., 2012, p. 239) with the allowance of the identification of new goals during a learning trajectory. This in response to occurring learning opportunities and discovered capabilities of learners. How the RLE and its transformative power may benefit from this approach is an interesting topic for further investigation.

A third influential aspect for the RLE design is the use of reflection. Our studies showed that the teacher plays a crucial role in fostering high intensity coaching in the sense of setting up reflective activities that allow students to optimally use the learning potential of working with multiple disciplines and multiple stakeholders. However, thus far, this type of critical reflection has not structurally been implemented in the RLE. Although the RLEs that were classified as 'high coaching intensity' (Chapters 2 and 3) worked with a parallel coaching trajectory focused on personal and professional skills and on learning experiences from working with stakeholders, systematic critical reflection was hardly included as an explicit, continuous learning activity in the studied RLE projects. Most studied RLEs only required students to write an individual reflection report after having finalised their projects. In these reflection reports students were asked the general question to reflect on their personal competence development as a result of working in the RLE. With respect to reflection, the RLE may draw on a long-established tradition in service learning (Dewey, 1933; Jacoby, 2014; Sletto, 2010). Service learning is in favour of critical reflection which is, building on Dewey's words (1933, p. 9), defined as 'guiding students through the process of considering and reconsidering their values, beliefs, and acquired knowledge that enables them to question and challenge their stereotypes and other *a priori* assumptions' (Jacoby, 2014). This idea of the concept of critical reflection closely connects to the boundary crossing learning mechanism 'reflection', and its associated sub-processes, which we found to be activated by student-stakeholder supportive workshops in the RLE (Chapter 4). This boundary crossing learning mechanism is expected to favour from explication in systematic, critical reflection trajectories. Both Eyler et al. (1996) for service learning, and Stauffacher et al. (2006) for the Transdisciplinary Case Study stressed that critical reflection must be an ongoing component of a (service and/or multi-stakeholder) learning programme, i.e. must take place before, during and after the experience, for deepest learning to occur. How this idea of critical reflection could be implemented in RLE practice, and how this then stimulates student learning, should be further investigated. Regarding the aim of the RLE to be a learning platform not only for students but also for the other participants, an interesting element to add to future studies in this respect is how stakeholders could contribute to and favour from reflection trajectories.

For assessment strategies, the fourth additional influential factor for student learning in the RLE, the same diversity in manifestation has been observed in the studied RLEs as for the manifestation of learning objectives. Assessment strategies, and the extent to which the strategies were clearly explicated to the students, largely differed. Just as in the learning objectives, also in the assessment strategies little to no explicit attention was being paid to boundary crossing learning or learning with and from other stakeholders. Looking to the *what* of assessment in the studied RLEs, i.e. the assessment criteria, if formulated at all, did not address boundary crossing leaning. The criteria mostly referred to disciplinary knowledge or skill application, and a students' ability to reflect on team work or personal learning processes. Looking to the *how* of RLE assessment, i.e. the assessment forms, the studied RLEs showed little variety. Students were mainly graded based on a final product mark, which was mostly a group mark, assessed by the teacher. This mark was every now and then combined with a mark for a personal or group reflection report. In some cases, the students had to do an individual oral exam in which the teachers asked the students questions on the project process and results. The RLE has no established tradition of assessing student-stakeholder collaboration, let alone assessing boundary crossing learning (Meijles & Van Hoven, 2010). We observed only one exception in this respect where students had to act in a role-play in which two teachers played troublesome stakeholders. While this assessment offered fruitful opportunities for assessing students' boundary crossing abilities, the assessment process and criteria of this experimental role-play were still arbitrary.

Absence of, or lacking clarity and transparency in assessment strategies impedes student learning (Gulikers & Van Benthum, 2014). To support further experimentation with RLE assessment strategies, we developed, as a side product of this thesis, a rubric for assessing boundary crossing learning in the RLE. The starting point of the rubric were the four so-called boundary crossing learning mechanisms, i.e. identification, coordination, reflection and transformation, as distinguished levers for boundary crossing learning by Akkerman & Bakker (2011). We described 2-4 typical RLE performance indicators per learning mechanism (e.g. 'identify the stakeholders' for identification; 'envisioning new practices' for transformation). For each of the total of eleven performance criteria, four levels of performance were distinguished. The rubric enables to discuss learning ambitions with the students, assess and rate each students' performance on the eleven criteria, and provide an insight in well-, and less-developed boundary crossing abilities. Figure 6.2 shows an illustrative fragment of this rubric-under-construction. Although the rubric has not yet been used in actual RLE practice, RLE teachers involved in an introductory workshop on the rubric (February 2016) appreciated the concept both in the light of formative and summative assessment of

Performance criterion	Level 1	Level 2	Level 3	Level 4
Reflection 2. Learning from other actors	Student is only focused on the direct project result, not on learning thereof	Student discovers new learning elements, and is able to explicate these	Student learns new things, is able to explicate these, and uses other peoples' insights to reconsider own existing ideas	Student actively searches for learning opportunities as a result from working with other people, and differentiates his/her own perspective from other peoples' perspectives

Figure 6.2. Illustrative Fragment of the Boundary Crossing Rubric-under-Construction.

RLE performance (Gulikers & Oonk, 2016b). Its further use and development requires future experimentation and monitoring.

Before we elaborate on the learning potential of the RLE for other target groups next to the higher education planning students (Section 6.5), we first reflect on strengths and weaknesses of this thesis project.

6.4 Strengths and limitations of the thesis project

The first three quasi-experimental studies in this thesis examined twenty different RLEs, as part of various curricula at four higher education institutions, in which a total of 490 students participated and delivered quantitative and qualitative data. We consider this to be a strong basis for drawing conclusions on the RLEs' effectiveness for student learning, even more so as quantitative and qualitative student data have been triangulated, and student data have been carefully supported with teacher insights (Chapter 2). Effectiveness of the RLE, both in general and in relation to its typical multi-stakeholder learning environment characteristics, was not confirmed before, at least not systematically and statistically. This makes this thesis project add new elements to the knowledge base on student learning in, and the pedagogical design of the RLE. The findings also benefit the pedagogical design of comparable authentic, multi-stakeholder learning environments, for which systematic insights in student learning as a result of multi-stakeholder learning environment characteristics lacked thus far (Angotti et al., 2011; Karatzoglou, 2013; Long, 2012a, 2012b). Having combined the three student focused studies, with a fourth study illuminating the requirements of teachers in multi-stakeholder learning environments, strengthens the pedagogical output of the thesis even further. All four studies address aspects of

boundary crossing working, learning and competence, which is regarded a highly topical issue in current competence research (Mulder & Winterton, 2017).

The choice for a systematic comparison of student learning in various RLEs, and as a result of three typical learning environment characteristics, adheres two limitations. The first limitation follows from the quasi-experimental instead of experimental design of the first three studies. The twenty studied RLEs were regarded as to be comparable learning environments, sharing the same set of general educational characteristics (see e.g. Section 1.5), and only differing from one another on the three independent variables. However, as the RLEs were real learning environments in educational practices, that is not set up in an experimental controlled setting, the way in which these general educational characteristics were implemented differed to some extent. Gender and age of the students were controlled for, but the RLEs also differed in for example study load, student group size, learning objectives to be met by and communicated to the students, and/or assessment strategies. As a consequence, differences in student learning between the RLEs could have been influenced by more factors than only the three independent variables. These other, non-studied factors may also have had a mediating and/or moderating effect on the relation between student learning (dependent variable) and the three studied learning environment characteristics (independent variables). The effect of learning from working in *multidisciplinary student groups* might for instance have been influenced by group size and group composition (Channon et al., 2016). Exchanging with 5 or 6 team members is expected to provide more multi-disciplinary learning experiences than an exchange with only 2 or 3 multi-disciplinary group members. The studied multi-disciplinary groups differed in the extent to which the disciplinary backgrounds of the students were related (e.g. only spatial planning related (Rural, Urban and Environmental Planning, Landscape Architecture, Real Estate Management) or varying from Business Studies and Climate Studies to Hospitality Management and Biology). We do not know whether this had positive or negative effects on students' competence development. The effect of *multi-stakeholder collaboration* might have been influenced for instance by various relational factors between the students, the stakeholders and their coaching teacher. We controlled for differences in the amount of stakeholders involved, and the type of collaboration between the students and stakeholders, varying from informing each other to real, intensive collaboration. However, we do not know about the effect of differences per RLE project in e.g. expectation management between students, stakeholders and teachers, the urgency of stakeholders' interests, and the willingness and enthusiasm of the stakeholders to support the project process and results (McIlrath, 2012, p. 149). A second factor that might have influenced learning from working with stakeholders and students' self-efficacy for their collaboration with stakeholders (Chapter 4), even despite the two

supportive student-stakeholder workshops, is the position of the RLE project in a students' study programme. Part of the studied RLEs were positioned in a relatively early stage of the curriculum, at least before students' work placements. The students were expected to work with external partners even though they were at a stakeholder-immature stage of their learning trajectory at which the students possibly did not feel well-prepared and at ease to work with 'real' external partners. A third obvious factor that could have influenced effects of multi-stakeholder collaboration is the duration of the project. Mobilizing and building relationships with stakeholders, learning to know each other, takes time before effective collaboration can start. Short projects with a duration of two to eight weeks, do not allow students to take time for this acknowledging stage of a stakeholder collaborative project. Our results of study 1 (Chapter 2; Table 2.1) and study 2 (Chapter 3; Table 3.3) do not imply an effect of project duration on overall competence development per RLE, but this effect has not been statistically examined, neither has been examined the mediating effect of project duration on student learning from working with multiple stakeholders. The effect of *coaching intensity* might have been mediated, for example, by differences in coaching style and coaching experiences between the teachers. Controlling for teacher influence would have required a completely different study, which was outside of the scope of this thesis project, but will certainly be recommended below as a useful future study (see Section 6.6). Being aware of this limitation of the choice for a quasi-experimental, systematic analysis, we found at least strong significant effects of working in multidisciplinary student groups and with a high coaching intensity on student learning in two successive studies. This is regarded as a strong indicator for the enhancing effect of these boundary crossing characteristic on student learning, despite other possible influencing factors. The effect of multi-stakeholder collaboration was only confirmed in study 2 (Chapter 3). The less strong effect of this variable over the two successive studies, may have been caused by influencing factors as described above. However, our observations and field notes from studying five RLEs in study 1 (Chapter 2 and Section 6.3) led us to believe that the ineffectiveness of working with multiple stakeholders was mainly caused by the fact that student-stakeholder collaboration was in most RLEs neither an explicit learning objective, nor was it structurally supported or stimulated. This idea triggered the third study in this thesis project (Chapter 4) that examined the effects of explicit support of student-stakeholder collaboration. The found effects of the supportive workshops on student-stakeholder collaborative activities, and on reported boundary crossing learning processes, do strongly proof that students need to be structurally supported in the challenging collaboration with external partners to fully employ the added value of multi-stakeholder collaboration in the RLE. For the further pedagogical improvement of the RLE, we recommend future studies that explore the effects on student learning of

various other factors as discussed above. When aiming at directly building on the results of this thesis, these factors to be explored should be related to the RLEs' boundary crossing learning potential.

A second limitation of this thesis project is that the project did not include in depth analyses of student learning in the individual RLE cases. This limitation is also inherent to the choice for a systematic comparison of student learning over various RLEs. In an RLE, a lot more happens next to what we caught in our systematic studies. The further pedagogical design of the RLE would certainly benefit from deeper insights in students' learning processes and outcomes (Meijles &Van Hoven, 2010). In particular, the various, over time varying relationships that students have in the RLE, with other students, between students and their coaches, and in the triangle student-coach-external stakeholders, and learning thereof, are suggested to be a relevant object for further studies. From the student reports, as collected in our first three studies (Chapter 2, 3 and 4), these relationships appeared to be crucial learning resources for the students.

A third limitation of the thesis project relates to the large extent to which the conclusions are based on self-reports of students: did the students have an accurate impression of what and how much they learned? Yet, self-assessments were the most optimal measurement instrument we could use. We simply did not have the availability of comparable non-self-reported data on students' learning outcomes, due to differences in assessment strategies as employed in the studied RLEs. This is exactly why the use of self-reports is common practice in educational science, and is even argued to often provide as reliable results as third party reports (Braun et al., 2012; Chan, 2009). However, as illuminated in various method and discussion sections of the studies (e.g. Sections 2.7 and 4.4), we tried to optimise the use of self-reports. We augmented the variety in types of student self-reports in different ways, and added teacher judgements on student learning in general in the RLE to them. At first, study 1 and 2 (Chapter 2 and 3) combined the use of a validated quantitative competence measurement instrument (Khaled et al., 2014) with qualitative student reports on the open question 'what did you learn more?'. This open question was expected to expose students' authentic, honest answers broad in scope. Secondly, we attempted to minimalize the risk of social desirable responding (Chan, 2009). The students were informed before they filled out any questionnaire that their self-scores and reports would not be used for the assessment of their RLE projects. There was no reason to manage impression, fake or withhold information. Thirdly, big student numbers ($N = 225$ in study 1 and $N = 143$ in study 2) were expected to mediate under- and overestimation of the students' competence self-scores in the competence measurement. Fourth, study 1 included teacher reports on student learning outcomes and preconditions for learning, with which we were enabled to enrich student data with

teacher data. Fifth, study 3, where grasping boundary crossing learning, minimised the drawbacks of self-assessment by triangulating three types of open questions. These open questions incited reports on three types of learning outcomes close to different aspects of the self-reporters' own recent RLE experiences, and transfer of these to imaginary upcoming experiences. At this place not the self-reports as such are the main point of concern, but the fact that we used indirect measures for the concept to be measured, i.e. boundary crossing. Students could refer to boundary crossing in their answers, but were not explicitly incited to do so. In case students did not refer to boundary crossing, this would not necessarily mean that they did not experience boundary crossing learning processes and/or learn from that. This provokes the development and use of direct boundary crossing measures in future studies. Further studies should certainly try to make use of comparable RLE student learning outcomes across several RLEs, and as such avoid the suspicious use of self-reports in studying effectiveness. This would require to develop comparable RLE assessment strategies for which we proposed a suggestion in section 6.3.

Finally, a fourth notion of criticism could be made for the insubstantial relation between the first three studies in this thesis project on the one hand, and the more distinct fourth teacher-focused study on the other hand. The fourth study provides a comprehensive overview of teacher responsibilities and capabilities in the RLE, without making a direct link to student learning, that was the scope of the first three studies. However, we regarded a comprehensive overview of teacher roles, tasks, and competencies in the RLE, that was not yet available, a prerequisite for further studies on the actual RLE teacher performance, teacher-student-stakeholder relationships, and their influence on student learning. These elements are argued to be crucial for furthering pedagogical development of the RLE, and can now be covered in further studies.

6.5 The broader RLE learning potential

This thesis project did confirm the effectiveness of the RLE for student learning, more specifically, for a selection of 490 higher education students in, mostly, spatial planning related study programmes. This is a relevant finding for planning education. Spatial planning is a multi-stakeholder collaborative profession by its very nature (Healy, 1997). As such, planning education is expected to develop planning students' multi-stakeholder collaborative readiness (Angotti et al., 2011; Dalton, 2007; Edwards & Bates, 2011; Seltzer & Ozawa, 2002).

However, also other than just higher education Planning students participate in the RLE. Moreover, students are not the only participant group in the RLE. One of the main interesting characteristics of the RLE is that next to, and together with the students, many other regional actors work and learn in the RLE, e.g. teachers,

researchers, local authorities, entrepreneurs, representatives from NGO's and citizens. Stimulating student learning is not the only aim of the RLE. The RLE should also stimulate learning of the other actors. Furthermore, the RLE is intended to result in regional development, innovation and even transformation, which is likely to be linked to the effectiveness of the collaborative learning and knowledge co-creation process between the various actors. Thus, when putting our research in a broader perspective, interesting questions are: what learning potential does the RLE offer to other participant groups? How may the RLE learning potential for these other participant groups be optimised? What triggers regional development and/or transformation in the RLE, and what does this mean for the pedagogical design of the RLE and the roles of the participating actors? These questions and opportunities will be discussed in this section.

The RLEs' learning potential for students from differing study programmes

Directly based on the findings of this thesis, we state that the RLE has a large learning potential for students in life sciences education programmes, both at academic and higher professional levels. This has been confirmed in this thesis project which has included, next to the majority of Dutch Urban and Landscape Planning students, students from both academic and higher vocational life sciences programmes in e.g. Land and Water Management, Biology, Forest and Nature Conservation, Climate Studies, Food and Agribusiness and Landscape Architecture. Graduates from the life sciences will inevitably meet multi-stakeholder contexts when working on complex life sciences problems. As such, the RLE as an authentic, multi-stakeholder learning environment, with inclusion of its three typical design characteristics as studied in this project, is likely to be a valuable and challenging learning environment for other life sciences students in the preparation for their future professional practices.

Further building on the findings from the thesis project, we would even argue that the RLE has learning potential for higher education generally. Working with multiple disciplines and perspectives is a current social and society-broad phenomenon, and should be addressed in higher education anyway (Jacob, 2015). During the project we observed students from other than life sciences education programmes productively contributing to the regional issues in multi-disciplinary groups, and reporting relevant learning outcomes thereof. These students came from e.g. Financial and Business Management, Law and Governance Studies, Economy, Facility Management and even Teacher Education programmes. The RLE projects included in this thesis all had a spatial focus. However, regional knowledge agendas offer such a broad range of societal and physical topics, that study programmes outside the life sciences will, if desired, be able to select projects that are more closely related to their core business. Students, while working in an RLE like educational design setting, may favour as

much from the RLEs' learning potential as the planning or life sciences students did who participated in our studies.

Next to the learning potential for higher education, RLEs are expected to also have learning potential for vocational education and training (VET). The various types of authentic projects that originate from regional knowledge agendas, range from more theoretical, knowledge-based, projects (e.g. developing an economic perspective for a village region that suffers from population and services decline), to practical construction-based assignments (e.g. creating a learning garden at a day care centre), and as such offer students from both academic and vocational programmes differentiated learning opportunities. Actually, in Dutch educational practice, also many senior secondary vocational education students participate in RLE projects. Obviously, their assignments differ from the projects that higher education students work on, but they also develop competencies crucial for future professional practices that involve working with multiple stakeholders (Gulikers & Oonk, 2013). The RLE has also been valued in VET for its support in students' career orientations and perspectives (Foorthuis et al., 2012). Many VET graduates start to work in their own regions, in which they started to build networks through their RLE work.

For all types of students, the RLE has the potential to be a unique learning laboratory in which students engage in real life multi-stakeholder collaborative experiences in multi-disciplinary groups. At the same time, students benefit from their permanent and safe educational back-up in the sense of continuous explicit teacher support of students' collaboration with real life actors and peer-students from different disciplines. The combination of this safe 'home-base' with real-life experiences is an aspect for which the RLE and its learning effects may differ from other authentic learning environments. Learning effects of workplace learning for example are challenged because of apparent discrepancies between learning activities in school versus the workplace (Schaap et al, 2012). In the RLE, these discrepancies could be minimalized because of the permanent link between school support and the real life work experiences, provided that support and reflection is well facilitated.

All types of students as mentioned above could profit from working together in the RLE by working in multi-disciplinary and/or multi-level student groups, which group compositions are all possible and intended in the RLE (Foorthuis et al., 2012). The proven added value of working in multi-disciplinary student groups pleas for the continuation of open access minors and international exchange of students. These exchanges support students' chance to meet multi-disciplinary learning settings. Working in multi-level student groups is not yet commonplace in the RLE, mainly due to organisational difficulties. Nonetheless, we suggest to experiment with the use of multi-level student groups next to multi-disciplinary groups. RLE experiences outside of the scope of this thesis project did believe that combining different student levels in

one project group contributed to the transformative outcomes of the project because of the inclusion of the whole range from theoretical knowledge creation and substantiation to practical construction. Moreover, working in multi-level student groups develops students' insights into the various typical potential contributions of (future) professionals working on various educational levels. This would increase the authenticity of the RLE. Based on our findings and experiences, we suggest one aspect to explicitly take into account when students from different disciplines and educational levels work together on one RLE project. It seems to be important to carefully select project assignments, and pay explicit attention to expectations on project process and product outcomes between the students, and between students, teachers and stakeholders. Clarity and 'do-ability' of the project assignments together with expectation management at the start and during the projects were often mentioned as critical success factors in RLE evaluations (see e.g. Chapter 4).

The RLE's learning potential for teachers

Although this thesis project did investigate teacher responsibilities and requirements for working in the RLE, it did not explicitly address the RLEs' potential for teacher learning. However, many learning opportunities for teachers occurred from the fourth teacher-oriented study, and to a less extent, from the first three studies. Teachers and their managers value the close connection of RLE teachers with the actual, nearby practice either when coaching student projects, when facilitating multi-stakeholder processes, and when working on the dissemination of co-created knowledge. Teachers build on their networks with the out-of-school world, of which they are expected to also benefit for other than RLE activities (e.g. organizing work placements for students or inviting guest speakers for courses). Specifically new, compared to other teacher learning settings, is that RLEs offer teachers opportunities to self-participate in real life projects. In these cases the teacher is also an active learner and co-constructor of new knowledge for real regional issues. This is regarded as an important motivator for teachers as the RLE can trigger them to update their knowledge and skills by learning from all kinds of new methods, technologies and trends in current professional practice. Active participation of teachers in RLE practices permanently boosts the renewal of practical knowledge and skills, without being required to timely quit school work for time-consuming teacher work placements or other practice-based professionalization trajectories. This stresses the potential of the RLE in providing a close-by, easy-accessible continuing professional development opportunity, which is regarded to enhance authentic professional learning (Webster-Wright, 2009).

RLE involvement changes teacher-student relationships. Consequently, RLE teachers may and should develop new competencies with respect to their relations with students. Stauffacher et al. (2006), when exploring the teacher role in the

Transdisciplinary Case Study, explicate the much more complex interactions between students and teachers compared to 'normal' university education. Stauffacher et al. mention high expectancies on both sides, which require both parties to show an open learning attitude and make use of negotiation and reflection skills. The challenges of these relationships were also revealed from our data. Students sometimes reported on a role-model position that a teacher fulfilled e.g. in contacting stakeholders, but also on teachers being no longer the only and best informed knowledge experts. These status related issues require to carefully inform teachers on their new RLE roles, select teacher-coaches that are willing to experiment in performing these new roles, and support teachers in their professionalization. In our studies, relational challenges seemed to become even bigger when external stakeholders intervened in the student-teacher relationships. Students frequently reported imbalances in expectations at the start and during the projects between students, teachers and other stakeholders, which appeared to have a big influence on their project processes (Chapter 4). Changing relationships influence the learning of all RLE partners, and are as such a relevant aspect for further investigation.

A danger as often pointed out by RLE teachers and their managers, is the amount of time that RLE involvement requires from the teachers. Building networks, acquiring real life projects, maintaining (external) relationships, sometimes upgrading student work to fulfil external clients' expectations requires a lot from the teachers. This could pressure the quality of other teacher tasks. When implementing RLE-like learning environments in a curriculum, distribution of teacher tasks should carefully be reconsidered.

The RLEs' learning potential for external stakeholders

External stakeholders are expected to anyhow benefit from RLE catalysed regional developmental processes, e.g. from a social or economic perspective. This developmental potential of the RLE will be addressed in the next section. In this section, stakeholders' personal learning as a result of collaboration with the other actors comes up for discussion. This thesis project did neither include stakeholders' perspectives on their personal learning in the RLE in general, nor did it include an investigation of stakeholders' relationships with the students and/or teachers during their collaborative work, and the influence thereof on their learning.

With regard to stakeholders' learning in general, it is increasingly acknowledged that university-community engagement can lead to improved professional skills and capacity building for acting in multi-stakeholder settings (Karatzoglou, 2013; Bawa & Munck, 2012). However, little has been written specifically on stakeholders' personal learning benefits from working with students in these kinds of learning settings. Our studies revealed this to be an important area of concern when further improving the

RLEs' learning potential. In case we had the chance to meet stakeholders during our studies, we only met them at the start of an RLE project, when they explained their project issues to the students, or during final presentations of RLE products. What we observed from stakeholders' responses during the final presentations was that they were mostly enthusiastic about the students' products and how much they learned thereof. However, this learning referred to what they learned from a content point of view (mainly possible solutions to spatial problems), not to personal competencies they developed as a result of their RLE involvement. They seemed to see themselves more as external clients than as 'learners'.

Looking more specifically to the RLEs' learning potential for stakeholders' learning from the relationships with students and teachers, reports from students and teachers resulting from our studies revealed dual views. In some cases the stakeholders showed an open learning attitude towards the students, being approachable, being willing to understand the students' interests and act accordingly. In other cases, stakeholders appeared to be detached, not enthusiastic, not approachable, having difficulties to place themselves in students' positions, and to balance between educational and own interests. These differences have probably been caused by differing factors e.g. earlier experiences with student collaboration, available time, urgency of the project results, and/or patience for explaining things to novices. Nonetheless, working with non-enthusiastic, detached stakeholders led in various cases to miscommunication and problems with expectation management between students, teachers and the respective stakeholders. Teachers involved in the studied RLEs mentioned the importance of carefully preparing the stakeholders for their collaboration with the students. Both students and teachers who participated in the student-stakeholder workshops (Chapter 4) suggested in their workshop evaluations to invite the stakeholders to participate in the workshops, aiming at supporting all parties in effective collaboration and to become active learners.

Stakeholders, as well as students and teachers, should learn to make up other perspectives, and reconsider the own practice as a result of working with the students (Meijles & Van Hoven, 2010; Scholz & Steiner, 2015a, 2015c). This is where boundary crossing is expected to come into play and has an added, professionalizing, value (see the next Section). It should be further investigated what the RLE offers for the personal development of stakeholders, and what RLE involvement requires from the stakeholders. This call aligns with the suggestion of Augsburg (2014, p. 237) to develop 'transdisciplinary individuals' by investigating which competencies all transdisciplinary participants need.

The RLEs' learning potential for sustainable regional development and transformation

The aim of the RLE is sustainable regional development or, ultimately, transformation, which has to be reached by adding together all parties' investments in the RLE, whether or not including educational involvement. The body of co-created knowledge resulting from the existing Dutch RLEs has been brought together on a website (see www.groenkennisnet.nl). The website includes a wide range of reports, brochures, communication plans, videos, and designs, which at least suggests an increased knowledge base since the launch of the RLE in 2005 (Boetzkes et al., 2014; Foorthuis et al., 2012; Meijles &Van Hoven, 2010). However, systematic investigations of the output of the RLE in terms of regional impact have not been made.

The observed impact of the RLE aligns with results of impact studies in other university-society settings. University-society engagement in general has at first proven to add value to regional economic development, either directly by increased employment opportunities, enhanced local GDP and spinoffs, or more implicitly by the growth of the 'knowledge economy' and the transformation of an area into a 'learning region' (Caniels & Van Den Bosch, 2010; Karatzoglou, 2013; Keane & Allison, 1999); the latter concept referring to universities' practices to transfer knowledge and training to a region (Keane & Allison, 1999, p. 896). Next, mainly resulting from service learning impact studies, university-society partnerships have societal impact by means of network building, community capacity building and support of the (re)establishment of local services (Jacoby, 2014). A third strand in which many impact studies on university-society engagement have been done is the transdisciplinary sustainability strand, showing capacity building for sustainable development (Scholz & Steiner, 2015c; Sterling et al., 2013; Wals et al., 2016).

Though service learning impact studies explicitly investigate student contributions to university-community partnerships, many of the other impact studies hardly address student contributions to these projects. These studies mostly focus on research staff-community collaborative output. And, in the impact studies that include student contributions, studies appear to show reservations for the added value of curricular, student-inclusive contributions to regional innovation (e.g. Lansu et al,. 2013). One reason for this is the unpredictable quality of student-project output; the students are not experienced professionals yet. We also observed this to be an issue in the studied RLEs, despite distributed enthusiastic responses of various partners on students' creative and cognizant final products. A second reason for reserve towards the added value of student contributions which we explicitly recognised in the RLEs, is the fact that student-projects are often 'stand-alones'. The results will not be followed up in further projects simply because follow-ups do not fit in the curricula of the students

who would potentially be able to work on follow-ups. This relates to the transformative capacity of the RLE, as discussed in the next paragraph.

Transformation by means of establishing new spatial and governing practices and approaches, is the ultimate aim of the RLE (Foorthuis et al., 2012). The question is whether, and how, we than finally expect to come to transformation in the RLE. *Whether* transformation has already been achieved in the RLE, is not easy to determine, has not systematically been investigated yet, and cannot be concluded on the basis of this thesis project. We only saw some examples of what may be regarded as transformational output: external clients praising students for their breakthrough effects in deadlocked regional planning processes. In two cases this effect was a result from the assignment to develop stakeholder mobilisation and communication plans for multi-stakeholder planning issues (e.g. for the future recreational use of a brook that crossed the borders of many different planning authorities).

Transformation as a boundary crossing learning mechanism, defined as the learning process towards profound changes in practices (Akkerman & Bakker, 2011), was scarcely reported by RLE students (Chapter 4). However, our supportive workshop that explicitly stimulated transformation did at least show a little supportive effect. Next, the way in which we operationalised the learning mechanism into associated sub-processes (i.e. (1) intending to create a new practice, (2) envisioning new practices, (3) establishing new practices, (4) enthusing others for new practices and (5) stimulating follow ups) was confirmed to provide a useful coding frame to capture transformative learning (Chapter 4).

We suggest transformation as a boundary crossing learning mechanism to have potential for the further development of the transformational aim of the RLE, i.e. for *how* to achieve transformation. The learning mechanism and the sub-processes as used in our coding frame are assumed to be a useful starting point for the further development of learning activities that stimulate transformation. Regarded as crucial for improving transformation in the RLE, is to make all parties aware of the boundary crossing steps to be taken before transformation could be achieved, define respective boundary crossing learning outcomes for all parties, and support them in how to achieve these. Our studies in this respect suggest that perspective making and taking, leading to the ability to continuously reconsider the own practice as a result of others' practices, all part of the boundary crossing learning mechanism of reflection, are most essential to develop 'transformation agents' (Rosenberg Daneri et al., 2015) needed to achieve transformation in the RLE.

Overall, the RLE is expected to have potential for regional development and transformation, but the questions if this is really the case, how the potential should be increased and to what extent the boundary crossing theory could contribute to its potential, should be addressed in further studies. Knowledge about the RLE impact,

and how to achieve transformation, would create a broader support for the existence of the RLE, not only for student learning but also for 'regional learning'.

6.6 Future research

This thesis project prompted various suggestions for future research that could inform the further development of the RLE, and broader, enhance effective multi-stakeholder and boundary crossing learning. Some suggestions have already been discussed in detail in the sections 6.3 to 6.5. These suggestions will be complemented with remaining questions, and result in a comprehensive set of suggestions for future research. Figure 6.1 illustrates how all suggestions for further studies are positioned in the constructive alignment of the RLE (see Figure 6.1, A-K), and as such, to which aspects of multi-stakeholder learning the answers on future questions may contribute.

Although this thesis provided for a description of roles, tasks and competencies required for RLE teachers, further studies should examine actual teacher performance. Relevant questions in this respect are how RLE teacher performance effectively fosters and stimulates teacher-student-stakeholder relationships, and what task distribution within a teacher team makes RLEs flourish (Figure 6.1; A).

Next, many questions remain on stakeholder involvement. What makes a stakeholder a good learner and a good contributor to student learning? Could the RLE output profit from supporting stakeholders in how to work with the students? And, would boundary crossing learning mechanisms be helpful for the design of this support? (Figure 6.1; B).

Specifically aiming at improving students' boundary crossing learning in the RLE, working on the learning objectives is regarded as useful (Figure 6.1; C). How to make the learning objectives 'multi-stakeholder proof', and how to balance between prescribing learning objectives and leaving room to learning surprises? The idea of the 'boundary crossing' rubric (Gulikers & Oonk, 2016b; see also Section 6.3) might help at answering these questions.

With respect to learning activities that could enhance students' boundary crossing learning, we suggest three elements for further research to be of utmost importance. The first suggestion is to further experiment with parallel supportive workshops: what are other crucial design elements of this support to enhance students' boundary crossing learning? (Figure 6.1; D). Next, experimenting with multi-level student-groups, i.e. groups existing of students from different educational levels, and the effects on student learning thereof would be interesting. We see multi-level groups as a potential fourth typical boundary crossing learning environment of the RLE (Figure 6.1; E), but the studied RLEs did not offer the possibility to examine the added value of working in multi-level student groups. Third, the implementation of systematic

reflection and how this stimulates student learning is regarded as an interesting topic for further studies (Figure 6.1; F).

This thesis captured boundary crossing learning processes of students (Chapter 4), but it is obvious that the other RLE partners should also cross boundaries between their own and others' practices. Whether they do cross boundaries, albeit after being stimulated, is a relevant topic for future examination (Figure 6.1; G). This idea aligns with calls for deeper analyses of boundary crossing learning and competence development as launched by other educational scholars working on the conceptualisation and operationalisation of boundary crossing theory in educational science (Akkerman & Bakker, 2011; Bakker & Akkerman, 2014; Bronkhorst & Akkerman, 2016).

With respect to learning outcomes as the product of learning (Biggs, 2003), the RLE would benefit from studies that use more objective, comparable learning outcomes as the outcome measure, instead of indirect measures, as self-reports and teacher reports are. This requires RLE comparable assessment strategies, aligned with clear and comparable learning objectives as mentioned above. The further design and experimentation with the boundary crossing rubric would be beneficial in this respect (Section 6.3 and Figure 6.1; H). The availability of comparable and measurable learning outcomes enables the re-examination of student learning as a result of the three boundary crossing learning environment characteristics. Further studies could then include the mediating effect of various influential factors (Section 6.4 and Figure 6.1; I). Next to additional systematic, comparative studies that comparable learning outcomes would enable, case-based studies would provide for deeper qualitative insights in learning processes and learning outcomes of the RLE (Figure 6.1; J).

Finally, we recommend further regional impact studies. The availability of impact figures would support the further establishment of the RLE as a respected, catalysing institution, both from a learning and a regional innovation perspective. Impact studies are most interestingly focused on boundary crossing learning of participants and the transformative impact they 'co-create' (Figure 6.1; K).

6.7 Theoretical implications

The results of this thesis theoretically contribute to at least four current scholarly debates.

At first, results of study 1 and study 2 (Chapters 2 and 3) respond to the call for more systematic studies that find evidence for the pedagogical design of authentic learning environments in relation to their specific learning environment characteristics (e.g. Angotti et al., 2011; Brandt et al., 2013; Long, 2012b; Wu & Brooks, 2011). The evidence that we found for the effect of three typical boundary crossing learning environment characteristics directly contributes to this call, at least where the call

strikes authentic learning environments that include, or would benefit from including, working on real life issues in a student-stakeholder collaborative setting.

The second scholarly debate to which this thesis contributes, is the debate on how to make higher education institutions more out-of-school proof, i.e. ready to face university-society engagement (e.g. Brundiers et al., 2013; Guzmán-Valenzuela, 2015; Scholz & Steiner, 2015c; Webb & Burgin, 2009). The thesis provides an overview of the new responsibilities and requirements of teachers to work in university-society settings, and suggests additions to existing scholarly higher education teacher profiles that lack out-of-school teacher responsibilities.

Thirdly, the thesis contributes to the call for getting a grip on boundary crossing learning processes from a micro perspective as they occur in different settings in which learners are expected to cross boundaries between contexts (Akkerman & Bakker, 2011; Bakker & Akkerman, 2014; Bronkhorst & Akkerman, 2016). The thesis has shown that boundary crossing learning occurs in a multi-stakeholder learning environment; students do report boundary crossing learning processes as a result of working across boundaries, particularly when this is explicitly stimulated (Chapter 4). Next, this study also shows that these boundary crossing processes can be captured by operationalising boundary crossing theory, and its related learning mechanisms and sub-processes thereof, into a coding frame. This operationalisation is a relevant methodological contribution to boundary crossing theory (Akkerman & Bakker, 2011; Akkerman & Van Eijck, 2013).

Fourth and finally, the thesis stresses the importance of boundary crossing competence for all participants in transdisciplinary university-society partnerships, and provides suggestions for the further development of their boundary crossing competence. This informs not only debates on the further development and implementation of transdisciplinary research and education in university-society collaborative settings (e.g. Bawa & Munck, 2012; Lansu et al., 2013; Scholz & Steiner, 2015b, 2015c). More broadly, these 'boundary crossing' findings also contribute to current debates in competence theory and research on competencies needed to face 21st century societal challenges (Mulder, 2017; OECD, 2016).

6.8 Practical implications

The proven evidence for the RLEs' learning potential in relation to its boundary crossing learning environment characteristics provides a firm fundament for the future use of this learning environment in educational practice. This second-last section discusses practical implications for the future design and implementation of the RLE.

The most obvious practical implication is the provision of effective design guidelines for the RLE and other authentic, multi-stakeholder learning settings, i.e. the inclusion of working in multi-disciplinary student groups, real-life stakeholder

collaborative work and a high coaching intensity. The RLE as such could directly be included into the Urban and Landscape Planning curricula, both in the Netherlands and abroad. Existing authentic learning environments as already used in planning education, all types of studio and service learning variants, are supposed to benefit from including the typical boundary crossing characteristics of the RLE.

Next to planning curricula, other higher education and vocational curricula, at least those of which graduates will collaborate with multiple stakeholders in their future professions, could benefit from the RLE and its effective boundary crossing design guidelines when reconsidering the use and quality improvement of multi-stakeholder learning in their curricula.

To support student-stakeholder collaboration and learning thereof in a multi-stakeholder learning environment, we recommend to use project-parallel supportive workshops. To explicitly stimulate boundary crossing working and learning, these workshops should be based on the four boundary crossing learning mechanisms, and explicitly address activities that stimulate students to adopt these learning mechanisms in their collaboration with stakeholders. Two prototype workshop manuals developed as side products of this thesis (Gulikers et al., 2015a; 2015b) could inspire the design of student-stakeholder workshops tailored to other multi-stakeholder learning environments.

The RLE teacher profile, encompassing teacher responsibilities and requirements for working in out-of-school settings, offers a professionalization and management tool for higher education institutions that (start to) work in university-society collaborative settings. To support the practical use of the teacher profile, we developed a brochure in which the profile has been explained in an accessible and practical way (Oonk et al., 2013).

Despite the benefits of university-community partnerships, higher education worldwide suffers from difficulties implementing community based learning in higher education structures (e.g. Webb & Burgin, 2009). The university structures mitigate against experiential teaching and learning, and against the 'unpredictability' of authentic, community-engaged projects. Although the RLE implementation is not a 'fait accompli', its design seems to enthuse a broad range of participants who show openness for experiments and effective implementation. The RLE, and its now proven effective design, may function as an effective 'interface organisation' (Whitmer et al., 2010), bridging needs of university and society, and supporting higher educational transitions towards out-of-school readiness.

6.9 A final word

The results of this thesis contribute to research-based evidence for the RLEs' effectiveness. This effectiveness was not confirmed before, and is certainly relevant for the further development of the RLE, and probably for its equivalents. However, next to these scientific findings, RLE researchers and developers should keep an eye on, and give room to, hardly measurable surprising events in this enthusing learning environment. Perhaps the salient student phrase 'normaal ga ik liever voor een 6 zonder stress, dan een 7 zonder leven. Maar in de RLE is alles echt, dan moet je gewoon wel voor een 9 gaan!'[9], as expressed in one of the studied RLEs, has more significant added value than all these scientific findings together. Although? Let's explore that!

9 Translation (Dutch-English (UK)): 'Normally I prefer a grade 6 without stress to a grade 7 without a life. However, in the RLE everything is "real", and as such you should make sure to go for a grade 9!' (The marks as mentioned are based on the commonly used Dutch grading system (1-10) in which mark 6 is the minimal mark required to pass and mark 10 is the highest possible rating).

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Appendices

A

Appendix 1. General regional aim of the RLE, examples of project assignments (including client(s)) and examples of stakeholders involved in the studied Regional Learning Environments

	General regional aim of the RLE	Example of project assignment (including client(s))	Examples of stakeholders involved in the project assignment (next to the client(s))
RLE 1.	Sustainable economic development of the marginal Twente region	Investigate the added value of the Twente regions' attractive landscape and high nature qualities for attracting business to the region (NGO Landscape Management Overijssel)	1. Staatsbosbeheer (national private forest owner and manager) 2. Various medium-size and big-size enterprises
RLE 2.	Integral area development of the River Regge Valley	Advise the municipality of Wierden how to develop an integral area development plan for the Regge Valley within two years (Municipality of Wierden)	1. Waterboard Regge and Dinkel 2. Local citizen initiative group
RLE 3.	To tackle economic and demographic decline of rural villages in the Province of Noord-Holland Noord	Compose village appraisals for three small villages in the municipality of Niedorp and translate the appraisal results into scenarios for the future development of, and cooperation between the villages aiming at becoming lively living areas (Village Councils of the respective villages)	1. Local citizens 2. Municipality of Niedorp
RLE 4.	Stimulating the regional economy of the Food Valley region by increasing the production, distribution, and consumption of healthy, typical regional, food products	Develop a strategy to bring together all stakeholders involved in a healthy regional food production and distribution chain, and match their ideas and perspectives (Foundation Renewal Gelderse Vallei and Eem)	1. Food Valley Region (co-operative of 8 municipalities) 2. Various intensive livestock farmers
RLE 5.	Revitalising the region Salland	Develop a vital business plan for the 'De Haere' estate (Private Estate Management Foundation IJssellandschap)	1. Municipality of Olst-Wijhe 2. Various hotel entrepreneurs

Appendix 2. Competencies including description as assessed in study 1 and study 2

No.	Competency and competency description
1	**Domain-specific professional expertise** I have much expert knowledge and professional skills. By applying this knowledge and these skills, I can easily perform standard operations in my field of expertise. I also have enough expert knowledge and skills to be able to act in a professional way in new and unexpected situations. With my expertise, I am able to help others to complete their tasks.
2	**Deciding and initiating activities** In my work or my studies, I take the initiative to undertake activities and start up and tackle (new) tasks. When taking a decision, I first think about the options I have, and which advantages and disadvantages these options have. Because of this, I can explain others why I made certain choices and/or I can justify my choices. This also makes me perform my tasks with confidence, and I take responsibility for my choices.
3	**Showing attention and understanding** I can empathize with other people's feelings and take their opinions into account. I do this by carefully listening, paying attention to signals of others and showing understanding for the views of others, even if they differ from my own views. I adapt my reaction and behaviour to the situation that I am in, as well as to the feelings of others.
4	**Collaborating and discussing** When working with others, I give an active and valuable contribution to our meeting. I perform my duties and do my best to work with the group towards a good result. Wherever possible, I help my group members with their duties and give them feedback on their work. I also contribute to a good atmosphere in the group. I am aware of irritations between people and take action to prevent and resolve conflicts.
5	**Investigating** I have a research-oriented, curious attitude. If something is unclear to me, if I want to develop something new or if I encounter a problem, I start looking for solutions. I collect information in a structured way from various sources such as internet, journals and experts. Based on this information I can identify several solutions and I test whether solutions work appropriately. Based on my research, I formulate recommendations and I share my findings with others in order to let them benefit from my findings.
6	**Acting commercially** I understand business processes. This means that I have knowledge about the policies, the goals and the way a company wants to achieve those goals, also called the business strategy. I also know how the different sections/departments of a company are related. I know how to find the right people for the right tasks and in case of questions I know whom to contact. Acting commercially also requires to operate cost-effectively. Before spending money, I weigh the costs and benefits for the company. I also minimize unnecessary costs and a waste of energy and materials.
7	**Creating and innovating** I want to be innovative in my work and I regularly come up with new ideas for my work. I am concerned with the improvement of products and/or services or with inventing new things. When doing this, I take into account current developments in my professional field, such as new trends, needs of society, and needs of future customers. I am capable of assessing whether my new ideas are feasible. I discuss my ideas with others, for example my colleagues, and take actions to actually execute my ideas.
8	**Planning and organizing** When I am performing a task, I make a plan in advance. I first consider which results I want to achieve, which tasks must be performed to achieve the results, how much time is required and which materials I need. During the execution I monitor if everything runs according to the time schedule. If not, I adjust the time schedule.
9	**Customer-oriented acting** When working for a client or customer, I make sure that I know the needs of my client/customer. I adapt my work to these needs. I have a regular contact with my clients/customers to check their satisfaction, and keep them informed about the progress. I can answer questions of clients and customers. In case of a complaint, I quickly undertake action to resolve the complaint.
10	**Building relationships and networking** I think contacting other people in my work is important. I take initiative to contact people that, now or in the future, could positively contribute to my work. I easily get in contact with people within my organisation, and also with people outside my organisation. I do maintain my professional contacts, to get in touch with other people if we can do something for each other.

Appendix 3. The working process in the Regional Learning Environment

Insight in the working process of the RLE is regarded as to be helpful in understanding teacher roles, tasks and competencies when performing in the RLE. The working process illustrates the activities carried out by actors involved, and the products to be delivered in the different stages of the working process. Foorthuis et al. (2012) developed a five-step model for the RLE working process. The five steps of the model, including activities of the actors and outcomes of the steps, will be explained below paraphrased from Foorthuis et al. (2012). Although the steps are numbered, they do not necessarily occur in chronological order in the practice of the RLE.

The first step involves an exploration of regional developments and demands, and an identification and mobilisation of involved stakeholders aiming to set up a long-term and programmed partnership in the region. The educational institutions, both on management and/or teacher level, may play the role of initiator in this first exploratory step, but in most cases educational institutions act as one of the participating actors. Products of this stage of the working process are an initial steering committee, an initial network of committed stakeholders, a joint regional innovation agenda that serves as a basis for the formulation of concrete RLE projects (see step 2), and a signed letter of intent to collaborate. The innovation agenda serves as a basis for the formulation of concrete RLE projects (see step 2).

The second step involves the articulation of demands, that is the translation of the more abstract research themes from the innovation agenda into feasible projects for various executing actors, including education. This step results in a research agenda, containing concrete and feasible project descriptions and intended executing actors. A business plan for the RLE is also a product of this second step.

The third step is a formalising step in which mutual learning expectations of all stakeholders involved will be recorded in a learning contract that will be signed by all parties involved.

The fourth step is the project-executing step. Stakeholders work in various constellations on the defined projects. Teachers, as one of the possible stakeholders, either work as an equal partner next to other non-educational partners, as an equal partner next to participating students and/or as a student coach. In case students are the main executing partners, they are expected to work in close collaboration with multiple external stakeholders involved.

Students are always, but to varying extents, coached by teachers on both project content and process. Students are also assessed by teachers and/or external assessors, both during and at the end of a project. Output of this fourth step is the project product in its various appearances (e.g. consultancy reports, knowledge databases, methodologies, brochures, practical implementations).

The fifth and final step in the working process is the optimization and continuation of the RLE, both from a knowledge creation and dissemination point of view, as from an institutional point of view. This step is meant to guarantee the RLE to become an acknowledged long-term partnership. Activities in this part of the working process are the compilation and dissemination of newly developed knowledge and methodologies into usable products; products for various users both in and outside the region, and both theoretical and practical. Next, the RLE as an institution, its management and business plans will be evaluated. Outcomes of the evaluation result in decisions on a more fundamental embedding of the RLE in regional governing and organisational structures. This embedding is often accompanied by an updated version of the research agenda, actor networks and business plans. From an educational point of view, this final step also includes the more permanent embedding of the RLE into curricula. Educational embedding of the RLE involves on the meso-level that the curriculum design will be aligned with the RLE rhythm. On the micro-educational level RLE embedding includes the enrichment of existing educational activities with newly created knowledge and methods, and practical experiences resulting from RLE involvement.

The RLE working process is not completely unique for working processes in multi-stakeholder learning environments. The RLE working process shares similarities with working processes as described for other multi-stakeholder learning environments for which university-community partnerships have been built, e.g. for service learning (Jacoby, 2003, p. 10), studios (Brandt et al., 2013) and for transdisciplinary sustainability case studies (Brundiers et al., 2013; Yarime et al., 2012).

Summary

Today's world is full of complex issues that society cannot tackle without integrative and collaborative approaches. Examples of these issues are population growth, economic decline, climate change, and the spatial consequences thereof. Finding solutions for these problems requires cross-boundary collaboration between multiple stakeholders who represent various practices, disciplines and perspectives. The majority of higher education graduates worldwide will be involved in these multi-stakeholder collaborative practices in their future professions. As a consequence, higher education should facilitate effective learning environments in which students will optimally be prepared to work and learn with multiple stakeholders, that is, to cross boundaries between practices. The Dutch authentic Regional Learning Environment (RLE) is an example of a multi-stakeholder learning environment. The RLE is expected to effectively prepare future higher education professionals to face current societal problems. However, the effectiveness of the RLE, including its typical cross-boundary design characteristics, for student learning has not yet been investigated. The main purpose of this thesis is to find evidence for student learning in the multi-stakeholder Regional Learning Environment related to its typical learning environment characteristics. Four studies have been carried out; the first empirical three studies with a focus on student learning in the RLE, the fourth descriptive study with a focus on teacher requirements for working in such an out-of-school oriented, multi-stakeholder learning setting. This summary shortly introduces the RLE, the applied theoretical concept of boundary crossing and the reason for taking Urban and Landscape Planning students as the subject of study. Next, the summary recaps the design and results of the four respective studies, and describes the main findings, implications and suggestions for future research.

The Regional Learning Environment

The general aim of the Regional Learning Environment (RLE) is to facilitate the collaborative creation of new knowledge towards sustainable regional development. The RLE was introduced in The Netherlands in 2005 as a long-term learning and working community in which students, teachers, researchers, policy makers, members

of NGO's, entrepreneurs and/or citizens, i.e. multiple stakeholders, co-operatively work on complex issues of regional development while mutually learning. The RLE has been established so far in 13 Dutch, mostly rural, regions that are characterized by their high landscape and biodiversity values, recreational pressure and economic and demographic decline. Educational institutions, on both vocational and academic level, are always one of the partners in the RLE. A unique feature of the RLE is that student learning is embedded in a real multi-stakeholder, knowledge co-creating process aiming at stimulating both student learning, as well as 'regional learning'. Examples of recent RLE results are distribution chains for regional organic food, landscape and educational garden designs, a communication and activity plan catalysing the re-establishment of community centres and various tools for innovative participative approaches.

From an educational perspective, the RLE is an authentic, multi-stakeholder learning environment. Each RLE is characterized by an identical set of learning environment characteristics. Students work in student groups on real, transdisciplinary problems from the region, commissioned by an external client. Knowledge is collaboratively constructed between students, teachers and, preferably, multiple regional stakeholders. Working in the RLE results in a realistic authentic product that has value for the external client(s) and contributes to regional development, ideally to transformation. Assessment criteria and procedures vary between RLEs. Teachers facilitate students' and other parties learning processes, and are also learning partners in the RLE. The RLE preferably has three additional design characteristics that are expected to explicitly stimulate students to work and learn across boundaries between different disciplines and perspectives, that is:

1. students work in multidisciplinary student groups;
2. students collaborate intensively with multiple stakeholders; and
3. students are intensively coached on working and learning across boundaries.

Boundary crossing in the Regional Learning Environment

Little is known about the learning processes that occur when students work across practices, and about the effects of typical learning environment characteristics that address working across practices. Boundary crossing theory provides insights and tools for getting a grip on working and learning across practices, disciplines and/or perspectives. Boundaries between these practices tend to be perceived as barriers, but often appear to provide challenging learning and knowledge creating opportunities. Boundary crossing then is understood as working across the boundaries of different practices, and learning from that. Boundary crossing competence reflects a persons' ability to do so, and to contribute to effective outcomes of collaboration across practices. Last, boundary crossing theory distinguishes four learning mechanisms that

can leverage learning processes that occur when crossing boundaries, i.e. identification, coordination, reflection and transformation.
The RLE is hypothesized to be a learning environment in which higher education students are challenged to develop their boundary crossing capabilities by adopting these four learning mechanisms.

Urban and Landscape Planning students as the subjects of study
Although the RLE is used in various education programmes, the majority of the RLEs that were studied in this thesis were part of Urban and Landscape Planning curricula. As a consequence, most students who participated in the studies were planning students. The reason behind the choice for the context of planning programmes is that the planning profession is a multi-stakeholder collaborative, 'boundary crossing' profession by nature. Spatial planning draws from the social, the technical and the environmental sciences in creating interdisciplinary knowledge and instruments supporting the design, implementation and evaluation of collaborative, participative spatial processes. It is obvious that multi-stakeholder collaboration, including working with and learning from different disciplines and perspectives, should at least be addressed in planning education. However, actual multi-stakeholder collaboration is not included in all planning curricula worldwide. Moreover, when planning curricula do include student-stakeholder collaboration, e.g. in the well-known service learning or studio variants, systematic investigations of student learning outcomes related to the educational design of the learning environments are scarce. This thesis addresses this gap by explicitly studying student learning in relation to multiple stakeholder collaboration and as such will, at least, be beneficial for planning education.

Next, the four studies as carried out in this thesis will be described.

Study 1. Educating boundary crossing planners: Evidence for student learning in the multi-stakeholder Regional Learning Environment
The first study (Chapter 2) investigates to what extent RLEs stimulate students to develop competencies identified as relevant for working in an RLE setting, and if the typical RLE characteristics of working in multidisciplinary student groups and multi-stakeholder collaboration enhance student learning. Next, the study examines what RLE teachers perceive to be student learning outcomes and preconditions for using the learning potential of the RLE.

A quasi-experimental mixed methods pre-and post-test design investigated the effectiveness of five RLEs for student learning (N = 225). Students' competence development was measured using a validated competence measurement instrument and qualitative student reports showed additional experienced learning outcomes. Additionally, twenty-five RLE teachers participating in a semi-structured workshop

were asked what learning outcomes as a result of typical RLE characteristics they perceived, and what they identified to be preconditions for learning in the RLE.

Paired *t*-tests examined competence development per RLE. General Linear Models compared competence development across RLEs using mono-/multidisciplinary student groups, low/high multi-stakeholder collaboration and low/high coaching as independent variables. Coaching was added as a third typical RLE characteristic, since teachers illuminated this as a crucial precondition for learning in the RLE. Students' qualitative reports on additional learning outcomes were coded as referring to working in multi-disciplinary student groups or multi-stakeholder collaboration or other learning outcomes. Finally, teacher statements were coded on categories of student learning outcomes and preconditions for learning.

Results show competence development in 4 out of the 5 RLEs, and the added value of working in multi-disciplinary student groups and a high coaching intensity for student learning. Unexpectedly, non-significant effects were found for intensive collaboration between students and multiple stakeholders, although teachers illuminated this to be a powerful design principle of the RLE.

The findings inform the future design and pedagogy of the RLE and other authentic learning environments in planning education, like studios or service-learning. Since multi-stakeholder collaboration is inherent to planning practice, future research should examine if and how learning with and from multiple stakeholders can be optimized in the RLE.

Study 2. Educating collaborative planners: Strengthening evidence for the learning potential of multi-stakeholder Regional Learning Environments

The second study (Chapter 3) is a follow-up of study 1, in an attempt to further strengthen evidence for the effectiveness of the RLE by studying a new set of seven RLEs and 143 other students. The study uses the same design as study 1 for measuring and analysing student learning, and compares the results with those of study 1.

In this follow-up study, 6 out of the7 RLEs show competence development. Next, this follow-up study shows the added value for student learning of all three typical 'boundary crossing' RLE design characteristics, i.e. working in multidisciplinary student groups, working intensively with multiple stakeholders and a high coaching intensity.

Results strengthen previous findings, and further fund an evidence-based pedagogy for authentic learning environments as used in planning education. Differing findings for the added value of working intensively with multiple stakeholders between the first and the second study trigger future studies that examine the effect of explicit support of student-stakeholder collaboration.

Study 3. Stimulating students' boundary crossing learning in the multi-stakeholder Regional Learning Environment

Study 3 (Chapter 4) originates from the idea that optimising student learning from working with multiple stakeholders requires explicit support. It investigates students' boundary crossing working and learning processes in the RLE as a result of workshop-based support thereof. The study examines whether explicit workshop-based support of student-stakeholder collaboration in the RLE results in more self-efficacy for stakeholder collaboration, in more reported collaborative activities between students and stakeholders and in differences in reported boundary crossing learning mechanisms.

The study was designed as an intervention study. Two workshops on student-stakeholder collaboration were developed. The workshops were expected to address the boundary crossing learning mechanisms identification and coordination (workshop 1), respectively reflection and transformation (workshop 2). RLE students (N = 122) participated in either none, one or two workshops during their RLE projects. Self-efficacy was measured using student scores on a set of statements that addressed students' felt ability to collaborate with the stakeholders. Three types of qualitative student reports aimed to illuminate students' collaborative activities, and adoption of boundary crossing learning mechanisms.

Self-efficacy scores were compared using an ANOVA. The three student reports were qualitatively analysed and triangulated to identify students' collaborative activities and reported boundary crossing learning processes.

Results show that a series of two workshops stimulates the amount of reported collaborative activities, and activates planning students' boundary crossing learning in terms of reflection and transformation. Self-efficacy for stakeholder collaboration during the projects did not differ between the conditions.

Findings provide insights into the use of explicit support of student-stakeholder collaboration in authentic multi-stakeholder learning environments. Moreover, the findings contribute to boundary crossing theory by operationalising this theoretical concept into an analytical framework that captures boundary crossing learning. A next step in research would be to not only measure boundary crossing learning processes, but also grasp its learning outcomes.

Study 4. Teachers as brokers: Adding an out-of-school perspective to higher education teacher profiles

The RLE is exemplary for out-of-school oriented, multi-stakeholder learning environments that gain more prevalence in higher education institutions now that these are expected to be society-engaged. Teachers fulfil a crucial role in enhancing the effectiveness of a learning environment, expectantly also in multi-stakeholder learning

environments, but should properly be supported to function in these learning environments. A systematic analysis of existing higher education teacher profiles shows that these hardly include requirements for working in out-of-school, multi-stakeholder collaborative settings. This lack may hinder teachers to perform well in out-of-school settings. Study 4 (Chapter 5) hypothesizes that higher education teachers fulfil new, non-traditional roles and tasks in out-of-school settings, and need to master additional competencies to effectively develop and support learning in such settings. This study aims to identify roles, tasks and competencies needed to effectively work in out-of-school settings, and as such should be added to general higher education teacher profiles.

RLE documents, teacher interviews and focus group discussions were analysed to develop a role, task and competence profile for teaching in the RLE, taking the RLE as an exemplary out-of-school learning environment. This profile was systematically compared with existing general higher education teacher profiles to identify new roles, tasks and competencies not represented in existing profiles.

The resulting RLE profile offers nine roles, nineteen tasks and 24 competencies, the majority of which are new to existing more in-school oriented higher education teacher profiles.

Starting a scholarly debate on out-of-school additions to existing higher education teacher profiles, the study develops an argument for adding the role of broker, including boundary crossing competence, and a collaborative learning attitude, to existing profiles. Practically, the resulting RLE profile is a useful source for identifying teacher requirements in out-of-school learning settings, and developing consequential professionalization trajectories. Actual performance of RLE teachers and related teacher professionalization trajectories are regarded as interesting topics for further inquiry.

The effectiveness of the RLE in a broader perspective: discussing the main findings

The four studies in this thesis confirm the effectiveness of the RLE and its various typical design characteristics in several ways. The general discussion (Chapter 6) puts these results in a broader perspective, reflects on limitations, provides future research opportunities, shows contributions to theoretical debates, and ends up with implications for the development of authentic multi-stakeholder learning in higher education practice.

The studies and our research experiences in the RLE, illuminated four aspects of the RLEs that were not object of study but seemed to be influential in affecting students' boundary crossing learning in the RLE. These aspects included (1) the lack of explicating learning objectives that address boundary crossing working and learning, (2) the limited attention for learning surprises that authentic, multi-stakeholder

collaboration provides, (3) the limited use of systematic reflection, and (4) the absence of assessment strategies, let alone assessment strategies that address boundary crossing learning.

This thesis confirmed the RLE to be an effective learning environment for higher education, mainly planning, students. The discussion elaborates on how the RLE is expected to also offer learning potential for higher education students from other than planning programmes, for students in Vocational Education and Training (VET), for teachers and stakeholders, and finally for regional development and, ideally, transformation.

Three quasi-experimental studies examined twenty different RLEs, as part of various curricula at four higher education institutions, in which a total of 490 students participated and delivered quantitative and qualitative data. This is considered to be a strong basis for drawing conclusions on the RLEs' effectiveness for student learning.

Prevalent limitations of the thesis are threefold. First, the quasi-experimental set up of the first three studies left room for more factors influencing differences in student learning in the various RLEs than the studied independent variables. Secondly, the studies do not provide for in-depth analyses of student learning in individual RLE cases, due to the choice for a systematic comparison of RLEs. Third, the studies are mainly based on self-reports.

The thesis discusses eleven suggestions for future studies. A few of these remaining questions will be highlighted here. The RLE would benefit from clear learning objectives. How to make these learning objectives more stakeholder-proof? How to balance between prescribing learning objectives and leaving room for learning surprises? And, how to assess RLE learning? Would a boundary crossing rubric support the assessment of boundary crossing learning outcomes? How to improve teacher and stakeholder support of student learning in the RLE? Finally, related to the ultimate aim of the RLE: what is the regional transformative impact that participants co-create?

The results of this thesis theoretically contribute to at least four current scholarly debates. First, the thesis responds to the call for more systematic studies on the effects of the pedagogical design of authentic learning environments on higher education students' learning. Secondly, the thesis contributes to the debate on how to make higher education institutions more out-of-school proof, i.e. ready to face university-society engagement, by providing an out-of-school oriented teacher profile. Thirdly, this thesis operationalised what boundary crossing learning can look like at the individual level in situations in which students learn across the boundaries of their own and stakeholders' practices. Fourth, the thesis stresses the importance of boundary crossing competence for all participants in transdisciplinary university-society partnerships, and provides suggestions for the further development of their boundary

crossing competence. This feeds current debates in competence theory and research on 21st century skills needed to face current societal challenges.

Practically, this thesis provides evidence-based effective design guidelines for the RLE, and for other authentic, multi-stakeholder learning settings. As such, the results stimulate the further design of authentic learning environments in various educational contexts. To support student-stakeholder collaboration and learning thereof in a multi-stakeholder learning environment, we recommend to use project-parallel supportive boundary crossing workshops. Finally, the RLE teacher profile offers a professionalization and management tool for higher education institutions that (start to) work in university-society collaborative settings.

Samenvatting

Hedendaagse complexe maatschappelijke vraagstukken vragen om integrale en op samenwerking gestoelde benaderingen. Voorbeelden van deze vraagstukken zijn bevolkingsgroei, economische achteruitgang, klimaatverandering en de ruimtelijke gevolgen daarvan. Het vinden van oplossingen voor deze problemen vereist samenwerking tussen meerdere belanghebbenden, hierna *stakeholders* genoemd, over de grenzen van hun verschillende praktijken, disciplines en perspectieven heen. De inspanningen die betrokkenen leveren om samenwerking over grenzen gestalte te geven wordt ook wel *boundary crossing* genoemd; het leren daarvan boundary crossing leren. De meerderheid van afgestudeerden aan het hoger onderwijs wereldwijd zal betrokken raken bij *multi-stakeholder* praktijken in hun toekomstige beroep. Zij zullen effectief moeten samenwerken met en leren van een diversiteit aan stakeholders. Het hoger onderwijs zal dus effectieve leeromgevingen moeten aanbieden waarin studenten optimaal worden voorbereid om te werken en leren met verschillende stakeholders: leeromgevingen waarin studenten de grenzen tussen praktijken leren overschrijden. De in Nederland ontwikkelde, authentieke Regionale Leeromgeving (RLE) is een voorbeeld van zo'n multi-stakeholder leeromgeving. De verwachting is dat de RLE toekomstige hoger onderwijs professionals effectief voorbereidt op de aanpak van huidige maatschappelijke vraagstukken. Echter, de effectiviteit van de RLE, inclusief haar typische boundary crossing leeromgevingskenmerken, voor het leerproces van studenten is nog niet onderzocht. Het belangrijkste doel van dit proefschrift is het aantonen van het leren van studenten in de multi-stakeholder RLE, gerelateerd aan haar typische leeromgevingskenmerken. Daartoe zijn vier studies uitgevoerd. De eerste drie, empirische, studies richtten zich op het leren van studenten in de RLE. De vierde, beschrijvende studie richtte zich op rollen, taken en competenties van docenten benodigd voor het werken in een dergelijke, buitenschools georiënteerde leeromgeving.

Deze samenvatting start met een introductie van de RLE, de gebruikte theorie over boundary crossing en de keuze voor studenten Ruimtelijke Planning als subject van studie. Vervolgens geeft de samenvatting een korte beschrijving van het ontwerp en de resultaten van de vier studies. De samenvatting sluit af met de belangrijkste

bevindingen van het proefschrift voor theorie en praktijk en suggesties voor toekomstig onderzoek.

De Regionale Leeromgeving

De Regionale Leeromgeving (RLE) beoogt de gezamenlijke creatie van nieuwe kennis op weg naar duurzame regionale ontwikkeling te bevorderen. De RLE is geïntroduceerd in Nederland in 2005 als een lange-termijn leer- en werkgemeenschap waarin studenten, docenten, onderzoekers, beleidsmakers, maatschappelijke organisaties, ondernemers en/of burgers, i.e. de verschillende stakeholders, samenwerken aan complexe vraagstukken van regionale ontwikkeling terwijl zij tegelijkertijd bewust samen leren. De RLE bestaat nu in dertien Nederlandse regio's; regio's die worden gekenmerkt door hoge natuur- en landschapswaarden, een hoge recreatieve druk en economische en demografische achteruitgang. Onderwijsinstellingen, zowel voor beroepsonderwijs als voor academisch onderwijs, zijn altijd één van de partners in de RLE. Uniek kenmerk van de RLE is dat het leren van studenten is ingebed in een echt proces van kennis co-creatie dat in werkelijkheid plaatsvindt. Dit proces is gericht op het stimuleren van zowel het leren van studenten, als van het leren van de 'regio'. Voorbeelden van recente RLE resultaten zijn distributieketens voor regionale biologische voedselproducten, tuin- en landschapsontwerpen, communicatie- en activiteitenplannen voor de heroprichting van buurthuizen en diverse instrumenten voor innovatieve, participatieve procesbenaderingen.

Vanuit een onderwijskundig perspectief is de RLE een authentieke, multi-stakeholder leeromgeving. Elke RLE wordt gekenmerkt door een identieke set van leeromgevingskenmerken. Studenten werken, in opdracht van een externe opdrachtgever, in groepen van studenten aan echte, transdisciplinaire problemen uit de regio. Kennis wordt gezamenlijk geconstrueerd in een samenwerkingsverband tussen studenten, docenten en bij voorkeur meerdere regionale stakeholders. Het werken in de RLE resulteert in een realistisch, authentiek product dat waarde heeft voor de externe opdrachtgever(s) en bijdraagt aan duurzame regionale ontwikkeling, zo mogelijk aan regionale transformatie. Beoordelingscriteria en -procedures verschillen tussen RLEs. Docenten faciliteren de leerprocessen van studenten en van andere partijen en zijn zelf ook actief lerende partners in de RLE. De RLE heeft idealiter drie extra leeromgevingskenmerken waarvan wordt verwacht dat deze de deelnemende studenten expliciet stimuleren om te werken en te leren over de grenzen van verschillende disciplines en perspectieven, namelijk:

1. studenten werken in multidisciplinaire studentgroepen;
2. studenten werken intensief samen met meerdere stakeholders; en
3. studenten worden intensief begeleid in het werken en leren over grenzen heen.

Boundary crossing in de Regionale Leeromgeving

Over de leerprocessen die zich voltrekken wanneer studenten werken over de grenzen van verschillende stakeholderpraktijken is nog weinig bekend, evenals over de effecten van typische leeromgevingskenmerken die deze leerprocessen aanspreken. Theorieën over boundary crossing bieden inzichten en tools om grip te krijgen op het werken en leren over grenzen van praktijken, disciplines en/of perspectieven. Grenzen tussen praktijken worden vaak opgevat als barrières voor samenwerking, maar blijken juist vaak kansen voor kenniscreatie te bieden. Boundary crossing wordt dan opgevat als de inspanningen die mensen verrichten om te werken en leren over de grenzen van verschillende praktijken. Wie het vermogen beheerst om grenzen over te steken, te kunnen 'boundary crossen', zou moeten kunnen bijdragen aan een effectieve samenwerking over de grenzen van praktijken heen. Tot slot, binnen de theorie van boundary crossing worden vier leermechanismen onderscheiden die kunnen worden opgevat als een type inspanning die het leren over grenzen in werking kan zetten; een soortement hefboom voor leren. De vier leermechanismen zijn identificatie, coördinatie, reflectie en transformatie. Dit proefschrift veronderstelt dat de RLE studenten in het hoger onderwijs uitdaagt om hun boundary crossing bekwaamheden te ontwikkelen door deze vier leermechanismen aan te spreken.

Studenten Ruimtelijke Planning als het subject van studie

Hoewel de RLE wordt ingezet in verschillende onderwijsprogramma's op verschillende onderwijsniveaus, was de meerderheid van de RLE's die zijn onderzocht in dit proefschrift onderdeel van HBO- en universitaire opleidingsprogramma's Ruimtelijke Planning. Als gevolg daarvan waren de meeste studenten die deelnamen aan de studie studenten Ruimtelijke Planning. De keuze voor de context van ruimtelijke planning is ingegeven door het feit dat de ruimtelijke planning bij uitstek een op samenwerking gerichte, boundary crossing professie is. Ruimtelijke planning bouwt op de sociale, de technische en de milieuwetenschappen in het creëren van interdisciplinaire kennis en instrumenten ten behoeve van het ontwerp, de implementatie en de evaluatie van participatieve ruimtelijke processen. Samenwerking met verschillende stakeholders, inclusief het werken en leren van verschillende disciplines en perspectieven, zou op zijn minst moeten worden aangesproken in onderwijsprogramma's Ruimtelijke Planning. Echter, het feitelijk en in een realistische omgeving samenwerken met verschillende stakeholders maakt nog lang geen deel uit van alle bestaande curricula Ruimtelijke Planning. Bovendien, waar de planning curricula wel de werkelijke samenwerking tussen studenten en stakeholders bevatten, bijvoorbeeld in varianten van *service learning* of van de studio, is systematisch onderzoek naar leeruitkomsten van studenten gerelateerd aan het onderwijskundig ontwerp van de leeromgeving nog schaars. Dit proefschrift bestudeert expliciet het

leren van studenten in relatie tot samenwerking met stakeholders en hoopt op die manier in ieder geval van waarde te zijn voor het onderwijs op het gebied van ruimtelijke planning. De hiernavolgende paragraven beschrijven de vier uitgevoerde studies.

Studie 1. Het opleiden van boundary crossing planners: bewijs voor het leren van studenten in de multi-stakeholder Regionale Leeromgeving

De eerste studie (hoofdstuk 2) in dit proefschrift onderzoekt in hoeverre de RLE studenten stimuleert om competenties te ontwikkelen die als relevant worden beschouwd voor het werken in een RLE, en of de typische RLE kenmerken van het werken in multidisciplinaire studentgroepen en intensieve multi-stakeholder samenwerking dit leren van studenten versterken. Verder onderzoekt de studie de opvattingen van RLE docenten over potentiele RLE leeruitkomsten van studenten en over randvoorwaarden voor het gebruik van het leerpotentieel van de RLE.

In een quasi-experimenteel, *mixed methods* pre- en post-test onderzoeksontwerp onderzochten we de effectiviteit van vijf RLE's voor het leren van studenten (N = 225). Competentieontwikkeling van studenten werd gemeten met een gevalideerd competentie meetinstrument. Daarnaast toonden kwalitatieve student-rapportages andere ervaren leeruitkomsten. Vijfentwintig RLE docenten die deelnamen aan een semigestructureerde workshop werd gevraagd welke leeruitkomsten ze zagen als resultante van de typische kenmerken van de RLE en welke randvoorwaarden voor leren in de RLE zij identificeerden.

Gepaarde *t*-toetsen onderzochten de competentieontwikkeling van studenten per RLE. Gegeneraliseerde Lineaire Modellen vergeleken competentieontwikkeling tussen RLE's met gebruik van de onafhankelijke variabelen mono- versus multidisciplinaire studentgroepen, laag versus hoog intensieve multi-stakeholder samenwerking en een lage versus hoge coaching intensiteit. Coaching werd toegevoegd als een derde typisch leeromgevingskenmerk van de RLE, omdat docenten intensieve coaching uitlichtten als een essentiële voorwaarde voor leren in de RLE. De kwalitatieve rapportages van studenten werden gecodeerd op een verwijzing naar (1) het werken in multidisciplinaire studentgroepen of naar (2) stakeholder samenwerking of naar (3) andere leerresultaten. Tenslotte werden de docentrapportages gecodeerd op verschillende categorieën van leeruitkomsten en randvoorwaarden voor het leren in de RLE.

De resultaten tonen competentieontwikkeling in vier van de vijf RLE's. Verder is de toegevoegde waarde van het werken in multidisciplinaire studentgroepen en een hoge coaching intensiteit voor de competentieontwikkeling van studenten aangetoond. Tegen de verwachtingen in vonden we geen significant effect voor de meerwaarde van intensieve samenwerking tussen studenten en meerdere stakeholders, hoewel docenten

dit benoemden als een krachtig leeromgevingskenmerk van de RLE.

De bevindingen van deze eerste studie informeren het toekomstig ontwerp en de pedagogiek van zowel de RLE als van andere authentieke leeromgevingen zoals die gebruikt worden in opleidingsprogramma's Ruimtelijke Planning. Aangezien samenwerking tussen verschillende stakeholders inherent is aan de planningspraktijk, zou toekomstig onderzoek zich moeten richten op de vraag of en hoe het leren met en van verschillende stakeholders kan worden geoptimaliseerd in de RLE.

Studie 2. Het opleiden van samenwerkende planners: versterken van het bewijs voor het leerpotentieel van de multi-stakeholder Regionale Leeromgeving

De tweede studie (hoofdstuk 3) in het proefschrift is een vervolg op de eerste studie, in een poging om het bewijs voor de effectiviteit van de RLE verder te versterken door het bestuderen van een nieuwe reeks van zeven RLE's en 143 andere studenten. De studie maakt gebruik van hetzelfde ontwerp als gebruikt in studie 1 voor het meten en analyseren van het leren van studenten en vergelijkt de resultaten met die van studie 1.

In deze follow-up studie, wordt in zes van de zeven RLE's competentieontwikkeling aangetoond. Hiernaast laat deze follow-up studie de toegevoegde waarde voor het leren van studenten zien van alle drie de typische 'boundary crossing' leeromgevingskenmerken, dat wil zeggen het werken in multidisciplinaire studentgroepen, het intensief samenwerken met meerdere stakeholders en een hoge coaching intensiteit.

Deze resultaten versterken eerdere bevindingen en vormen een op onderzoek gebaseerde onderbouwing voor de pedagogiek van authentieke leeromgevingen zoals gebruikt in het onderwijs op het gebied van ruimtelijke planning. De verschillen in bevindingen tussen studie 1 en studie 2 voor wat betreft de toegevoegde waarde van een intensieve samenwerking tussen studenten en meerdere stakeholders, geven aanleiding tot verdere studies die het effect van expliciete ondersteuning van de samenwerking tussen studenten en stakeholders onderzoeken.

Studie 3. Het stimuleren van boundary crossing leren van studenten in de multi-stakeholder Regionale Leeromgeving

Studie 3 (hoofdstuk 4) komt voort uit het idee dat het optimaliseren van het leren van studenten als gevolg van het werken met verschillende stakeholders expliciete steun vereist. De studie onderzoekt boundary crossing werk- en leerprocessen van studenten in de RLE als gevolg van op workshops gebaseerde ondersteuning daarvan. De studie brengt in kaart of expliciete ondersteuning van de samenwerking tussen studenten en stakeholders in de RLE middels workshops resulteert in (1) een groter gevoel van bekwaamheid voor de samenwerking met stakeholders, in (2) meer gerapporteerde gezamenlijke activiteiten tussen de studenten en stakeholders en in (3) verschillen in

gerapporteerde boundary crossing leermechanismen.

De studie werd ontworpen als een interventiestudie. Om te beginnen werden twee workshops student-stakeholder samenwerking ontwikkeld. De workshops werden zo ontworpen dat ze verwacht werden de boundary crossing leermechanismen identificatie en coördinatie (workshop 1), respectievelijk reflectie en transformatie (workshop 2) aan te spreken. RLE studenten (N = 122) in acht RLE projecten namen deel aan ofwel geen, ofwel één, ofwel twee workshops tijdens hun RLE projecten.

Gevoelde bekwaamheid voor samenwerking met stakeholders werd gemeten door studenten zichzelf te laten scoren op een set stellingen over de bekwaamheid om met stakeholders samen te werken (5-punts Likert schaal). Drie verschillende open vragen hadden tot doel kwalitatieve uitspraken van studenten over de samenwerkingsactiviteiten en het zich eigen maken van boundary crossing leermechanismen te ontlokken.

De scores voor gevoelde bekwaamheid werden vergeleken met behulp van een ANOVA. De drie typen studentrapportages werden kwalitatief geanalyseerd en getrianguleerd om samenwerkingsactiviteiten van studenten met stakeholders en boundary crossing leerprocessen te identificeren.

Resultaten van de studie laten zien dat een reeks van twee workshops het aantal gerapporteerde activiteiten dat een student onderneemt met stakeholders stimuleert en het boundary crossing leren in termen van reflectie en transformatie activeert. Gevoelde bekwaamheid van studenten voor samenwerking met stakeholders tijdens de RLE projecten verschilde niet tussen de drie condities.

De bevindingen geven inzicht in het belang en ontwerp van expliciete ondersteuning van samenwerking tussen studenten en stakeholders in authentieke multi-stakeholder leeromgevingen. Bovendien dragen de resultaten bij aan boundary crossing theorie door dit theoretische concept te operationaliseren in een analyse raamwerk voor het in kaart brengen van boundary crossing leerprocessen. Een volgende stap in het onderzoek zou zijn om niet alleen leerprocessen te meten, maar ook de leeruitkomsten daarvan.

Studie 4. Leerkrachten als bruggenbouwers: het toevoegen van een buitenschools perspectief aan docentprofielen voor het hoger onderwijs

De RLE is exemplarisch voor buitenschools georiënteerde, multi-stakeholder leeromgevingen die aan invloed winnen nu instellingen voor hoger onderwijs geacht worden meer maatschappij betrokken te opereren. Docenten vervullen een cruciale rol in het verbeteren van de effectiviteit van een leeromgeving, naar verwachting ook van multi-stakeholder leeromgevingen, maar zij moeten goed worden ondersteund om te kunnen functioneren in deze leeromgevingen. Een systematische analyse van bestaande docentprofielen voor docenten hoger onderwijs toont aan dat deze profielen

nauwelijks vereisten bevatten voor het werken in buitenschools, en op samenwerking met externe stakeholders, georiënteerde leercontexten. Dit gebrek kan docenten belemmeren om goed te presteren in zo'n buitenschools georiënteerde leeromgeving. Studie 4 (hoofdstuk 5) veronderstelt dat docenten hoger onderwijs nieuwe, niet-traditionele rollen en taken vervullen in buitenschools georiënteerde leeromgevingen en over aanvullende competenties dienen te beschikken om het leren in deze omgevingen effectief te kunnen ontwikkelen en te kunnen ondersteunen. Dit onderzoek stelt zich ten doel rollen, taken en competenties te identificeren die nodig zijn om effectief te werken in buitenschools georiënteerde leeromgevingen en als zodanig zouden moeten worden toegevoegd aan bestaande algemene docentprofielen voor docenten hoger onderwijs.

RLE documenten, interviews en focusgroep discussies met docenten en managers werden geanalyseerd om een rol-, taak- en competentieprofiel voor het werken als docent in de RLE te maken. De RLE werd hierbij beschouwd als zijnde exemplarisch voor een buitenschools georiënteerde leeromgeving. Dit RLE profiel werd systematisch vergeleken met bestaande algemene docentprofielen voor docenten hoger onderwijs om nieuwe rollen, taken en bevoegdheden te kunnen identificeren die niet in bestaande profielen waren vertegenwoordigd.

Het resulterende RLE profiel bestaat uit 9 rollen, 19 taken en 24 competenties waarvan de meerderheid nieuw is ten opzichte van bestaande, meer binnen-schools georiënteerde docentprofielen.

De studie start een discussie over buitenschools georiënteerde toevoegingen aan bestaande docentprofielen hoger onderwijs door te pleiten voor het toevoegen van de rol van 'bruggenbouwer', in boundary crossing termen ook wel 'grensganger' genoemd, aan bestaande docentprofielen. De bruggenbouwer verbindt praktijken, beschikt over boundary crossing bekwaamheden en toont een op samenwerking gerichte, lerende houding. Vanuit praktisch oogpunt is het resulterende RLE docentprofiel een bruikbare bron voor het identificeren van docentbekwaamheden in andere buitenschools georiënteerde leeromgevingen en voor het ontwerpen van bijbehorende professionaliseringstrajecten. Een interessant onderwerp voor verder onderzoek is het in kaart brengen van het eigenlijke functioneren van RLE docenten, al dan niet gerelateerd aan professionaliseringstrajecten.

De effectiviteit van de RLE in een breder perspectief: een discussie over de belangrijkste bevindingen

De vier studies in dit proefschrift bevestigen de effectiviteit van de RLE en haar typische leeromgevingskenmerken op verschillende manieren. De algemene discussie (hoofdstuk 6) plaatst deze resultaten in een breder perspectief, reflecteert op limitaties van het onderzoek, toont mogelijkheden voor toekomstig onderzoek, bespreekt de

bijdrage van de studies aan relevante theoretische debatten en eindigt met implicaties voor de ontwikkeling van authentiek, multi-stakeholder leren in de praktijk van het hoger onderwijs.

De studies en onze ervaringen tijdens het onderzoek aan de RLE, openbaarden vier aspecten van de RLE die weliswaar geen object van studie waren, maar van invloed leken te zijn op het boundary crossing leren van studenten in de RLE. Deze aspecten omvatten (1) het gebrek aan het expliciteren van leerdoelen die het werken en leren over grenzen adresseren, (2) de beperkte aandacht voor het leren van onvoorziene verrassingen die authentieke, multi-stakeholder samenwerking vaak levert, (3) de beperkte inzet van systematische reflectie en (4) het ontbreken van assessment strategieën voor de beoordeling van het leren in de RLE, laat staan assessment strategieën die het leren van het werken over grenzen expliciet beoordelen.

Dit proefschrift bevestigt dat de RLE een effectieve leeromgeving is voor het hoger onderwijs, met name voor studenten Ruimtelijke Planning. De discussie gaat dieper in op het leerpotentieel van de RLE voor studenten hoger onderwijs van andere studierichtingen, voor studenten in het middelbaar beroepsonderwijs, voor docenten en stakeholders, en tot slot, voor regionale ontwikkeling en, idealiter, regionale transformatie.

Drie quasi-experimentele studies onderzochten twintig verschillende RLE's, onderdeel van verschillende curricula op vier instellingen voor hoger onderwijs, waarin een totaal van 490 studenten participeerde en ten behoeve van het onderzoek kwantitatieve en kwalitatieve gegevens leverde. Dit wordt beschouwd als een sterke basis voor het trekken van conclusies over de effectiviteit van de RLE voor het leren van studenten.

De resultaten moeten worden beschouwd in het licht van in ieder geval drie limitaties. Ten eerste, de quasi-experimentele opzet van de eerste drie studies liet ruimte voor meer factoren die van invloed zouden kunnen zijn geweest op de verschillen in het leren van studenten in de verschillende RLE's dan de bestudeerde onafhankelijke variabelen. Ten tweede, de studies voorzien niet in diepgaande analyses van het leren van studenten in individuele RLE's. Dit is een gevolg van de keuze voor een systematische vergelijking van RLEs. Ten derde zijn de studies voornamelijk gebaseerd op zelfrapportages.

Het proefschrift bespreekt elf suggesties voor toekomstige studies, waarvan een aantal hier zal worden belicht. De RLE zou gebaat zijn bij duidelijke leerdoelen. Hoe kunnen we deze leerdoelen meer stakeholdersamenwerking-proof maken? Hoe te balanceren tussen het voorschrijven van leerdoelen en het benutten van leerverrassingen? En, hoe kunnen we het leren in de RLE goed beoordelen? Zou een boundary crossing rubric de beoordeling van leeruitkomsten kunnen ondersteunen? Hoe kan de ondersteuning van het leren van studenten door docenten en stakeholders

worden verbeterd? En tot slot, gezien het uiteindelijke, ultieme doel van de RLE: wat is de regionale impact die de RLE deelnemers co-creëren?

De resultaten van dit proefschrift dragen in theoretisch opzicht bij aan ten minste vier actuele wetenschappelijke debatten. Ten eerste, het proefschrift beantwoordt aan de roep om meer systematische studies over de effecten van het pedagogisch ontwerp van authentieke leeromgevingen op het leren van studenten hoger onderwijs. Ten tweede, het proefschrift draagt bij aan het debat over de wijze waarop hoger onderwijs instellingen hun maatschappelijke betrokkenheid verder kunnen vormgeven, met name middels het buitenschools georiënteerde docentprofiel. Ten derde, dit proefschrift draagt bij aan boundary crossing theorie door te laten zien hoe boundary crossing leren eruit ziet op het niveau van individuele studenten die leren over de grenzen van hun eigen praktijken en over die van verschillende externe stakeholders. Ten vierde, het proefschrift benadrukt het belang van boundary crossing bekwaamheid voor alle deelnemers in transdisciplinaire samenwerkingsverbanden tussen universiteiten en de maatschappij. Ook geeft het proefschrift suggesties voor de verdere ontwikkeling van deze bekwaamheid. Dit laatste aspect draagt bij aan recente debatten in competentietheorie en -onderzoek naar 21^{e} eeuwse vaardigheden die nodig zijn om te kunnen werken aan de huidige maatschappelijke uitdagingen.

In de praktijk levert dit proefschrift op onderzoeksresultaten gebaseerde richtlijnen voor een effectief ontwerp van de RLE en voor het ontwerp van andere authentieke, multi-stakeholder leeromgevingen. Als zodanig stimuleren de resultaten de verdere vormgeving van authentieke leeromgevingen in verschillende onderwijscontexten. Om student-stakeholder samenwerking en het leren daarvan in een multi-stakeholder leeromgeving te ondersteunen, raden wij op basis van dit onderzoek aan om parallel aan RLE projecten ondersteunende boundary crossing workshops in te zetten. Ten slotte biedt het RLE-docentprofiel een professionaliserings- en managementinstrument voor hoger onderwijsinstellingen die samenwerken met maatschappelijke actoren of dat in de toekomst willen gaan doen.

Dankwoord

Als aardrijkskunde van jongs af aan je lievelingsvak is en het onderwijs diepgeworteld zit in de genen, wat is er dan mooier om later in je loopbaan aan een promotieonderzoek te kunnen werken op het raakvlak van die beide disciplines? Een aantrekkelijke gedachte, maar ook een uitdaging naast een coördinerende functie en een gezin. Deze uitdaging vereiste de bekwaamheid om niet teveel beren op de weg te zien en vooral het geluk er niet teveel tegen te komen. Ik zie als ras optimist weliswaar niet snel beren op de weg, maar ik prijs me vooral gelukkig dat ik er dankzij de ondersteuning van vele betrokkenen niet al teveel ben tegengekomen. Studenten en docenten die hebben meegewerkt aan het onderzoek, collega's, vrienden en familie; jullie waren eigenlijk allemaal paranimfen, beschermengelen.

Allereerst, grote dank aan alle 'subjecten van studie': de docenten die steeds opnieuw weer ruimte maakten voor het inpassen van ons onderzoek in hun RLE projecten en de 490 studenten die actief hebben deelgenomen aan de workshops, de moeite namen om vragenlijsten in te vullen en regelmatig zinvolle discussies aangingen naar aanleiding van het onderzoek.

Huidige en voormalige collega's zijn voor mij een grote bron van inspiratie, ondersteuning, plezier en vriendschap. Veel dank aan de oud-collega's van Saxion en de collega's van Wageningen Universiteit, in het bijzonder van ECS. Laten we het motto 'Every Challenge a Success' vasthouden, ook nu onze trekker met emeritaat is. Nienke en Yvette, jullie zijn een meer dan perfect paranimfen-team. Renate en PJ, jullie hebben voor mij de poort naar onderzoeksland geopend. Jullie begeleiding bij mijn eerste onderzoeksproject heeft me doen inzien wat promoveren echt zou betekenen. Hartelijk dank voor jullie gidswerk. Judith, onze WURKS-match bleek er één uit duizenden. Van projectgenoot werd je copromotor en ik had geen betere begeleider kunnen treffen. Jij vindt mij een goede planner. Dat kan zijn. Maar jij doet je werk gewoon op tijd, en hoe? Altijd snel, scherp, anticiperend op wat er komen gaat en gestoeld op een ijzersterk geheugen. En dat ook nog eens vanaf een roze en twee blauwe wolken in de afgelopen zes jaar. Ik vind dat ik nog één keer DANKJEWEL mag zeggen! Martin, jouw conceptuele inzichten hebben fundamentele keuzes in het

project bepaald. Ook cruciaal voor het slagen van dit project waren de ruimte die je me bood om eraan te werken en je groeiende vertrouwen dat het gestaag vorderde naast mijn dagelijkse verantwoordelijkheden voor ECS. Ik wens je alle gezondheid en geluk als emeritus.

Deventer Dames, DDD, Sjonnies en Wageningse ladies: vijf maanden geheelonthouding van sociale geneugten middels solitaire opsluiting in mijn werkkamer was voor mij geen eenvoudige opgave. Het is toch gelukt, mede dankzij jullie begrip, relativering en onze WhatsApp-lijntjes. Ik verheug me op tijd voor gezelligheid!

De onvoorwaardelijke steun van familie en schoonfamilie voor dit project was goud waard. ‘Als we kunnen bijspringen laat je het weten hè?!’ Pappa, je hebt al mijn stukken gelezen en plaatste waardevolle, in jouw woorden, ‘leken-noten’. We mogen weliswaar beiden wetenschappelijke laatbloeiers zijn, maar de Oonkies zijn nu onmiskenbaar vertegenwoordigd in Scopus en ERIC. Nog belangrijker was de steun die jullie, pappa, mamma en Monique, samen uitstraalden naar mij om dit traject vooral genietend te doorlopen. Het lijkt me volkomen duidelijk waar mijn enthousiasme voor het onderwijs geworteld is.

Douwe, bij terugkomst van jouw beroepskeuze stage op een basisschool bij ons in de wijk, vloog de achterdeur enthousiast open: ‘Mamma, nu weet ik nog zekerder dat ik docent wil worden.’ Toch weer die genen? En Job, ik hoop dat Lars en ik de eerste gasten mogen zijn in jouw hotel. We genieten van jullie en van jullie toekomstplannen. Lars, ik kan me niet meer wensen dan een liefhebbende, begripvolle echtgenoot en vader, tevens statistisch adviseur en IT ondersteuner. Lieve mannen: zonder jullie flexibiliteit en geboden ruimte zou dit proefschrift er niet zijn geweest!

About the Author

Carla Oonk was born in 1966 in Enschede, the Netherlands. She followed a bachelor in Environmental Science and a master in Land Use Planning, both with minors in Educational Science. She started her career as a local policy officer, and continued working as a teacher and team coordinator at the faculty of Spatial Development and Environmental Science of Saxion University of Applied Sciences (Deventer, the Netherlands). After two short appointments as a researcher at the Countryside and Community Research Unit (University of Gloucester, Cheltenham, UK) and as a programme manager at the Dutch Institute for Spatial Planning, she moved to Wageningen University to start working as a programme manager Land Use Planning at Wageningen Business School. In 2007, she was appointed as an education coordinator and teacher at the Education and Competence Studies Group of Wageningen University. In this position she combined her land use planning background with educational science in conducting research projects on the newly established, authentic, multi-stakeholder Regional Learning Environment. From 2010, she worked on her PhD thesis exploring student learning and teacher competence needed to work in this Regional Learning Environment. Carla finished her PhD thesis by the end of 2016. She continues working at the Education and Competence Studies group of Wageningen University both as an education coordinator, teacher and researcher. Her future research, and its use in educational and planning practice, will focus on the further development of university-society, multi-stakeholder learning arrangements into effective 'boundary crossing' learning settings.

List of Publications

Refereed journal publications

Khaled, A. E., Gulikers, J. T. M., Tobi, H., Biemans, H. J. A., Oonk, C., & Mulder, M. (2014). Exploring the validity and robustness of a competency self-report instrument for vocational and higher competence-based education. *Journal of Psychoeducational Assessment, 32*(5), 429-440.

Oonk, C., Gulikers, J., & Mulder, M. (2016). Educating collaborative planners: Strengthening evidence for the learning potential of multi-stakeholder Regional Learning Environments. *Planning Practice & Research*, *31*(5), 533-551. doi: 10.1080/02697459.2016.1222108.

Refereed book chapter

Gulikers, J., & Oonk, C. (2016). boundary crossing in regioleren: Actief ondersteunen van student-stakeholdersamenwerking. In Bakker, A., Zitter, I., Beausaert, S., & De Bruijn, E. (Eds.), *Tussen opleiding en beroepspraktijk: Het potentieel van boundary crossing* (pp. 226-246). Assen, the Netherlands: Koninklijke Van Gorcum BV.

Manuscripts under review

Oonk, C., Gulikers, J.T.M., & Mulder, M. (accepted with revisions). Educating boundary crossing planners: Evidence for student learning in the multi-stakeholder regional learning environment. *Journal of Planning Education and Research*.

Oonk, C., Gulikers, J., & Mulder, M. (under review). Stimulating students' boundary crossing learning in the multi-stakeholder regional learning environment.

Oonk, C., Gulikers, J., Wesselink, R., Beers, P., & Mulder, M. (under review). Teachers as brokers: Adding an out-of-school perspective to higher education teacher profiles.

Conference papers and presentations

Beers, P.J., Oonk, C, & Wesselink, R. (2011). *Het organiseren van formele en informele leerprocessen in regionale ontwikkeling: Sociaal leren in een hybride leeromgeving.* Symposium conducted at the Onderwijs Research Dagen. Maastricht, the Netherlands.

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Oonk, C., Beers, P.J., & Wesselink, R. (2012*). Teacher roles, tasks and competencies in the authentic multi-stakeholder learning environment 'regional atelier'.* In *Learning in Transition. Book of Abstracts for the 6th EARLI SIG 14 Learning and Professional Development Conference*. Antwerp, Belgium.

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Oonk, C., & Gulikers, J. (2014). *Educating collaborative planners: Further evidence for the learning potential of multi-stakeholder regional learning environments for planning education through a replication study.* AESOP Conference. Utrecht, the Netherlands.

Oonk, C., Gulikers, J., & Mulder, M. (2012). *De meerwaarde van regioleren als nieuwe authentieke leeromgeving.* Poster presented at the Onderwijs Research Dagen. Wageningen, the Netherlands.

Oonk, C., Gulikers, J., & Mulder, M. (2013). Educating collaborative planners: The learning potential of multi-actor Regional Learning Environments for planning education. In *Proceedings of the Landscape and Imagination Conference.* Paris, France.

Oonk, C., Gulikers, J., & Mulder, M. (2015). *Strengthening evidence for student learning in relation to design characteristics of the Regional Learning Environment: A replication study*. Paper presented at the ESEE 22th Conference. Wageningen, the Netherlands.

Oonk, C., Gulikers, J., & Mulder, M. (2015). *Supporting student-stakeholder collaboration in the multi-stakeholder Regional Learning Environment and the effects on student learning.* Paper presented at the ICO National Fall School 2015. Utrecht, The Netherlands.

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Oonk, C., Gulikers, J., & Mulder, M. (2016) *Ondersteuning van student-stakeholdersamenwerking in de Regionale Leeromgeving en het effect op het leren van studenten: Een interventiestudie.* Paper presented at the Onderwijs Research Dagen. Rotterdam, the Netherlands.

Oonk, C., Gulikers, J., & Mulder, M. (2016). Supporting student-stakeholder collaboration in the multi-stakeholder Regional Learning Environment and the effects on student learning. In *Proceedings of the AERA 2016 Conference.* Washington, DC.

Oonk, C., Gulikers, J., & Mulder, M. (2016). *Supporting student-stakeholder collaboration in the multi-stakeholder Regional Learning Environment and the effects on students' boundary crossing learning.* Paper presented at the WASS Graduate School PhD day. Wageningen, the Netherlands.

Oonk, C., Gulikers, J. & Mulder, M. (2016). Stimulating students' boundary crossing learning in the multi-stakeholder Regional Learning Environment. In *Proceedings of the Competence 2016 Conference.* Wageningen, the Netherlands.

Wesselink R., Boer, K., Oonk, C., & Beers, P. (2011). Regional ateliers and the level of participation of educational vocational institutions in the Netherlands. In *Proceedings of the ECER VETNET Conference.* Berlin, Germany.

Wesselink, R., Gulikers, J., Oonk C., & Mulder, M. (2015). New teacher roles in hybrid learning environments: The development of a rubric to assess and develop teacher roles necessary for successful performance in hybrid learning environments. In *Proceedings of the AERA 2015 Conference.* Chicago, Illinois.

Professional publications

Bogers, M.M.B., Oonk, C., Palang, H., Pedroli, G.B.M., & Stastná, M. (2007). *Road map for education and training in land use and sustainability.* European Commission, Coordination Action FP6 priority 1.1.6.3 Global change and ecosystems. Tallinn: HUMA Publishers.

Gulikers, J., & Oonk, C. (2013). Regioleren, methodieken en effecten: Op weg naar maximale leerwinst. In H. Biemans (Ed.), *Op weg naar leerwinst: WURKS-1 onderzoeksprogramma 2011-2013: Competenties voor het groene kennissysteem deel I* (pp. 4-5). Wageningen, the Netherlands: Wageningen Universiteit en Researchcentrum, Leerstoelgroep Educatie- en competentiestudies. ISBN: 9789461737090.

Gulikers, J., & Oonk, C. (2016). Het waarderen van leren met partijen buiten de school. *OnderwijsInnovatie, 2016* (3), 17-26.

Gulikers, J., Oonk, C., Dijkshoorn-Dekker, M., & Kortstee, H. (2013). *Effectief en efficiënt leren met de omgeving in negen fasen.* WURKS-II project Ondernemende studenten in de stadsranden. Wageningen, the Netherlands: Leerstoelgroep Educatie- en competentiestudies.

Gulikers, J., Oonk, C., & Wesselink, R. (2015). *Student-stakeholder Workshop I: Wie zijn ze en hoe krijg ik ze betrokken?* Wageningen, the Netherlands: Wageningen University. Retrieved from http://edepot.wur.nl/359458.

Gulikers, J., Oonk, C., & Wesselink, R. (2015). *Student-stakeholder Workshop II: Echt samen leren en de regio innoveren.* Wageningen, the Netherlands: Wageningen University. Retrieved from http://edepot.wur.nl/359459.

Hoejenbos, M.E., & Oonk, C. (1988). Kleine zwanen (Cygnus bewickii) en tafeleenden (Aythya ferina) op de randmeren. *Het Vogeljaar*, *36*(6), 244-250.

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in the context of the research school

Interuniversity Center for Educational Research

Wageningen School of Social Sciences

Carla Oonk
Completed Training and Supervision Plan
Wageningen School of Social Sciences (WASS)

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
From Topic to Proposal	WASS	2010	4
Competence Theory and Research	WASS/ICO	2012	4
ICO Introductory Course	ICO	2014	5
Writing WASS/ICO proposal	WASS/ICO	2014	6
ICO National Fall School	ICO	2015	1
'Teachers' roles and tasks in the Regional Atelier'	ECER, Berlin	2011	1
'The learning potential of the boundary: Multi-actor learning environments for life science students'	EARLI, München	2013	1
'Educating collaborative planners: Further evidence for the learning potential of multi-stakeholder regional learning environments for planning education through a replication study'	AESOP, Utrecht/Delft	2014	1
'Students boundary crossing learning in the multi-stakeholder regional learning environment: An intervention study'	Competence 2016, Wageningen	2016	1
'Ondersteuning van student-stakeholdersamenwerking in de Regionale Leeromgeving en het effect op het leren van studenten: Een interventiestudie'	ORD, Rotterdam	2016	1
B) General research related competences			
Techniques for Writing and Presenting Scientific papers	WGS	2011	1.2
Scientific Writing	Wageningen in'to Languages	2015	1.8
ATLAS ti	WASS	2013	1
Quantitative Research Methods and Statistics (MAT 22306)	WU-MAT	2013	3
Masterclass Qualitative Research Methodology	Maastricht University/ICO	2015	2
Considering Case Studies	WASS	2014	0.5
Various methodological seminars (e.g. Writing a world class paper, EndNote, Speed Reading, English Conversation, Structural Equation Modelling)	WU/WASS/WU-ECS	2010-2016	1
Active contribution to research and manuscript meetings at both ECS and LUP	WU-ECS/WU-LUP	2010-2016	1

C) Career related competences/personal development			
Project acquisition	WU-ECS	2010-2016	1
Teaching various ECS courses; supervision internships and theses	WU-ECS/WU-LUP	2010-2016	3
Facilitating teacher workshops related to PhD project in both vocational and academic education	WU-ECS	2011-2016	1
Non-academic publications resulting from PhD project (see publication list in thesis)	WU-ECS	2011-2016	1
Curriculum innovation project (Studio BLP/MLP)	ECS/BLP and MLP	2013-2014	2
Total			**44.5**

*One credit according to ECTS is on average equivalent to 28 hours of study load

ICO Dissertation Series

In the ICO Dissertation Series dissertations are published of graduate students from faculties and institutes on educational research within the ICO Partner Universities: Eindhoven University of Technology, Leiden University, Maastricht University, Open University of the Netherlands, University of Amsterdam, University of Twente, Utrecht University, VU University Amsterdam, and Wageningen University, and formerly University of Groningen (until 2006), Radboud University Nijmegen (until 2004), and Tilburg University (until 2002). The University of Groningen, University of Antwerp, University of Ghent, and the Erasmus University Rotterdam have been 'ICO 'Network partner' in 2010 and 2011. From 2012 onwards, these ICO Network partners are full ICO partners, and from that period their dissertations will be added to this dissertation series.
The list will be updated every year. The list below contains a selection of the list update from February, 2015 including the most recent dissertations of the last five years (see also http://www.ico-education.nl/research/ico-dissertation-series).

212. Slof, B. (28-01-2011). *Representational scripting for carrying out complex learning tasks*. Utrecht: Utrecht University.
222. Fastré, G. (11-03-2011). *Improving sustainable assessment skills in vocational education*. Heerlen: Open University of the Netherlands.
223. Min-Leliveld, M.J. (18-05-2011). *Supporting medical teachers' learning: Characteristics of effective instructional development.* Leiden: Leiden University.
224. Van Blankenstein, F.M. (18-05-2011). *Elaboration during problem-based small group discussion: A new approach to study collaborative learning.* Maastricht: Maastricht University.
225. Dobber, M. (21-06-2011). *Collaboration in groups during teacher education.* Leiden: Leiden University.
226. Jossberger, H. (24-06-2011). *Towards self-regulated learning in vocational education: Difficulties and opportunities.* Heerlen: Open University of the Netherlands.
227. Schaap, H. (24-06-2011). *Students' personal professional theories in vocational education: Developing a knowledge base.* Utrecht: Utrecht University.

228. Kolovou, A. (04-07-2011). *Mathematical problem solving in primary school.* Utrecht: Utrecht University.
229. Beausaert, A.J. (19-10-2011). *The use of personal developments plans in the workplace. Effects, purposes and supporting conditions*. Maastricht: Maastricht University
230. Favier, T.T. (31-10-2011). *Geographic information systems in inquiry-based secondary geography education: Theory and practice.* Amsterdam: VU University Amsterdam.
231. Brouwer, P. (15-11-2011). *Collaboration in teacher teams.* Utrecht: Utrecht University.
232. Molenaar, I. (24-11-2011). *It's all about metacognitive activities; Computerized scaffolding of self- regulated learning.* Amsterdam: University of Amsterdam.
233. Cornelissen, L.J.F. (29-11-2011). *Knowledge processes in school-university research networks.* Eindhoven: Eindhoven University of Technology.
234. Elffers, L. (14-12-2011). *The transition to post-secondary vocational education: Students' entrance, experiences, and attainment*. Amsterdam: University of Amsterdam.
235. Van Stiphout, I.M. (14-12-2011). *The development of algebraic proficiency.* Eindhoven: Eindhoven University of Technology.
236. Gervedink Nijhuis, C.J. (03-2-2012) *Culturally Sensitive Curriculum Development in International Cooperation.* Enschede: University of Twente.
237. Thoonen, E.E.J. (14-02-2012) *Improving Classroom Practices: The impact of Leadership School Organizational Conditions, and Teacher Factors.* Amsterdam: University of Amsterdam.
238. Truijen, K.J.P (21-03-2012) *Teaming Teachers. Exploring factors that influence effective team functioning in a vocational education context.* Enschede: University of Twente.
239. Maulana, R.M. (26-03-2012)*Teacher-student relationships during the first year of secondary education. Exploring of change and link with motivation outcomes in The Netherlands and Indonesia.* Groningen: University of Groningen.
240. Lomos, C. (29-03-2012) *Professional community and student achievement.* Groningen: University of Groningen.
241. Mulder, Y.G. (19-04-2012) *Learning science by creating models.* Enschede: University of Twente.
242. Van Zundert, M.J. (04-05-2012) *Optimising the effectiveness and reliability of reciprocal peer assessment in secondary education.* Maastricht: Maastricht University.
243. Ketelaar, E. (24-05-2012) *Teachers and innovations: on the role of ownership, sense-making, and agency*. Eindhoven: Eindhoven University of Technology.
244. Logtenberg, A. (30-5-2012) *Questioning the past. Student questioning and historical reasoning.* Amsterdam: University of Amsterdam.

245. Jacobse, A.E. (11-06-2012) *Can we improve children's thinking?* Groningen: University of Groningen.
246. Leppink, J. (20-06-2012) *Propositional manipulation for conceptual understanding of statistics.* Maastricht: Maastricht University.
247. Van Andel, J (22-06-2012) *Demand-driven Education. An Educational-sociological Investigation.* Amsterdam: VU University Amsterdam.
248. Spanjers, I.A.E. (05-07-2012) *Segmentation of Animations: Explaining the Effects on the Learning Process and Learning Outcomes.* Maastricht: Maastricht University.
249. Vrijnsen-de Corte, M.C.W. *Researching the Teacher-Researcher. Practice-based research in Dutch Professional Development Schools.* Eindhoven: Eindhoven University of Technology.
250. Van de Pol, J.E. (28-09-2012) *Scaffolding in teacher-student interaction. Exploring, measuring promoting and evaluating scaffolding.* Amsterdam: University of Amsterdam.
251. Phielix, C. (28-09-2012) *Enhancing Collaboration through Assessment & Reflection* [Samenwerking Verbeteren door middel van Beoordeling en Reflectie] Utrecht: Utrecht University.
252. Peltenburg, M.C. (24-10-2012) *Mathematical potential of special education students.* Utrecht: Utrecht University.
253. Doppenberg, J.J. (24-10-2012) *Collaborative teacher learning: settings, foci and powerful moments.* Eindhoven: Eindhoven University of Technology
254. Kenbeek, W.K. (31-10-2012) *Back to the drawing board. Creating drawing or text summaries in support of System Dynamics modeling.* Enschede: University of Twente.
255. De Feijter, J.M. (09-11-2012) *Learning from error to improve patient safety.* Maastricht: Maastricht University.
256. Timmermans, A.C. (27-11-2012) *Value added in educational accountability: Possible, fair and useful?* Groningen: University of Groningen.
257. Van der Linden, P.W.J. (20-12-2012) *A design-based approach to introducing student teachers in conducting and using research.* Eindhoven: Eindhoven University of Technology.
258. Noroozi, O. (11-01-2013) *Fostering Argumentation-Based Computer-Supported Collaborative Learning in Higher Education.* Wageningen: Wageningen University.
259. Bijker, M.M. (22-03-2013) *Understanding the gap between business school and the workplace: Overconfidence, maximizing benefits, and the curriculum.* Heerlen: Open University of the Netherlands.
260. Belo, N.A.H. (27-03-2013) *Engaging students in the study of physics.* Leiden: Leiden University.
261. Jong, R.J. de (11-04-2013) *Student teachers' practical knowledge, discipline strategies, and the teacher- class relationship.* Leiden: Leiden University.

262. Verberg, C.P.M. (18-04-2013) *The characteristics of a negotiated assessment procedure to promote teacher learning.* Leiden: Leiden University.
263. Dekker-Groen, A. (19-04-2013) *Teacher competences for supporting students' reflection. Standards, training, and practice.* Utrecht: Utrecht University.
264. M.H. Knol (19-04-2013). *Improving university lectures with feedback and consultation.* Amsterdam: University of Amsterdam.
265. Diggelen, M.R. van (21-05-2013) *Effects of a self-assessment procedure on VET teachers' competencies in coaching students' reflection skills.* Eindhoven: Eindhoven University of Technology.
266. Azkiyah, S.N. (23-5-2013) *The effects of Two Interventions - on Teaching Quality and Student Outcome.* Groningen: University of Groningen.
267. Taminiau, E.M.C. (24-05-2013) *Advisory Models for On-Demand Learning.* Heerlen: Open University of the Netherlands.
268. Milliano, I.I.C.M. de (24-05-2013) *Literacy development of low-achieving adolescents. The role of engagement in academic reading and writing.* Amsterdam: University of Amsterdam.
269. Vandyck, I.J.J. (17-06-2013), *Fostering Community Development in School-University Partnerships.* Amsterdam: VU University Amsterdam.
270. Hornstra, T.E. (17-06-2013) *Motivational developments in primary school. Group-specific differences in varying learning contexts.* Amsterdam: University of Amsterdam.
271. Keuvelaar-Van den Bergh, L. (26-06-2013) *Teacher Feedback during Active Learning: The Development and Evaluation of a Professional Development Programme.* Eindhoven: Eindhoven University of Technology.
272. Meeuwen, L.W. van (06-09-13) V*isual Problem Solving and Self-regulation in Training Air Traffic Control.* Heerlen: Open University of the Netherlands.
273. Pillen, M.T. (12-09-2013) *Professional identity tensions of beginning teachers.* Eindhoven: Eindhoven University of Technology.
274. Kleijn, R.A.M. de, (27-09-2013) *Master's thesis supervision. Feedback, interpersonal relationships and adaptivity.* Utrecht: Utrecht University.
275. Bezdan, E. (04-10-2013) *Graphical Overviews in Hypertext Learning Environments: When One Size Does Not Fit All.* Heerlen: Open University of the Netherlands.
276. Bronkhorst, L.H. (4-10-2013) *Research-based teacher education: Interactions between research and teaching.* Utrecht: Utrecht University.
277. Popov, V. (8-10-2013) *Scripting Intercultural Computer-Supported Collaborative Learning in Higher Education.* Wageningen: Wageningen University.
278. Dolfing, R. (23-10-2013) *Teachers' Professional Development in Context-based Chemistry Education. Strategies to Support Teachers in Developing Domain-specific Expertise.*. Utrecht: Utrecht University.

279. Lucero, M.L. (21-11-2013) *Considering teacher cognitions in teacher professional development: Studies involving Ecuadorian primary school teachers.* Ghent: Ghent University.
280. Kamp, R.J.A. (28-11-2013) *Peer feedback to enhance learning in problem-based tutorial groups.* Maastricht: Maastricht University.
281. Cviko, A. (19-12-2013) *Teacher Roles and Pupil Outcomes. In technology-rich early literacy learning.* Enschede: University of Twente.
282. Zwet, J. van der (30-1-2014). *Identity, interaction, and power. Explaining the affordances of doctor- student interaction during clerkships.* Maastricht: Maastricht University.
283. Smet, M.J.R. de (31-1-2014). *Composing the unwritten text: Effects of electronic outlining on students' argumentative writing performance.* Heerlen: Open University of the Netherlands.
284. Hagemans, M.G. (07-03-2014) *On regulation in inquiry learning*. Enschede: University of Twente.
285. Kuijk, M.F. van (13-03-2014*). Raising the bar for reading comprehension. The effects of a teacher professional development program targeting goals, data use, and instruction*. Groningen: University of Groningen.
286. Karimi, S (14-3-2014) *Analysing and Promoting Entrepreneurship in Iranian Higher Education: Entrepreneurial Attitudes, Intentions and Opportunity Identification*. Wageningen: Wageningen University.
287. Frambach, J.M. (26-3-2014) *The Cultural Complexity of problem-based learning across the world*. Maastricht: Maastricht University.
288. Mascareno, M.N. (11-4-2014) *Learning Opportunities in Kindergarten Classrooms. Teacher-child interactions and child developmental outcomes*. Groningen: University of Groningen.
289. Bakker, M. (16-04-2014) *Using mini-games for learning multiplication and division: A longitudinal effect study*. Utrecht: Utrecht University.
290. Loon, M. van (8-5-2014) *Fostering Monitoring and Regulation of Learning.* Maastricht: Maastricht University.
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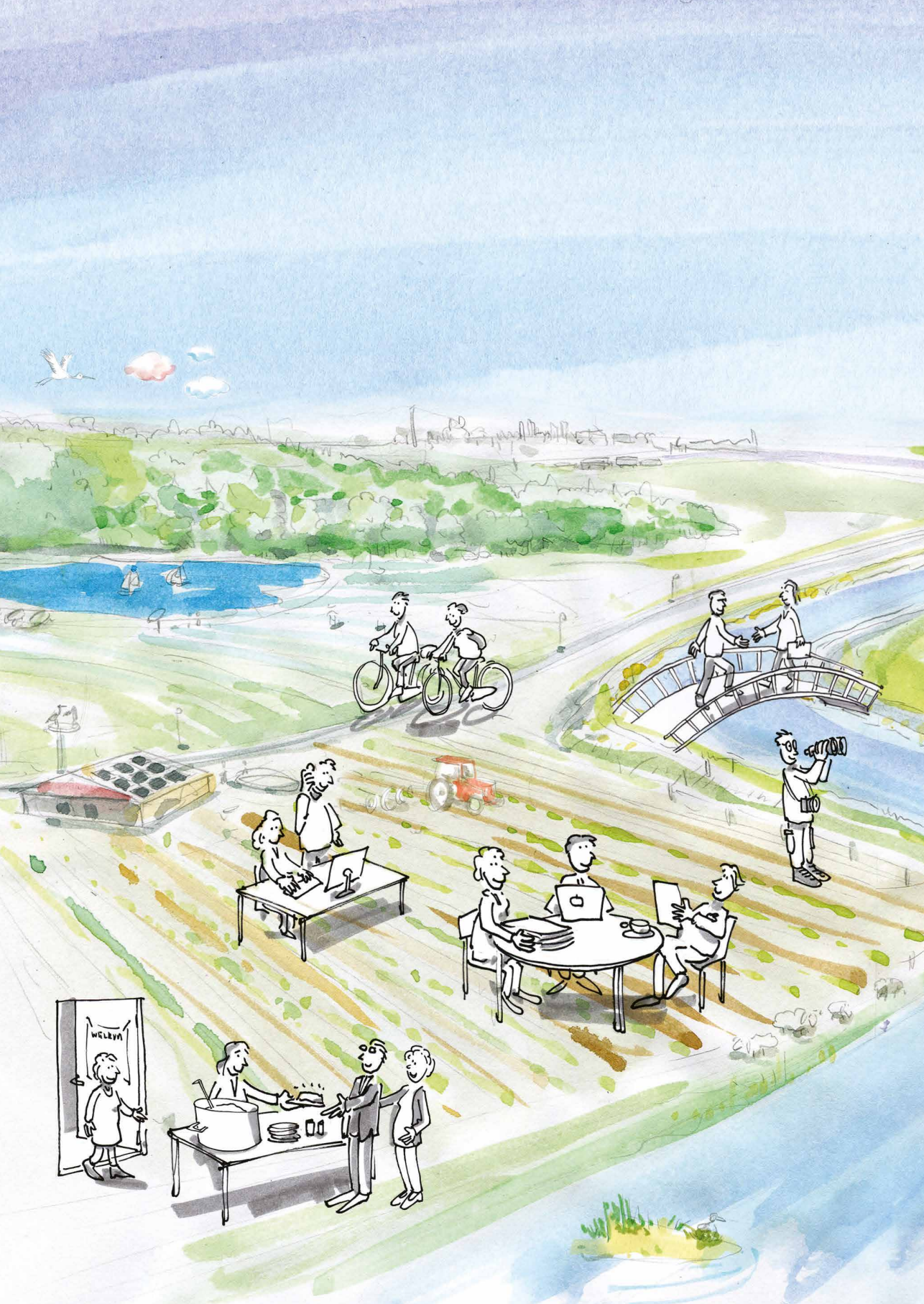
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