Awareness of “Boundary Crossing”

Assessing awareness of “boundary crossing” of students of the European Workshop at Wageningen University & Research

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ECS-80424: Minor Thesis in Environmental Education

27 August 2018

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WAGENINGEN
UNIVERSITY & RESEARCH

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Preface

When I first attended the 'Study Day Information' on the third day of the AID back in 2016, I learnt that it was possible to undertake a minor in either Environmental Education or Environmental Communication as part of MES. It was then I decided that I would take a minor but I was not quite sure yet exactly which minor I would focus on. I took a few courses related to communication and education and met with people from both departments too. Prior to me choosing the minor, I was actually leaning more towards the communication side because I thought Education means I would end up teaching, which was something I am not too confident in, neither do I have any prior experience in. Plus communication seemed like a way to extend what I did from my major thesis which was on Citizen Science and monitoring mosquitoes. However, I eventually chose to do my thesis with the Education department when I met with Carla Oonk to talk about possible opportunities for internship and thesis in the (then) ECS chairgroup. It was through the meeting that I came to know more about what kind of research was being done in the ECS chairgroup and that I did not have to have any prior experience with education to be able to do undertake research there. Not really knowing exactly what I wanted to research about, but that I was keen on something related to Environmental Sciences, Carla shared with me on her research about 'boundary crossing' and some plans to explore boundary crossing further. As I was planning to take the European Workshop (EUW), Carla mentioned the possibility of doing research related to the EUW as well as boundary crossing together with Karen Fortuin from the Environmental Systems Analysis (ESA) chairgroup. As I was interested in interdisciplinary and transdisciplinary approaches, I thought this was something interesting to investigate and that was how I came to work on this minor thesis.

Working on this thesis has been pretty challenging as I was racing against time to make sure I complete everything in time to graduate on time. Well as the popular saying goes, diamonds are made under pressure and I think I made quite good progress along the way because of the pressure. Through this research project, I came to realise that I actually enjoyed research and learnt much more about statistical analysis as well as other analysis skills. I also had to cross boundaries to learn about boundary crossing – stepping out of my comfort zones and having to speak up in the various EUW groups to get them to fill out my surveys, as well as constantly having to cross the boundaries of my own knowledge when I get stuck at certain points.

However, while writing a thesis has always been seen like an individual thing, where you are all alone and no one besides you and your supervisors really know what your project is about, I was never really alone in this journey and I have the following people to thank for this:

Carla and Karen – Thank you for placing your trust in me and taking me on this journey of crossing boundaries. You have both been superb supervisors – always quick to respond to my emails and give comments on my work, always encouraging and reassuring me of the progress I've made during this thesis journey. I have learnt so much on boundary crossing and research from both of you. Thank you for the opportunity to work with you both and I look forward to working with both of you to cross (even more) boundaries at WUR.

My Wageningen family – (1) *Wonderteam (Qian, Rafika, Valentina, Vandru, Davide)* – I'm glad you guys were all still based in Wageningen even though everyone was doing an internship! Even though we all worked on our own projects, we were never really alone because misery loves company (haha). Thank you for all the reassurances, all the dinners, laughter to destress and for your friendship. (2) *Sunday Singaporeans (Hazimah & Ian)* – Thanks for making the summer months enjoyable even though we all had our projects to work on. Our Sunday get-togethers were my motivation to work hard during the week! Thank you for all the thesis/life advices, being my Masterchefs and indulging in my SG food cravings, all the Carcassonne/Cartagena/Bauble rounds and also for your friendship.

Friends and family in Singapore – Thank you for the encouragement, keeping me updated on SG happenings and for simply being my listening ears, 10,440km away. And to my parents, for the encouragement despite being doubtful when I told them I was going to do a minor thesis instead of an internship because they thought an internship would provide me more job opportunities haha.

EUW participants and teachers – Thank you for taking time to fill out my long questionnaires, and for giving me data (& nice results) for my thesis!

Cassandra Tho (27 May 2018)

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Summary

For the longest time, programs offered in higher education institutions have been firmly grounded in a traditional academic discipline, where importance is placed on gaining disciplinary knowledge and skills. The focus was largely on various disciplinary aspects of a problem, but it was mostly worked on in isolation from the rest of the disciplines. However, in recent times, with many complex and wicked problems faced by the world at large e.g. environmental problems that transcends geographical boundaries and requires attention from various disciplines to solve or alleviate the problems, there is a realisation that there needs to be a different approach to handle such problems. As such, there has been a rise in higher education institutions offering programs that are inter- and transdisciplinary in nature, incorporating real world problems and interdisciplinary collaborations into the curriculum, in order to prepare students for their future careers. However, with such interdisciplinary and transdisciplinary collaborations and approaches, students involved would face 'boundaries' as well as to cross these 'boundaries' (e.g. intercultural boundaries, disciplinary boundaries, academia-society boundaries) in order to carry out their tasks. The European Workshop (EUW) in Wageningen University & Research is one of such courses that incorporates an inter- and transdisciplinary approach to solve a real life problem for a real client. Course coordinators have identified 3 boundaries that participants will likely encounter in the course (e.g. cultural boundaries, disciplinary boundaries and academia-society boundaries).

Boundaries, as defined by Akkerman & Bakker (2011), are "(sociocultural) differences that lead to discontinuities in action and interaction". "Boundary crossing" then refers to the crossing of such boundaries that exist between subjects or activities, e.g. between theory and practice or between multiple disciplines. 'Boundaries' are often viewed as obstacles and barriers for working together and learning processes. People are often hesitant to work in inter- and transdisciplinary groups because of additional time needed to familiarise and accommodate other disciplines not from their own. This has thus brought about research into boundaries and boundary crossing in recent years. These studies have mostly been on educating students to cross boundaries and how educators can stimulate students' boundary crossing learning. As such, there is a need for a first step before teaching and learning boundary crossing skills, which is to investigate awareness levels towards 'boundaries' and 'boundary crossing.'

This thesis aims to investigate if the European Workshop has any influence on students' levels of awareness of boundary crossing, in order to help inform the future design of transdisciplinary courses/projects. To achieve the objectives of this research, three research questions (RQs) have been formulated; RQ1 aims to find out students' levels of awareness towards 'boundary crossing' prior to the start of the European workshop (pre-test), RQ2 investigates students' levels of awareness towards 'boundary crossing' at the end of the European Workshop (post-test) and RQ3 looks into the differences between the pre- and post-test results. As part of the methodology, 'awareness of boundary crossing' was first operationalised into 4 different concepts – 'Awareness of boundaries', 'Recognition of relevance and value to cross boundaries', 'Willingness to cross boundaries' and 'Perceived capability to cross boundaries'. 'Teacher support required' was also added to investigate if students required support from teachers. The main instrument use for data collection in this experiment is a questionnaire, and it was administered in a pre-test and post-test manner. The questionnaire consisted of a quantitative section where respondents had to rate statements under the various concepts (scales) on a Likert scale, as well as a qualitative section consisting of open-ended questions which asked students about their motivations, learning expectations, perception of boundaries, potential boundaries that participants foresee in the EUW, and the boundaries that they actually encountered during the EUW.

Following the collection and analysis of data, the quantitative results showed a decrease in the mean scores for the various scales from pre-test to post-test. However, it does not mean that levels of awareness towards boundary crossing decreased, but rather, in a roundabout way shows that students became more aware about boundary crossing. This is in line with the Dunning-Kruger effect, which posits that individuals tend to overestimate their knowledge about concepts that they are not too familiar with. On the other hand, the results from the qualitative data showed that a majority of the boundaries that students perceived to be boundaries, as well as the boundaries that they reported to have encountered during the EUW did not fall under the same boundaries that the course coordinators had in mind. This shows that students are aware of boundaries, but they mostly think about personal boundaries (e.g. comfort zones), physical boundaries (e.g. borders of a country, boundaries of their research area) or project boundaries (e.g. time and budget, scope of research), rather than

‘cultural boundaries’, ‘disciplinary boundaries’ and/or ‘academia-society boundaries’ that the course coordinators had in mind. With these results in mind, it helps inform course coordinators and teachers what students actually think about boundaries and boundary crossing, and how to better align their delivery or materials to raise students’ awareness towards boundary crossing. The limitations in the methodology and data analysis were also discussed to make it known that there were some variables that could have affected the results.

In conclusion, the results showed that the European Workshop did have some influence on students’ awareness levels towards boundary crossing. These results provide course coordinators with better insight and understanding of students’ boundary crossing awareness as well as students’ perceptions of boundaries. With this information, course coordinators will be able to better pinpoint what is missing and where attention can be targeted at to further improve future European Workshops as well as to help students recognise the boundaries and eventually, build their boundary crossing competences. The questionnaire developed in this research project can also be further improved and/or adapted by researchers for future research to investigate boundary crossing awareness, in order to inform and help guide the design of other courses or learning activities that aim to develop students’ boundary crossing capabilities.

1 Background & Introduction

1.1 Background

For the longest time, programs offered in higher education institutions have been firmly grounded in a traditional academic discipline, where importance is placed on gaining disciplinary knowledge and skills (Remington-Doucette, Hiller Connell, Armstrong, & Musgrove, 2013). The focus tended to be on the various disciplinary aspects of the problem, but worked on in isolation from the rest (Bootsma, Vermeulen, van Dijk, & Schot, 2014). However, as we are constantly faced with many complex and wicked problems, there is a realization that there needs to be a different approach to handle such problems. Furthermore, in 2003, the UN called for higher education institutes to design and gear education towards sustainability[1]. As a result of that, and in order to prepare students for future careers, there has been a rise in programs that are inter- and transdisciplinary in nature, incorporating real world problems and interdisciplinary collaboration into the curriculum.

Interdisciplinary approaches involve having students from multiple disciplines working together on a problem. Transdisciplinary approaches goes one step further and includes having non-academic stakeholders join in the problem-solving process (Scholz & Steiner, 2015). With such transdisciplinary courses, students involved would have to cross boundaries, e.g. disciplinary boundaries, cultural boundaries, academia versus professional boundaries etc. However, boundary crossing is not limited to only in higher education courses, but it is very much a part of people's professional and daily lives as well. Wageningen University & Research (WUR) is one such higher education institution that aims at preparing its students to be competent boundary crossers for their future careers which may involve multidisciplinary and transdisciplinary aspects. As such, boundary crossing has been increasingly recognised as an attribute that will benefit and prepare learners/students for their future careers. This has brought about research into "boundary crossing" and how boundary crossing competence can be developed.

There have been a few studies that looked into boundary crossing as a concept (Akkerman & Bakker, 2011) as well as how to teach and learn boundary crossing skills (Fortuin, 2015; Oonk, 2016). However, while individuals often move across various practices and perspectives (i.e. boundaries) in their daily lives, it is often done subconsciously, without much awareness of the boundaries or that they are actually "crossing boundaries". As such, there is a need for a first step before teaching and learning boundary crossing skills, which is to investigate awareness levels of boundaries and boundary crossing. This research will thus focus on determining the extent to which students of the European Workshop (EUW) in WUR recognise boundaries, and if and how they actively approach boundaries. This is key information needed to improve the current course design, as well as to effectively develop any future boundary crossing learning activities.

1.2 Boundary crossing

A boundary, as defined by the Oxford dictionary[2], is a limit of something abstract, especially a subject or sphere of activity. Akkerman & Bakker (2011) defined boundaries as "(sociocultural) differences that lead to discontinuities in action and interaction". "Boundary crossing" then refers to the crossing of such boundaries (or barriers) that exist between subjects or activities, e.g. between theory and practice or between multiple disciplines. The term "boundary crossing" was originally introduced to represent how professionals, sometimes had to work in areas and perspectives which they were unfamiliar to/with and not in their area of expertise (Suchman, 1993). They were challenged to merge various information from various areas and perspectives to produce results (Engeström, Engeström, & Kärkkäinen, 1995). Boundaries are often viewed as obstacles and barriers for working together and learning processes (Akkerman & Bakker, 2011). People are often hesitant to work in inter- and transdisciplinary groups because of additional time needed to familiarise and accommodate other disciplines not from their own. Such collaboration between disciplines often encounter roadblocks, even at the very start during problem formulation, as it is difficult to reach consensus on what the problem is (Tress, Tress, & Fry, 2007). While these challenges might be overwhelming, boundary crossing has been highly regarded as necessitous for transformation to take place (Akkerman & Bakker, 2011). In order to overcome these barriers associated with inter- and transdisciplinary approaches, as well as to take advantage of the transformative potential that comes with boundary crossing, there is a need

[1] UN Decade of Education for Sustainable Development (2005 - 2014). (2005). Retrieved April 24, 2018, from http://unesdoc.unesco.org/images/0014/001416/141629e.pdf

[2] Definition of Boundary. (n.d.). Retrieved April 24, 2018, from https://en.oxforddictionaries.com/definition/boundary

to develop "boundary crossing competence" in individuals. Boundary crossing competence refers to the ability to collaborate and communicate effectively across various boundaries (e.g. practices, cultural, disciplines etc), in order to be agents of transformation (Augsburg, 2014; Oonk, 2016; Rosenberg-Daneri, Trencher, & Petersen, 2015)

In order to cultivate and develop boundary competence, "boundary crossing" has to be operationalised to be able to assess the degree of competence. In a literature review done by Akkerman & Bakker (2011), they concluded that there are four potential learning mechanisms that can occur at boundaries. These learning mechanisms are: *identification*, *coordination*, *reflection* and *transformation*, and are explained as follows[3]:

1. *Identification*: to be able to recognise one's own area of expertise, strengths and limitations; to be able to articulate what expertise is needed to carry out a project/task successfully and to identify which people (groupmates/stakeholders/actors) need to be involved;
2. *Coordination*: to purposefully contact and collaborate with multiple relevant stakeholders to ensure the success of the project;
3. *Reflection*: to learn with and from peers/stakeholders and be able to put one's self in others' shoes to see things from different perspective. To empathise with others and to reflect on one's own knowledge and perspective, but also to encourage others to reflect on their own expertise and actions;
4. *Transformation*: to combine and integrate various perspectives and expertise to generate novel and innovative knowledge and results at the interface of existing practices, that can be applied in real world context.

The above learning mechanisms, provide a basis for assessing the degree of an individual's boundary crossing competence. These learning mechanisms have been used to guide the development of a boundary crossing rubric as developed by Wageningen University and Research (WUR) and has been used in several European Workshops to support and assess students' boundary crossing learning and competence.

1.3 Boundary crossing in European Workshop at Wageningen University & Research

Wageningen University & Research is a higher education institute in The Netherlands that specialises in Life Sciences. It is an example of a higher education institute that recognises the need to integrate fields of natural and social sciences. Its mission is "to explore the potential of nature and to improve the quality of life" and their research and education is strongly focused on solving real-world problems and coming up with practical applications. To do this, they have courses that require students to work in multidisciplinary groups on real life problems, preferably in collaboration with multiple societal stakeholders. One of such courses, developed by the Environmental Systems Analysis chair group, is the *ESA 60312: European Workshop in Environmental Sciences and Management* (henceforth abbreviated as EUW), introduced as part of the Academic Master Cluster[4] for Masters' students. In this course, thirty students from various study disciplines come together to work in a multi-discipline and multi-cultural group for eight weeks, to solve a real-world problem presented to them by a European real life commissioner. The EUW challenges students to integrate previous knowledge and skills from courses and think across boundaries (in this case, mainly cultural, disciplinary, and academia-society boundaries), all while working in a multi-cultural setting.

As part of the assessment criteria of the EUW, students have to write two final reports (one synthesis report, one report for their study area) as well as a personal reflection paper, where they have to reflect on their learning goals, what they have learnt from the course, as well as their boundary crossing competence. In order to help students identify their boundary crossing competence and set targets on which aspects of boundary crossing that they would like to work on during the span of the workshop, and finally assess their self-perceived development in this respect, a boundary crossing rubric was developed. This rubric was developed by Karen Fortuin, Carla Oonk and Judith Gulikers from Wageningen University & Research, on the basis of the four learning mechanisms as identified by Akkerman & Bakker (2011). The rubric was developed

[3] Definitions of the four learning mechanisms of boundary crossing were adapted from a Boundary Crossing Rubric developed by Karen Fortuin, Carla Oonk and Judith Gulikers, to support inter- and transdisciplinary learning in an intercultural setting (Appendix A)
[4] Academic Master Cluster is part of the study program for students at Wageningen University & Research. It allows students to choose from three options: (i) work on a project for a client as part of the 'Academic Consultancy Training', (ii) participate in the 'European Workshop" (both of which requires students to work in a multi-disciplinary and multi-cultural team) or (iii) undertake the Research Master Cluster to prepare students for a possible PhD position.

with the intention of it being generally applicable for students that are working in multi-disciplinary teams on an inter- or transdisciplinary project. There are four main categories in the rubric, which refer to the learning mechanisms as pointed out by Akkerman & Bakker (2011), with each category having at least two sub-categories to assess a particular learning mechanism. In each sub-category, there are four different levels of performance. A sample of the boundary crossing rubric can be found in Appendix A. Based on personal experiences and interviews with the course coordinators of EUW, there are three main boundaries that have been identified which students have to cross in the EUW. The boundaries are: the cultural boundaries, the disciplinary boundaries, and the boundaries between academia and society.

1.4 Purpose of this study

1.4.1 Knowledge gap & problem statement

Past studies have looked into boundary crossing, but mostly on educating students to cross boundaries (Fortuin & Bush, 2010), and how educators can stimulate students' boundary crossing learning (Oonk, Gulikers, & Mulder, 2017). These studies mostly touch upon boundary crossing learning environments and learning activities and how these helped to train students' boundary crossing skills. However, there is currently not yet any research being done to qualitatively and quantitatively assess students' level of awareness of boundary crossing. Without the knowledge and insight into students' awareness levels or perception of boundaries, it is difficult to know if the boundaries that course coordinators have in mind are aligned with the boundaries that students think of. This information gap might render the boundary crossing environments and learning activities useless for trying to build boundary crossing competence in students. Thus, there is a need to look into students' levels of awareness of boundaries and boundary crossing, in order to ensure coherence of course design to create a learning environment that will cultivate student's boundary crossing competences.

1.4.2 Main research objective & research questions

The main objective of this research is to investigate if the European Workshop (EUW) in Wageningen University & Research has an influence on students' levels of awareness of boundary crossing in order to help inform the future design of transdisciplinary courses/projects.

In order to help achieve the main research objective, the following research questions have been formulated:

1. What are the students' levels of awareness towards "boundary crossing" prior to the start of the EUW?
2. What are the students' levels of awareness towards "boundary crossing" at the end of the EUW?
3. What are the differences between the pre- and post-test results?

1.4.3 Research relevance

This research will contribute towards providing course coordinators a better insight into students' levels of awareness of boundary crossing as well as how students perceive boundaries. This information can help inform course coordinators if their ideas of boundaries and boundary crossing in the EUW is similar to what students expect and experience, and if otherwise, how to improve and align them to cultivate and enhance students' boundary crossing competences. Furthermore, as there are plans to incorporate 'boundary crossing' across all programs in WUR in the coming years in the Comenius project, this research will contribute towards providing information to educators and higher management on measuring students' levels of awareness, as well as students' perceptions of boundaries and boundary crossing. This can help inform and guide the design and development of didactic models as well as set up conducive learning environments to cultivate and enhance students' boundary crossing competence, thus preparing WUR graduates to be competent boundary crossers for their future.

1.5 Outline of report

The rest of the report will be organized into five different chapters. Chapter 2 presents the overview of the methodologies used for data collection and analysis. Chapter 3 will showcase the results from the data collection and analysis. The results, its implications, and limitations of the project will be discussed in Chapter 4. Finally, Chapter 5 will bring together the most important conclusions to answer the main objective of this research project, and to provide recommendations for future works.

2 Methodology

In order to gather the information needed to answer the research questions listed in the previous chapter, it was decided that a questionnaire would be the main instrument to be used. This chapter describes in detail the questionnaire – how it was constructed and administered, and how the data collected was analysed.

2.1 Data collection

The main instrument used for data collection in this research project was a questionnaire. An online questionnaire was created on Qualtrics to qualitatively and quantitatively assess the European Workshop participants' perception and awareness of 'boundary crossing'. This method of data collection was selected as it had the capacity to gather as much data as possible within a short time frame, as compared to conducting interviews or focus group discussions.

Operationalisation of 'awareness of boundary crossing'

Prior to the construction of the questionnaire, there was a need to operationalise 'awareness of boundary crossing' in order to guide the design and questions in the questionnaire. The term 'awareness' has been defined as the state or condition of being aware; having knowledge or perception of a situation or fact[5]. As there are many facets of 'awareness', it was identified that knowing certain aspects of this 'awareness' would be useful in getting a first look and some understanding into students' perception of boundary crossing. Thus, 'awareness of boundary crossing' has been operationalised in this research to consist of: the 'awareness of boundaries' (in general and with respect to the EUW), 'the recognition of the relevance and value to cross these boundaries', 'the willingness to cross these boundaries', and the 'perceived capability of students' to cross boundaries'. The scale of 'teacher support required' was added to the list of concepts to be investigated to find out if students require teacher support to cross these boundaries, but it will not be taken into consideration for assessing students' levels of boundary crossing.

Design of questionnaire

The questionnaire was designed to test and assess the awareness of boundary crossing in two main sections – a "quantitative section" and a "qualitative section". The quantitative section was designed to assess the various aspects of awareness of boundary crossing – awareness of boundaries, recognition of relevance and values to cross boundaries, willingness to cross boundaries, perceived capability to cross boundaries as well as the need for teacher support. Each scale consisted of a series of statements that were designed on the basis of the boundary crossing rubric[6]. The definitions of the various aspects and examples of the corresponding statements to measure the aspect(s) can be found in Table 1. Survey respondents were required to rate various statements on a 4-point Likert scale (from "Strongly disagree" to "Strongly agree" and "Not Applicable") the extent to which they agree/disagree with the statements. The same statements were used in both the pre- and post-test questionnaire to enable a comparison between the students' awareness of boundary crossing at the start and after six weeks of the EUW. Students were also asked to fill out their student numbers in the questionnaires to assist in the comparison of data collected in the pre- and post-test, along with some other basic information about themselves (e.g. nationality, age, work experience, study program) for data analysis purposes.

The qualitative section of the questionnaire contained open-ended questions. The questions differed in the pre- (four questions) and post-test (one question). These open-ended questions were designed to give students the opportunity to share their thoughts and perception that the quantitative section might have not been able to capture. In the pre-test, the first two open questions asked students about their motivation for participation and learning expectations of the EUW. Student answers on these two questions were expected to reveal various motivations and learning expectations that could refer to their awareness of boundaries. The other two questions asked students specifically what they thought of the term boundaries, as well as the potential boundaries that they foresee they might encounter during the EUW. The latter two questions were included to stimulate students to think about boundaries – to see how and what students perceive of the term "boundaries" and what they thought were boundaries to them with regards to the EUW. In the post-test questionnaire, students were asked to share on the boundaries that they encountered in the EUW. This question was added to find out the

[5] Definition of "awareness". (n.d.). Retrieved July 30, 2018, from https://www.dictionary.com/browse/awareness?s=t

[6] "Boundary-crossing rubric: a tool to support inter- and transdisciplinary learning in an intercultural setting" developed by Karen Fortuin, Carla Oonk and Judith Gulikers (Appendix A)

kind of "boundaries" that students' reported encountering during the course of the five weeks and how often the same type of "boundary" was encountered and reported. A sample of both the pre- and post-test questionnaire can be found in Appendix B.

Table 1. Definition of the various aspects of awareness and corresponding examples of statements that were formulated for the questionnaire.

Scales to assess students' Awareness of Boundary Crossing	Definition / Meaning	Examples of statements
Awareness of boundaries	This scale was devised to investigate if students are aware of any boundaries – both in relation to their everyday lives and the EUW.	• I sometimes feel that there is a cultural gap between myself and other students from other countries. • I expect that doing a project for a client is similar to doing a project for school. • There is no difference between academic and professional practice.
Recognition of relevance and value to cross boundaries	This scale was devised to investigate if students are recognise the relevance and value to cross boundaries.	• The best way to address a complex problem is to work in a multi-disciplinary group. • It is inefficient to take time to understand one another's views in a multi-disciplinary group. • I do not like to collaborate with people from other disciplines on a project.
Willingness to cross boundaries	This scale was devised to investigate students' willingness to cross boundaries.	• In this project I have the intention to step out of my comfort zone and try something new. • I prefer to only learn about issues related to my own discipline. • I see differences between people as a hurdle in group work
Perceived capability to cross boundaries	This scale was devised to investigate students' perception of their own capabilities to cross boundaries.	• I find it difficult to step out of my comfort zone and try something new. • I am able to put myself in the shoes of others and see things from their perspective. • I am able to explicate my own capabilities at the start of a new project.
Teacher support required	This scale was devised to investigate if students require teacher support to help them to cross boundaries.	• Teacher support is crucial to help me work with students from other nationalities. • I need teacher guidance to be able to collaborate with external stakeholders. • Without intensive teacher support, I am not able to work with students from other disciplines.

Administration of questionnaires & study population

The questionnaire was administered to the students that participated in the European Workshop that was in Period 6 of the 2017/2018 Academic Year (15 May 2018 – 6 July 2018). The general characteristics and information of the project and participants of the various EUW groups can be found in Table 2. The data collection was designed and conducted in a pre- and post-test manner. Students were first asked to fill out the pre-test questionnaire online, prior to the start of the EUW. Due to time limitations of this research project, the post-test questionnaire was administered in the sixth week of the course, upon the students' return from fieldwork abroad, instead of at the end of the European Workshop course. However, there was a slight change in the administration of the questionnaire due to unforeseen circumstances. The original plan was to have students fill out the online questionnaire before the start of the EUW, but unfortunately there were insufficient responses and the teachers of the EUW were asked to remind their students to fill out the online questionnaire. However, the reminders from the teachers did not garner sufficient responses either. Hence, the survey was printed and students were asked to fill out the questionnaire on paper in the second week of the course. Following this experience of little responses through the online questionnaire, the post-test questionnaire was administered to the students in the hard-copy form.

Table 2. General characteristics of the project and students in the various European Workshops in Period 6 of Academic year 2017/2018

	EUW Algarve/Faro	**EUW Brno**	**EUW Malta**	**EUW Porto**
Topic of project	Towards sustainable seafood consumption in Algarve, Portugal	Improve the sustainability of water management in Brno's schools	Evaluation of cycling infrastructure and practices for better air quality and green space on Malta	Assessing the contribution of the second hand market to closing material loops
Client	Sciaena and Good Fish Foundation	Czech Environmental Partnership (Nadace Partnerství)	Bicycle Advocacy Group (NGO)	LIPOR – Intermunicipal Waste Management of Greater Porto
Number of students	**28**	**28**	**28**	**26**
Students' study program (#)	**7 Study Programs** Exchange (2), MAM (12), MBI (1), MES (7), MLE (5), MPS (1),	**4 Study Programs** MCL (1), MES (24), MLE (1), MUE (2)	**3 Study Programs** MES (12), MLE (5), MUE (11)	**4 Study Programs** MES (15), MLE (3), MPS (1), MUE (7)
Students mean age (Standard Deviation)	**24.61 (3.30)**	**23.68 (1.94)**	**24.89 (2.88)**	**24.19 (2.17)**
# of Nationalities represented (list the various nationalities)	**10 Nationalities** American (2), Brazilian (2), Chinese (4), Dutch (13), French (1), German (2), Greek (1), Indonesian (1), Italian (1), Spanish (1)	**8 Nationalities** Chinese (12), Dutch (10), German (1), Indonesian (1), Japanese (1), Mexican (2), Spanish (1)	**10 Nationalities** Chinese (5), Dutch (13), Indonesian (2), Taiwanese (2), Filipino (1), Italian (1), Malawian (1), S.Korean (1), Sri Lankan (1), Tanzanian (1)	**11 Nationalities** Chinese (8), Dutch (9), Ecuadorean (1), Ghanaian (1), Indonesian (1), Italian (1), Mexican (1), Paraguayan (1), Portuguese (1), Taiwanese (1), Thai (1)

Following data collection through the surveys, the data that was submitted through the online questionnaire was downloaded from Qualtrics, while the rest of the responses that were done on paper were keyed in manually before data analysis was carried out.

2.2 Data analysis

2.2.1 Quantitative data

Following data collection through the questionnaires, the quantitative data (ratings of the various statements on a Likert scale) was analysed with the Statistical Package for Social Sciences (SPSS, Version 23) program. Simple descriptive statistics were obtained to get a general feel of the responses to each individual question (refer to Appendix B). A variety of other tests such as bivariate analyses, paired samples *t*-tests, Wilcoxon signed-rank test were also conducted on the collected data as part of the analysis. However, before any analysis can be carried out to determine the levels of awareness of boundary crossing through the various scales, there was a need to calculate Cronbach's alpha to measure the internal consistency of the various scales[7].

Calculating Cronbach's alpha

In order to test for Cronbach's alpha, a score had to be assigned to each of the statements. This step was carried out on the data that was collected from the pre-test questionnaire. Some of the output from the pre-test questionnaire were recoded into different numbers for the scoring, to ensure that scores for each section were in the same direction. For example, under the scale of "Recognition of relevance and value to cross boundaries", a high score would mean that the respondent has a high level of awareness and recognition of the relevance and value of having to cross boundaries (Table 3). To do this, each of the statements under this scale were analysed and given a score to ensure that it follows the logical flow and scoring

[7] What does Cronbach's alpha mean? (n.d.). Retrieved from https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/

"direction" for each section. If a respondent strongly agrees with "The best way to address a complex problem is to work in a multi-disciplinary group", a high score (4) will be given as it meant that there is high recognition of the relevance and value to cross boundaries. However, if a respondent strongly agrees with "I do not see the need to work with people from other countries" it means that the person does not recognise the relevance and value to cross boundaries and would thus be assigned a low score (1). The same logic was applied to the other statements under the different scales and the scoring is shown in the sample of the survey attached (Appendix B).

Table 3. Example of scoring carried out for various statements in each of the different scales to assess the overall boundary crossing awareness of participants. The statements in this table are under the scale of "Recognition of relevance and value to cross boundaries"; a high score here would mean high levels of the recognition of the relevance and value to cross boundaries which translates to high levels of awareness of boundary crossing.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
The best way to address a complex problem is to work in a multi-disciplinary group.	**1**	**2**	**3**	**4**	**Missing value**
It is inefficient to take time to understand one another's views in a multi-disciplinary group.	**4**	**3**	**2**	**1**	**Missing value**
I do not see any value in working with citizens or lay-people who are not educated in the topic of our project.	**4**	**3**	**2**	**1**	**Missing value**
Differences in students' backgrounds adds creativity to the way we approach the problem and find solutions for the client.	**1**	**2**	**3**	**4**	**Missing value**
I do not see the need to work with people from other countries.	**4**	**3**	**2**	**1**	**Missing value**

Once the various statements were appropriately recoded, Cronbach's alpha was calculated on SPSS to test for the internal consistency of the statements under each scale. Each of the five different scales was first tested with all statements included and subsequently various statements were removed if its removal resulted a higher Cronbach's alpha. The final Cronbach's alpha for each of the scales are: (i) awareness of boundaries (α = .616); (ii) recognition of relevance and value to cross boundaries (α = .728); (iii) willingness to cross boundaries (α = .776), (iv) perceived capability to cross the boundaries (α = .790); and (v) need for teacher support (α = .818). The Cronbach's alpha for all scales, with the exception of 'Awareness of boundaries', were in the acceptable range ($\alpha \geq .70$) (Tavakol & Dennick, 2011). The results of the test for Cronbach's alpha, including the statements that were subsequently removed from further analysis can be found in Appendix C.

Bivariate analyses, paired samples t-test and Wilcoxon signed-rank test

Following the recoding of scores and the removal of statements that were inconsistent, a mean score per respondent was calculated for each of the various scales for further statistical analysis such as bivariate analysis for pre- and post-test individually, and either paired samples *t*-test and Wilcoxon signed-rank test for the comparison of pre- and post-tests together. The mean was used instead of the sum as there was an option for the respondents to choose 'Not applicable', and using the sum would mean that this options would be factored in, which might not be an accurate representation. Hence, the option of 'Not applicable' was recoded as a missing value and the mean was used in calculation of the score for further analysis.

Bivariate analyses were carried out to test if there is any linear relationship between the same pairs of variables in the population for the various scales within the pre- and post-test separately. This was done to see if there were any possible significant relationship between the various scales and in what direction they affect each other. Paired samples *t*-test and Wilcoxon signed-rank test were conducted for the comparison of the collected data between the pre- and post-tests. Paired samples *t*-test was used to compare the means between two related groups on the same continuous, dependent variable. It

was used for the data sets that were normally distributed. For the comparison of the data that were not normally distributed, the Wilcoxon signed-rank test was used instead.

2.2.2 Qualitative data

With the open-ended questions, a qualitative analysis was carried out to assess students' awareness of boundary crossing. For this analysis, the responses were tabulated in Microsoft Excel, with separate tabs for each question. Coding was the process used to analyse the qualitative data. Firstly, each respondent's response was divided into excerpts. Thereafter, codes were identified by going through the various excerpts. Codes serve as a way to label, consolidate and organize the excerpts[8]. Before the actual coding work was done, this author went through the whole list of respondents' responses and identified common themes that appeared. After a list of codes was finalized, a first round of coding was carried out on a sample of responses (20% of respondents) by this author and her supervisor. However, as there were too many codes identified and due to many overlaps, it resulted in a relatively low interrater reliability score. As a result of this initial low interrater reliability score, a mutual agreement between the coders was reached to have a less detailed version of the codes. The list of codes was then narrowed down to 'cultural boundaries', 'disciplinary boundaries, 'academia-society boundaries', 'other boundaries' and 'no boundaries mentioned'. A second round of coding was carried out according to this new list of codes by this author and one of her supervisors. The resulting interrater reliability score for each question can be found in Table 4, with the average interrater reliability score at 0.86, which is considered an almost perfect interrater reliability score[9]. After the determination of an almost perfect interrater reliability score, this author carried on the remaining coding work for the rest of the responses with the final coding scheme. The final coding scheme and selected illustrative examples for each code can be found in Table 5. After the coding was done, the results were tabulated to see if there were any patterns that could be observed, as well as if there were any trends in the various groups.

Table 4. Interrater Reliability scores for each question and the overall average score calculated from the coding of the excerpts from a random sample of 16 students by this author and her supervisor.

Test	Question	Interrater Reliability Score
Pre-test	What are your motivations to participate in the European Workshop?	0.86
	What do you expect to learn from the European Workshop?	0.71
	What do you think is meant by the term boundaries in relation to the European Workshop?	0.85
	What are some potential boundaries that you foresee that you will encounter during the European Workshop?	0.92
Post-test	Did you encounter any boundaries in the European Workshop? If so, please describe them.	0.97
	Average Interrater Reliability Score	**0.86**

Table 5.Awareness of Boundary Crossing coding scheme for the qualitative analysis

Type of boundary	Description of the boundary	Illustrative examples from students' responses
Cultural boundaries	Refers to the different cultures that students from different nationalities bring to the group	"Cultural boundary"; intercultural cooperation"; 'working with people from different nationalities";
Disciplinary boundaries	Refers to the boundaries that come with working with people from different disciplinary background, or study program	"Boundaries can refer to boundaries between disciplines; the students in the EUW are from diverse academic backgrounds", "study programme boundaries", "Also boundaries between e.g. social and natural scientists"

[8] Coding Qualitative Data. (n.d.). Retrieved August 20, 2018, from http://programeval.ucdavis.edu/documents/Tips_Tools_18_2012.pdf
[9] Benchmarking Inter-Rater reliability Coefficients. (n.d.). Retrieved August 15, 2018, from http://www.agreestat.com/book3/bookexcerpts/chapter6.pdf

Type of boundary	Description of the boundary	Illustrative examples from students' responses
Academia-society boundaries	Refers to the boundaries between academic world with society in general	"Between science and society/stakeholders", "a learning boundary as we are leaving the learning environment and actually working with a client", "transdisciplinary"; "Boundary of theoretical and practical but also different setting"
Other boundaries	Refers to excerpts that do not fall into the first three types of boundaries, and are still boundaries of sorts	• **Geographical boundaries** such as "geographical boundaries as we are doing a project abroad mostly while we are in the Netherlands", "physical nation boundary"; • **Project/Research boundaries** such as "But the project itself also has boundaries: what is the scope and what are time and budget boundaries."; • **Personal boundaries** such as "Crossing boundaries of your comfort zone" • **Others** such as "communication can be a boundary that needs to be overcome"
Not a boundary	When there was no mention of a possible boundary	"I have no idea"
No boundaries mentioned	When there are no responses for the open-ended question	-

2.2.3 Comparative analysis of data

Besides the analysis that was done separately within the pre- and post-test quantitative and qualitative data, there were also other analyses being carried out with the data collected. Firstly, within the quantitative and qualitative data itself, analysis was carried out between the pre- and post-test. For the quantitative aspect, paired samples *t*-test as well as Wilcoxon signed-rank test were carried out to look into the difference in the mean scores between the pre- and post-test results. For the qualitative analysis, to compare between pre- and post-test, the results of coding the open-ended questions were put together to observe if there were any patterns in the percentages of excerpts in the various categories of boundaries defined in the coding. Secondly, within both the qualitative and quantitative data, after an analysis was done on the entire group of students as a whole, a further investigation was also carried out to look into the responses for the various scales (quantitative) and open-ended questions (qualitative) in greater detail. The students were divided into various smaller groups to see if there were any trends in growth within the smaller groups and if the different groupings could explain any trends. The smaller groups that were created included groups based on (i) EUW groupings, (ii) Dutch and non-Dutch students, (iii) Environmental Sciences (MES) students and non-MES students, (iv) prior work experience, and (v) presence/absence of multi-disciplinary group work experience. Finally, an analysis was also conducted between the quantitative and qualitative data, to see if the results from the qualitative and quantitative analysis support and reinforce each other on the assessment of students' levels of awareness of boundary crossing.

3 Results

In this chapter, the results from the data collection and analysis of the questionnaires will be presented to address all the research questions in order to find out what are the levels of students' awareness towards boundary crossing before the start of the European Workshop (EUW) and after five weeks of the EUW, as well as the differences between the pre- and post-test. This chapter will be divided into three main sections – the first two being the results from quantitative data, followed by qualitative data, where each of these sections will be further subdivided to results from pre-test questionnaire, post-test questionnaire and a comparison of the data between pre- and post-test. The third section will consist of the comparison between the quantitative and qualitative data.

3.1 Quantitative data

3.1.1 Results from data analysis of pre-test questionnaire

Respondent characteristics

For the pre-test questionnaire, there were a total of 84 respondents (76% of total participants in EUW), of which 63 was completed via the online survey on Qualtrics and the rest were filled out on the hard copy questionnaire. The responses received were well distributed across the four European Workshops (EUW) groups – EUW Algarve (20), EUW Brno (20), EUW Malta (22) and EUW Porto (22). Of that total, there were seven different study programs represented – Aquaculture and Marine Resource Management (MAM, 8.5%); Biology (MBI, 1.2%); Environmental Sciences (MES, 48.8%); Leisure, Tourism and Environment (MLE, 14.6%); Plant Sciences (MPS, 2.4%); Urban Environmental Management (MUE, 22.0%); and two exchange students (2.4%). There were a total of 21 nationalities represented and the mean age of the respondents was 24.2 years (SD = 2.90), with the respondents ranging between 20 to 37 years. Of the 84 respondents, half of the respondents reported having working experience prior to starting their masters and 74.4% of the respondents indicated that they have had experience working in a multi-disciplinary group.

Descriptive statistics of the various scales

Following the data clean up and the test for Cronbach's alpha for the relevant statements to use in the analysis of the scales, a mean score was calculated for each of the scales for the respective respondents. This was done to have a feel of how students faired on the various scales, to gain a better understanding into their awareness levels of boundary crossing prior to the start of the European Workshop. Table 6 contains the descriptive statistics of the mean scores of the various scales. 'Teacher support required' recorded the lowest mean score and the biggest difference between the minimum and maximum scores. On the other hand, 'Recognition of relevance and value to cross the boundaries' recorded the highest mean score and had the lowest difference between the minimum and maximum scores. With the exception of 'Teacher support required', all other scales recorded relatively high mean scores of more than 2.50.

Table 6. Descriptive statistics of the mean scores of the various categories from the data collected from the pre-test questionnaire.

	PRE-TEST SCALES	N	Min.	Max.	(Max. - Min.)	Mean	Std. Deviation
1	Awareness of boundaries	84	2.00	3.75	1.75	2.86	0.39
2	Recognition of relevance and value to cross the boundaries	83	2.60	4.00	1.40	3.33	0.31
3	Willingness to cross boundaries	83	2.33	3.92	1.59	3.11	0.32
4	Perceived capability to cross boundaries	82	1.33	3.80	2.47	2.87	0.36
5	Teacher support required	82	1.00	4.00	3.00	2.35	0.54

Bivariate analysis of the various scales

Having looked into the mean scores of the scales individually, bivariate analyses were then carried out to investigate if there were any linear relationships between the different scales and in what direction they affect each other. The results of this bivariate analysis is shown in Table 7. For all the bivariate analysis tables in this report, the colour gradient indicates the level

of significance – the darker the shade represents significance at p < 0.01; the lighter the shade represents the significance level at p < 0.05; and no shading represents no significance.

From Table 7, it can be observed that there are significant correlations between various scales. Most of the significant correlations were positive and the strongest one being 'Recognition of relevance and value to cross the boundaries' with 'Willingness to cross boundaries' (r=.735, p<0.01), followed by 'Willingness to cross boundaries' with 'Perceived capability to cross these boundaries' (r=.537, p<0.01) and 'Recognition of relevance and value to cross the boundaries' with 'Perceived capability to cross these boundaries' (r=.415, p<0.01). There was, however, one significant negative correlation and that was between 'Perceived capability to cross these boundaries' and 'Teacher Support required' (r= -.281, p<0.05).

Table 7. Pearson correlations of mean scores of the various categories that were tested in the pre-test questionnaire. The colour gradient indicates the level of significance – the darker shade represents the significance level at p < 0.01; the lighter shade represents the significance level at p < 0.05; and no shading represents no significance.

	Recognition of relevance and value to cross the boundaries	Willingness to cross boundaries	Perceived capability to cross these boundaries	Teacher support required
Awareness of boundaries	-.014	-.026	.056	-.052
Recognition of relevance and value to cross the boundaries	-	.735**	.415**	-.189
Willingness to cross boundaries		-	.537**	-.214
Perceived capability to cross these boundaries			-	-.281*
Teacher support required				-

*** p < 0.01, * p < 0.05*

3.1.2 Results from data analysis of post-test questionnaire

Respondent characteristics

For the post-test questionnaire, there were a total of 85 respondents (77% response rate) which filled out the questionnaire on paper. The responses received were mostly well-distributed across the four European Workshops (EUW) groups – EUW Algarve (15), EUW Brno (20), EUW Malta (27) and EUW Porto (23). Of that total, there were six different study programs represented – Aquaculture and Marine Resource Management (MAM, 2.4%); Environmental Sciences (MES, 61.0%); Leisure, Tourism and Environment (MLE, 11.0%); Plant Sciences (MPS, 2.4%); Urban Environmental Management (MUE, 20.7%); and two exchange students (2.4%). There were a total of 22 nationalities represented and the mean age of the respondents was 23.9 years (SD = 2.81), with the respondents ranging between 20 to 37 years. Of the 85 respondents, 48.1% respondents reported having working experience prior to starting their masters and 76.5% of the respondents indicated that they have had experience working in a multi-disciplinary group. The results of the post-test questionnaire can be found in Appendix **B**.

Descriptive statistics of the various scales

The descriptive statistics from results of the post-test questionnaire is tabulated in Table 8. Similar to the pre-test results, 'Teacher support required' once again recorded the lowest mean score and the greatest difference between the minimum and maximum scores. The scale 'Recognition of relevance and value to cross the boundaries' also again recorded the highest mean score.

Table 8. Descriptive statistics of the mean scores of the various categories from the data collected from the post-test questionnaire.

	POST-TEST SCALES	N	Min.	Max.	(Max. - Min.)	Mean	Std. Deviation
1	Awareness of boundaries	85	2.38	3.75	1.37	2.94	0.27
2	Recognition of relevance and value to cross the boundaries	85	2.50	4.00	1.50	3.27	0.33
3	Willingness to cross boundaries	84	2.33	3.75	1.42	3.10	0.33

4	Perceived capability to cross boundaries	85	1.00	3.40	2.40	2.25	0.49
5	Teacher support required	85	0.80	3.40	2.60	2.18	0.52

Bivariate analysis of the various scales

Bivariate analyses were then carried out to test for any linear relationship between the different scales and in what direction they affect each other. The results of the bivariate analysis of the scales in the post-test is shown in Table 9. It was observed that there were significant correlations between various scales. All the significant correlations were positive and the strongest one being 'Perceived capability to cross these boundaries' with 'Teacher support required' (r=.878, p<0.01) followed by 'Recognition of relevance and value to cross the boundaries' with 'Willingness to cross boundaries' (r=.691, p<0.01).

Table 9. Pearson correlations of mean scores of the various categories that were tested in the post-test questionnaire. The colour gradient indicates the level of significance – the darker shade represents the significance level at p < 0.01; the lighter shade represents the significance level at p < 0.05; and no shading represents no significance.

	Recognition of relevance and value to cross the boundaries	Willingness to cross boundaries	Perceived capability to cross these boundaries	Teacher support required
Awareness of boundaries	.045	.027	.096	.103
Recognition of relevance and value to cross the boundaries	-	.691**	-.055	-.074
Willingness to cross boundaries		-	-.148	-.185
Perceived capability to cross these boundaries			-	.878**
Teacher support required				-

*** p < 0.01, * p < 0.05*

3.1.3 Comparison between pre- and post-test questionnaire

Having looked at the results of the pre-test and post-test questionnaire individually, the next step was to look at the results of the pre- and post-test together, to see if there were any visible trends. Paired sample *t*-tests and Wilcoxon signed-rank tests were used on the various scales to calculate the development of students' levels of awareness of boundary crossing from before the EUW and after five weeks of EUW. The data used for this section is from respondents who filled out both the pre- and post-test questionnaires (n=69). The results of the tests done for the various scales for the whole group are tabulated in Table 10. It was observed that there was a decrease in the mean scores from pre-test to post-test for the scales of 'Recognition of relevance and value to cross boundaries' (-0.06), 'Willingness to cross boundaries' (-0.003), 'Perceived capability to cross these boundaries' (-0.60), and 'Teacher support required' (-0.21) and only the scale for 'Awareness of boundaries' recorded an increase in the mean scores from pre- to post-test. This means that across the scales, only 'Awareness of boundaries' showed a positive growth. When paired *t*-tests and Wilcoxon signed-rank test were used to test if the growth was significant, only the scales of 'Perceived capability to cross these boundaries' and 'Teacher support required' were significant (p < 0.01). The scale of 'Perceived capability to cross these boundaries' also recorded a very large effect size (Cohen's d = 1.39) (Rosenthal, 1996), and 'Teacher support' recorded a small to medium effect size (Cohen's d = 0.40) (Ellis, 2009).

Table 10. An overview of the results of the comparison between the pre- and post-test responses for the various categories.

Category	Mean Scores		+/- Difference	Test used for testing of significance	p-value	Cohen's d (r)
	Pre-test	Post-test				
Awareness of boundaries	2.86	2.94	0.08	Wilcoxon signed-rank tests	0.079	0.24 (r=0.12)
Recognition of relevance and value to cross boundaries	3.33	3.27	-0.06	Wilcoxon signed-rank tests	0.110	0.19 (r=0.09)

Willingness to cross boundaries	3.10	3.10	-0.003	Wilcoxon signed-rank tests	0.749	0.0098 (r=0.0049)
Perceived capability to cross these boundaries	2.84	2.24	-0.60	Paired *t*-test	0.017**	1.39 (r=0.57)
Teacher support	2.37	2.16	-0.21	Paired *t*-test	0.001**	0.40 (r=0.20)

Having looked at the entire group of students as a whole, a further investigation was carried out to look into the scales in greater detail. As described in Chapter 2.2.3, the respondents were divided into smaller groups to see if there were any trends in growth within the smaller groups and if the different groupings could explain any trends. Some of the results that were significant are recorded in Table 11, Table 12, Table 13, Table 14 and Table 15. The rest of the results of the analyses can be found in Appendix D.

Awareness of boundaries

For the scale 'Awareness of boundaries' (Table 11), there were two significant results recorded. There was a significant positive growth between the mean scores of pre-test and post-test of non-Dutch students as well as the students that mentioned that they had no prior work experience before to start of their Master's study.

Table 11. Comparison of Pre-test and Post-test mean scores for the scale 'Awareness of boundaries' for various groups of students.

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Dutch	2.93	2.92	-0.01	No (p=0.873)
Non-Dutch	2.88	2.96	0.08	Yes (p=0.030)
With work experience	2.98	2.98	-0.0009	No (p=0.987)
No work experience	2.82	2.92	0.09	Yes (p=0.041)

Recognition of relevance and value to cross boundaries

For the scale 'Recognition of relevance and value to cross boundaries' (Table 12), there were three significant results recorded. The three groups that recorded a significant difference were the EUW Algarve group, non-Dutch students as well as students that were not from the Environmental Sciences Master's program (MES). These three groups of students also recorded a negative growth for this particular scale.

Table 12. Comparison of Pre-test and Post-test mean scores for the scale 'Recognition of relevance and value to cross boundaries' for various groups of students.

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	3.28	3.15	-0.13	Yes (p=0.029)
Brno	3.36	3.41	0.05	No (p=0.543)
Malta	3.34	3.34	-0.007	No (p=0.512)
Porto	3.32	3.27	-0.05	No (p=0.440)
Dutch	3.29	3.32	0.03	No (p=0.587)
Non-Dutch	3.35	3.30	-0.05	Yes (p=0.237)
MES students	3.28	3.31	0.03	No (p=0.552)
Non-MES students	3.40	3.31	-0.09	Yes (p=0.009)

Willingness to cross boundaries

For the scale 'Willingness to cross boundaries' (Table 13), only the EUW Malta group recorded a significant positive growth between the pre-test and post-test results ($p < 0.05$). The rest of the other groups (Appendix D), though not significant, also all recorded positive growths, except for the EUW Porto group, which was the only group that recorded a negative growth.

Table 13. Comparison of Pre-test and Post-test mean scores for the scale 'Willingness to cross boundaries' for various groups of students.

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	3.10	3.14	0.03	No (p=0.729)
Brno	3.15	3.18	0.03	No (p=0.609)
Malta	3.08	3.20	0.12	Yes (p=0.043)
Porto	3.13	3.07	-0.06	No (p=0.206)

Perceived capability to cross boundaries

As mentioned earlier in the results for the whole group, 'Perceived capability to cross boundaries' recorded a significant negative growth on the whole. Upon further investigation into the various groups of students (Table 14), all the different groups had a negative growth from pre-test and post-test and all but the EUW Algarve group's negative growth were significant.

Table 14. Comparison of Pre-test and Post-test mean scores for the scale 'Perceived capability to cross boundaries' for various groups of students.

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	2.68	2.46	-0.22	No (p=0.345)
Brno	2.83	2.17	-0.66	Yes (p=0.003)
Malta	2.90	2.04	-0.86	Yes (p=0.000)
Porto	2.91	2.37	-0.54	Yes (p=0.001)
Non-Dutch	2.82	2.38	-0.44	Yes (p=0.000)
Dutch	2.90	1.99	-0.91	Yes (p=0.000)
MES	2.74	2.26	-0.48	Yes (p=0.000)
Others	2.98	2.22	-0.76	Yes (p=0.000)
No work experience	2.76	2.21	-0.54	Yes (p=0.000)
With work experience	2.95	2.27	-0.68	Yes (p=0.000)
No MDGW experience	2.87	2.20	-0.67	Yes (p=0.000)
With MDGW experience	2.84	2.26	-0.58	Yes (p=0.000)

Teacher support required

Similarly, the scale for 'Teacher support required', there was a general negative growth in this scale (Table 15). When the paired sample *t*-tests and Wilcoxon signed-rank tests were carried out on the various groups, all but the EUW Algarve group recorded significant negative growth. The EUW Algarve was the only one that had a positive growth, but it was a small growth and it was not significant.

Table 15. Comparison of Pre-test and Post-test mean scores for the scale 'Teacher support' for various groups of students.

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	2.46	2.46	0.0038	No (p=0.973)
Brno	2.40	2.02	-0.38	Yes (p=0.025)
Malta	2.21	1.96	-0.25	Yes (p=0.031)
Porto	2.48	2.29	-0.19	Yes (p=0.137)
Non-Dutch	2.11	1.99	-0.12	Yes (p=0.060)
Dutch	2.52	2.25	-0.26	Yes (p=0.005)
MES	2.39	2.15	-0.24	Yes (p=0.014)
Others	2.36	2.17	-0.18	Yes (p=0.031)
No work experience	2.35	2.19	-0.15	Yes (p=0.037)
With work experience	2.41	2.13	-0.28	Yes (p=0.012)
No MDGW experience	2.39	2.16	-0.23	Yes (p=0.055)
With MDGW experience	2.37	2.16	-0.21	Yes (p=0.008)

3.2 Qualitative data

3.2.1 Results from data analysis of pre-test questionnaire

While the quantitative data mostly looked at the different aspects of students' awareness of boundary crossing, the qualitative data was studied to have a look into what students' perceived as boundaries and whether their ideas of boundaries were aligned with those thought by the course coordinators. The result of the pre-test qualitative coding exercise is shown in Table 16. When students were asked about their motivations for participating in the EUW, there were little excerpts that made references to 'cultural boundaries' and 'disciplinary boundaries' (4.41% and 5.88% respectively), slightly more excerpts referred to the 'academia-society boundaries' (11.40%) and 'other boundaries' (12.50%), but the majority (65.81%) of excerpts mentioned were not considered boundaries (e.g. wanting to learn how to work in big groups, gaining new skills etc.). The same can be said for the responses that were under learning expectations.

On the other hand, when students were asked about the boundaries in relation to the EUW as well as the potential boundaries that they foresee encountering in the EUW, a higher percentage of the responses made reference to 'cultural boundaries' and 'disciplinary boundaries' as compared to the first two questions on motivations and learning expectations. Approximately half of the responses made reference to boundaries, but they were mostly 'other boundaries' such as geographical boundaries, project/research boundaries or personal boundaries.

Having looked at the data as a whole, the next step was to look into the distribution of percentages of excerpts in the various smaller groups, to see if there would be any observable trends. Similar to the analysis done for the quantitative data, the smaller groups created were based on (i) EUW groupings, (ii) Dutch and non-Dutch students, (iii) Environmental Sciences (MES) students and non-MES students, (iv) prior work experience, and (v) presence/absence of multi-disciplinary group work experience shows the distribution of percentages of the excerpts from the pre-test questionnaire for the various groups. For this part of the discussion, only the results for 'Potential boundaries' are included in the main report (Table 17) as it would be useful to know what kinds of boundaries that students expect to encounter in the EUW. The results for the other open-ended questions can be found in Appendix E.

Table 16. Amount of reported boundaries as a percentage of all reported excerpts collected from the open-ended questions that were in the pre-test questionnaire.

Category	Pre-test Questionnaire Questions	Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries	Total
Motivations	What are your motivations to participate in the EUW? (272 Excerpts)	65.81	4.41	5.88	11.40	12.50	100.00
Learning Expectations	What do you expect to learn from the EUW? (268 Excerpts)	63.43	2.99	5.97	11.94	15.67	100.00
Boundaries in relation to EUW	What do you think is meant by the term *boundaries* in relation to the EUW? (177 Excerpts)	8.47	18.64	18.64	5.65	48.59	100.00
Potential Boundaries	What are some potential boundaries that you foresee that you will encounter during the EUW? (173 Excerpts)	5.20	20.81	17.34	2.31	54.34	100.00

From the results (Table 17), it can be see that across the board for the different groups, all the smaller groups actually made little or no reference to 'academia-society boundaries'. As usual, most of the excerpts fell into the 'other boundaries' category. However, there were some notable groups that differed quite a bit from the rest of the groups in a certain category of boundaries. Some of these groups include the MES students (22.35% of excerpts mentioned were 'disciplinary boundaries' as compared to 12.64% for Non-MES students) and students with no multi-disciplinary group work experience (26.19% of excerpts mentioned were 'cultural boundaries' as compared to 18.64% for students with multi-disciplinary group work experience).

Table 17. Distribution of the amount of reported boundaries as a percentage of all reported excerpts for the question of 'What are some potential boundaries that you foresee that you will encounter during the EUW?' collected from the open-ended questions that were in the pre-test questionnaire, divided according to various groups of students. The observable and notable differences in amount of excerpts for a particular type of boundary are highlighted in yellow.

POTENTIAL BOUNDARIES	#	Type of *boundary* mentioned				
		Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries
EUW Groupings Total (173 Excerpts)	100.00	5.20	20.81	17.34	2.31	54.34
EUW Algarve	25.43	2.27	25.00	15.91	0.00	56.82
EUW Brno	23.12	5.00	20.00	20.00	2.50	52.50
EUW Malta	26.59	2.17	17.39	17.39	2.17	60.87
EUW Porto	24.86	11.63	20.93	16.28	4.65	46.51
Dutch/Non-Dutch Total (171 Excerpts)	100.00	4.68	20.47	17.54	2.34	54.97
Dutch	39.77	1.47	25.00	16.18	1.47	55.88
Non-Dutch	60.23	6.80	17.48	18.45	2.91	54.37
MES/Non-MES Total (172 Excerpts)	100.00	5.23	20.35	17.44	2.33	54.65
MES	49.42	3.53	17.65	22.35	1.18	55.29
Non-MES	50.58	6.90	22.99	12.64	3.45	54.02
Work Experience Total (171 Excerpts)	100.00	4.68	20.47	17.54	2.34	54.97
No Work Experience	49.12	4.76	19.05	20.24	1.19	54.76

Yes work experience	50.88	4.60	21.84	14.94	3.45	55.17
Multi-disciplinary Group Work Experience Total (160 Excerpts)	100.00	5.00	20.63	16.25	2.50	55.63
No MDGW experience	26.25	2.38	26.19	14.29	2.38	54.76
Yes MDGW experience	73.75	5.93	18.64	16.95	2.54	55.93

3.2.2 Results from data Analysis of post-test questionnaire

Next, the qualitative data from the post-test questionnaire was also looked at. Participants were asked about the boundaries that they encountered during the EUW and the result of the qualitative coding exercise is shown in Table 18. Almost half of the excerpts that were mentioned were under 'other boundaries' and they mostly referred to language (during fieldwork) and communication boundaries (during both group work and fieldwork), boundaries between people (personalities, working styles, different mentalities etc). The rest of the excerpts were divided into 'cultural boundaries' (29.82%), 'disciplinary boundaries' (16.67%), and 'academia-society boundaries' (0.88%). About 7.89% of the excerpts were not considered as a boundary.

Table 18. Amount of reported boundaries as a percentage of all reported excerpts collected from the open-ended questions that were in the post-test questionnaire

Category	Post-test Questionnaire Questions	Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries	Total
Boundaries Encountered	Did you encounter any boundaries in the EUW? (114 Excerpts)	7.89	29.82	16.67	0.88	44.74	100.00

Next, a further investigation was carried out to look into the various groups of students to see if there would be any observable trends. Table 19 shows the distribution of percentages of the excerpts for the various groups for 'Boundaries encountered" from the post-test questionnaire. From the results, it can be seen that across the board for the different groups, most of them made little or no reference to 'academia-society boundaries'. As usual, most of the excerpts mentioned mostly fell under the category of 'other boundaries'. However, there were some notable groups that differed quite a bit from the rest of the groups in a certain category of boundaries. Some of these groups include EUW Algarve (27.27% of excerpts mentioned were under 'disciplinary boundaries' which is the highest amongst all the different EUW groups), Non-Dutch students (22.22% of excerpts mentioned were under 'disciplinary boundaries as compared to 8.11% for Dutch students), Non-MES students (39.13% of excerpts mentioned were under 'cultural boundaries' as compared to 25.40% for MES students), students with work experience (36.07% of excerpts were 'cultural boundaries and 21.31% were 'disciplinary boundaries' as compared to 26.09% and 10.87% respectively for students with no prior work experience) and students with no multi-disciplinary group work experience (43.75% of excerpts were 'cultural boundaries' and 31.25% were 'disciplinary boundaries' as compared to 27.66% and 13.83% respectively for students with previous multi-disciplinary group work experiences).

Table 19. Distribution of the amount of reported boundaries as a percentage of all reported excerpts for the question of 'Did you encounter any boundaries in the EUW?' collected from the open-ended questions that were in the post-test questionnaire, divided according to various groups of students. The observable and notable differences in amount of excerpts for a particular type of boundary are highlighted in yellow.

BOUNDARIES ENCOUNTERED	#	Type of *boundary* mentioned				
		Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries
EUW Groupings Total (114 Excerpts)	100.00	7.89	29.82	16.67	0.88	44.74
EUW Algarve	19.30	0.00	31.82	27.27	0.00	40.91
EUW Brno	21.93	4.00	24.00	12.00	0.00	60.00

EUW Malta	31.58	13.89	33.33	11.11	2.78	38.89
EUW Porto	27.19	9.68	29.03	19.35	0.00	41.94
Dutch/Non-Dutch Total (109 Excerpts)	100.00	8.26	31.19	17.43	0.92	42.20
Dutch	31.58	10.81	32.43	8.11	0.00	48.65
Non-Dutch	27.19	6.94	30.56	22.22	1.39	38.89
MES/Non-MES Total (109 Excerpts)	100.00	8.26	31.19	17.43	0.92	42.20
MES	57.80	12.70	25.40	14.29	1.59	46.03
Non-MES	42.20	2.17	39.13	21.74	0.00	36.96
Work Experience Total (107 Excerpts)	100.00	8.41	31.78	16.82	0.93	42.06
No Work Experience	42.99	8.70	26.09	10.87	2.17	52.17
Work experience	57.01	8.20	36.07	21.31	0.00	34.43
Multi-disciplinary Group Work Experience Total (110 Excerpts)	100.00	8.18	30.00	16.36	0.00	45.45
No MDGW experience	14.55	6.25	43.75	31.25	0.00	18.75
Yes MDGW experience	85.45	8.51	27.66	13.83	0.00	50.00

3.2.3 Comparison between pre- and post-test questionnaire

In order to compare the qualitative data between the pre- and post-test questionnaires, the results from the qualitative coding has been put together in Table 20. There were no drastic changes that can be observed, especially when just comparing the parts on 'Boundaries in relation to the EUW', 'Potential boundaries' and 'Boundaries encountered'. It is consistent in the pre- and post-test that a large part of the boundaries that students faced were mostly 'other boundaries'. Similarly, for the boundaries identified by coordinators (i.e. cultural, disciplinary and academia-society boundaries), it is also consistent that the students highlight 'cultural boundaries' the most, followed by 'disciplinary boundaries' and 'academia-society boundaries'.

Table 20. Amount of reported boundaries as a percentage of all reported excerpts collected from the open-ended questions that were in both the pre-test and post-test questionnaire.

Category	Question in the questionnaire	Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries	Total
(Pre-test) Motivations	What are your motivations to participate in the EUW? (272 Excerpts)	65.81	4.41	5.88	11.40	12.50	100.00
(Pre-test) Learning Expectations	What do you expect to learn from the EUW? (268 Excerpts)	63.43	2.99	5.97	11.94	15.67	100.00
(Pre-test) Boundaries in relation to EUW	What do you think is meant by the term *boundaries* in relation to the EUW? (177 Excerpts)	8.47	18.64	18.64	5.65	48.59	100.00
(Pre-test) Potential Boundaries	What are some potential boundaries that you foresee that you will encounter during the EUW? (173 Excerpts)	5.20	20.81	17.34	2.31	54.34	100.00
(Post-test) Boundaries Encountered	Did you encounter any boundaries in the EUW? (114 Excerpts)	7.89	29.82	16.67	0.88	44.74	100.00

3.3 Comparison between quantitative & qualitative data

Having studied the quantitative and qualitative data separately, the next thing to do was to study the results of both the qualitative and quantitative analysis together, to see if results of the analysis could support and reinforce each other. However, there was no statistical method that was used to do this analysis, except to observe by looking at the results of the analysis of the qualitative and quantitative data. As such, there are no results to be included in this section, but the comparison between the quantitative and qualitative data will be discussed in the next chapter.

4 Discussion

The aim of this paper is to investigate if the European Workshop has an influence on students' boundary crossing awareness in order to help inform the future design of transdisciplinary courses/projects. In order to achieve the aim, the research questions were formulated to assess students' boundary crossing awareness at two moments in time – one prior to the start of the EUW, and again at the end of the course. However due to time limitations, the post-test was conducted after five weeks of the EUW. Both a quantitative and qualitative approach were used to assess the levels of awareness of boundary crossing. This was done through operationalising 'awareness of boundary crossing' and developing statements to determine students' awareness levels. Open-ended questions were also included to allow for qualitative analyses. These two approaches were used to help get a better insight into students' awareness levels and perception of 'boundary crossing' in order to see how it can help inform the future design of transdisciplinary courses/projects.

The results in the previous chapter have answered the research questions and gave insight into students' levels of awareness prior to the start of the workshop and after five weeks of the EUW. This discussion chapter serves to put the results into context and to see if the EUW has an influence on students' boundary crossing awareness. This chapter is organized in four main sections, with three of these sections discussing the results from both the quantitative and qualitative analysis and its implications and discrepancies (if any) and another section which will reflect upon the limitations of the research project.

4.1 Discussion of quantitative results

While looking at the results of the pre- and post-test analysis of the quantitative data, it shows that 'Recognition of relevance and value to cross boundaries' and 'Willingness to cross boundaries' have the two highest mean scores, which is good because it means that students recognise the relevance and value to cross boundaries, and also have the willingness to cross the boundaries prior to the start, as well as after five weeks of the European Workshop (EUW). It can also be said that there is indeed some sort of awareness of boundary crossing in students as the mean scores of the various scales (not including 'Teacher support required') are all above 2.00 (4.00 being the maximum score). This could be attributed to the fact that these students have undergone almost an entire year of studies at Wageningen University & Research (WUR) and have been introduced to boundaries and boundary crossing in one way or another. On the other hand, 'Teacher support required' recorded the lowest mean scores in both the pre- and post-test analysis, as well as the greatest difference between the maximum and minimum scores for the pre-test. The low mean score for 'Teacher support required' could be attributed to the fact that at the start of the course, students were already informed that there will be minimal teacher support and that they had to take charge of their own learning processes. This might have triggered students to not depend too much on the teachers, but rather on themselves and fellow teammates for their learning and personal growth. Furthermore, the results from the pre-test and post-test showed that students maintained that they do not require teacher support at the start of the EUW, as well as after five weeks of the EUW. However, this particular scale of 'Teacher support required' also recorded the biggest difference between the minimum and maximum mean scores (and also the biggest standard deviation), which translates to the fact that students all different and themselves have differing points of view with regards to their need for teacher support.

The bivariate analyses also gave an insight into how the various scales relate to each other and the potential areas to work with to increase students' levels of awareness of boundary crossing. From the pre-test questionnaire, the positive correlation between 'Recognition of relevance and value to cross the boundaries' with 'Willingness to cross boundaries' showed that the higher the students recognised the relevance and value to cross boundaries, the more willing they are to cross the boundaries. This, coupled with the fact that the scales of 'Recognition of relevance and values to cross the boundaries' and 'Willingness to cross boundaries' have the two highest mean scores, shows that students recognise the relevance and value to cross boundaries and are indeed willing to cross boundaries. Secondly, the positive correlation between 'Willingness to cross boundaries' and students' 'Perceived capability to cross boundaries' also means that there is a positive linear relationship between these two scales. While it cannot be concluded which variable(s) is the cause or effect in the correlations, following a logical reasoning, it could be useful to work on helping students recognise the relevance and value to cross boundaries as well as their perceived capabilities to cross boundaries and this could stimulate students' willingness to cross boundaries.

However, it is interesting to note that in the bivariate analyses of the post-test data, there was actually a change in the direction of the relationship between 'Perceived capability to cross boundaries' and 'Teacher support required'. The correlation was negative in the pre-test and in the post-test analysis, the correlation became positive. This means that students' reported perceived capability to cross boundaries is positively affected with the need for teacher support in crossing boundaries. Following a logical flow of reasoning, it could mean that after five weeks of the European Workshop, students realise that they would need teacher support to guide them in crossing boundaries, which shows that the course teachers have a part to play in guiding students to cross boundaries. However, the results from the descriptive statistics seem to contradict this as there was actually a decrease in the mean scores of the 'Teacher support required' scale. But at the time of writing this report, there is not yet a possible explanation for this.

Next, when the results from the pre-test and post-test were put side by side, a negative trend was observed between the mean scores for each of the various scales, with the exception of 'Awareness of boundaries'. But upon closer inspection, the difference is actually quite small with the exception of 'Teacher support required' and 'Perceived capability to cross boundaries' recording a significant difference. However, while the growth rates are mostly negative, this does not necessarily mean that students' awareness levels dropped from pre-test to post-test. A plausible reasoning behind this could be the Dunning-Kruger effect in play, which posits that individuals tend to overestimate their knowledge about concepts that they are not too familiar with (Kruger & Dunning, 1999; Plohl & Musil, 2018), hence the higher mean scores in the pre-test. However, after having gone through the EUW, they have a better understanding of boundaries and 'crossing boundaries', thus resulting in lower mean scores. This, in a roundabout way actually signifies that the students' awareness levels of boundary crossing have increased. This shows that the EUW does actually have an influence on students' levels of awareness towards boundary crossing.

Following the study of the pre-test and post-test results for the entire group as a whole, a further investigation was carried out to look into the scales in greater detail. The respondents were divided into smaller groups to see if there were any trends that could be explained by the different groupings. When the comparisons were done on the smaller groups, there was quite a number of groups that recorded significant differences. However, as this author was not present at any of the EUW or fieldwork that took place, it is not really possible to make any real conclusions on the possible reasoning(s) behind various results as there could be many different factors that are in play and contributing to the situation. Thus only a few significant results will be discussed in the next paragraph and possible reasons will be speculated.

In the scale for 'Awareness of boundaries' there was a significant increase recorded for the mean scores of non-Dutch students as well as those with no work experience. These are positive results as it means that the EUW had an influence on this particular scale in making students more aware of boundaries. For 'Recognition of relevance and value to cross boundaries', there were three groups (EUW Algarve, Non-Dutch students, and Non-MES students) that recorded significant differences between the pre- and post-test results. All these three groups actually had a negative growth from pre- to post-test. This could perhaps be due to some negative experiences that the students encountered during the EUW, which might have led to the decline in the 'Recognition of relevance and value to cross boundaries'. In 'Willingness to cross boundaries', only the EUW Malta group had a significant increase in this particular scale. This is a positive result, however, it is not possible to pin-point exactly what might have led to the increase in willingness as it could be due to a wide array of different factors i.e. different attitudes and personalities of people in the group, teamwork etc. For 'Perceived capability to cross boundaries', all the different groups recorded a negative growth from pre-test to post-test. This could be attributed to the fact that at the start of the workshop, students might have underestimated the potential difficulties of boundaries and boundary crossing or over-estimated their capabilities to cross the boundaries (Dunning-Kruger effect), and only to realise the real difficulty of crossing boundaries or their capabilities of crossing boundaries after having gone through five weeks of the EUW.

4.2 Discussion of qualitative results

The qualitative data from the open-ended questions provided an avenue for students to express their thoughts about boundaries. This was useful as it provided some insight into what students perceived as boundaries, which were not possible to capture from the fixed statements that students had to rate on a Likert scale.

From the results of the qualitative data, it could be seen that there were more references made to 'academia-society boundaries' when students were asked about their motivations and learning expectations as compared to when they were asked about boundaries in relation to EUW as well as potential boundaries. This could be due to the fact that as students, they are interested to take part in the EUW as it provides them the opportunity to get involved in a real life consultancy project to experience what is it like to work for a real life commissioner. Furthermore, prior to the start of the EUW, students might not know exactly what to expect while working for an external client and are thus unable to predict/foresee any potential boundaries. Hence, there are more references made to 'academia-society boundaries' in students' motivations and learning expectations than the potential boundaries they foresee experiencing.

Conversely, there were more references made to 'cultural boundaries' and 'disciplinary boundaries' when students were asked about boundaries in relation to EUW as well as potential boundaries, as compared to when they were asked about their motivations and learning expectations. A possible reasoning behind this could be that students are already used to the international diversity that is present in WUR, as well as the fact that their courses mostly have group work which may already require them to work with people from different countries and disciplines. Thus, less references were made to 'cultural boundaries' and 'disciplinary boundaries' for motivation or learning expectations. The abovementioned reasoning is also able to support the fact that more 'cultural boundaries' and 'disciplinary boundaries' references were made - that because students are accustomed to having group work with peers from a different culture and discipline, they are aware of the possible boundaries and able to foresee the potential boundaries that they might encounter in the EUW.

From the results of the analysis of the post-test qualitative data, it was possible to see which are the boundaries that are more apparent (to the students) in the course when the students shared on the boundaries they encountered ('boundaries encountered' in post-test questionnaire). With the exception of the category of 'other boundaries', 'cultural boundaries' and 'disciplinary boundaries' were the next two boundaries where there was quite a bit of excerpts that made reference to them. This could be due to the fact that the students spent majority of the five weeks working with their peers of different nationalities, culture and disciplines and with more time spent working together, it increases the likelihood for certain 'boundaries' to be more apparent.

However, there were way less references made to 'academia-society boundaries'. This could be due to the fact that students were more engaged and concerned with group dynamics within the EUW, than with their interaction with societal partners (various stakeholders, experts in the field or the general public) which was comparatively less and was limited to when students had to conduct interviews and surveys. These meetings with the various societal partners were more of mutual, polite meetings without any real confrontations going on. Furthermore, it could also be possible that because the EUW is after all still an academic course in the University, students do not really see it as really working in the real world and thus mostly focus on the 'internal' boundaries that they might encounter within their own teams or personal boundaries. These reasons all possibly contribute to explain why there were little references made to 'academia-society boundaries' in students' excerpts when they were asked about the boundaries they encountered.

4.3 Comparison between quantitative & qualitative data

For the construction of the survey, the original purpose of having both open-ended questions as well as statements for respondents to rate on a Likert scales was to see if both the qualitative and quantitative data collected from the questionnaires could be used to support or reinforce each other. However, after the analysis of the data collected, it was found that it was difficult to make any real conclusions as to whether the quantitative data could support the qualitative data and vice versa. This is partly due to the fact that both the quantitative and qualitative data looked at different aspects. It was found that the quantitative data showed that there are levels of awareness of boundary crossing in students, while the qualitative data gave insights into what exactly students perceived as boundaries, which a majority reported 'other boundaries' than those boundaries identified by the course coordinators.

4.4 Limitations of the research

While this research project has provided some insight into students' levels of awareness of boundary crossing, there are certain limitations of the project that could have affected the results and these should be noted and taken into consideration

for future research work. The limitations that will be discussed in this section includes limitations of the methodology as well as limitations embedded in the analysis of the data.

4.4.1 Limitations of methodology

Questionnaires as main tool for data collection

One of the limitations was using questionnaires as the tool for data collection. With questionnaires, the questions are fixed and the researcher is only able to get whatever data is written on the paper. This presents a limitation because students might give answers that are on the surface, without going in-depth to explain, thus some of the meaning might have been lost along the way, preventing researchers from seeing the full picture. Furthermore, it also requires some interpretation on the researcher's end to try and understand the message that the respondent is trying to convey. This might result in some misinterpretations or misunderstandings which in turn will affect the validity of the results. However, due to time constraints for this research, questionnaires were chosen as the tool to gather information and data as it allows for a wider reach, to get as many participants' thoughts and opinions in a relatively short period of time (Munn & Drever, 1990). However, even though there is the possibility of misinterpretations and misunderstandings, the questionnaire was useful as it had a high return rate of responses, thus ensuring that many views and opinions were taken into consideration. A possible recommendation for future works would be to organize focus group discussions along with the use of questionnaires. Focus group discussions would enable the researcher to probe and ask further questions to clarify points made by the people involved in the discussions, thus minimizing the chance of misinterpretations.

Self-reporting & subjectivity

Another limitation associated with questionnaires has got to do with self-reporting as well as subjectivity of respondents' opinions. With self-reporting, it is difficult to really know if what they say is true. As with any survey that consists of self-reports, there is some uncertainty embedded within the results as we do not know how truthful the respondents are. In a paper by Flamand, Fritzell, Obale, Quenel, & Raude (2017), it was highlighted that self-reporting could be subjected to social desirability effects – that they report carrying out certain actions as they think that that is what society expects of them. Similarly, in this research, respondents might worry that their responses could be traced back to them and not be as truthful when filling out the survey. However, it is not possible to truly be sure of such results, thus the benefit of the doubt is exercised in this area. Furthermore, with such questionnaires that require respondents to rate statements on a Likert scale, there is always subjectivity involved. For example, a person that fills out "agree" to a certain statement, could actually be what another person fills as "strongly agree". However, this issue of subjectivity is difficult to avoid and is thus something to take note of.

Administration of questionnaires

Thirdly, with regards to the pre-test, there are some concerns that the determination of the awareness of boundary crossing could be affected by when the students actually filled out the survey. As mentioned in Chapter 2.1, there were some questionnaires that were filled out in the second week of the course. The one to two weeks of lectures, plenaries, and working in their various group work might have made them aware of 'boundaries' and affected the way they answered the pre-test questionnaire. Another concern is with regards to the administration of the post-test. Due to time constraints of this research project, the post-test questionnaire was administered when students returned from their respective fieldwork (i.e. after five weeks of the EUW). Ideally, it would be preferred to have the post-test conducted at the end of the workshop, in order to conclude if the EUW really does have an influence on students' levels of awareness of boundary crossing. However, regardless of these concerns, the research project managed to provide some insights into student's awareness of boundary crossing and these limitations could serve as points to note for the administration of questionnaires in any future research.

4.4.2 Limitations in data analysis

Cronbach's alpha

There are also limitations that are in the data analysis process. Firstly, when carrying out questionnaires with various statements to measure a certain aspect of a concept, there is a need to carry out a preliminary test in order to conduct Cronbach's alpha test to check the internal reliability of the statements in the scale. However, due to time constraints of this research project, the Cronbach's alpha was only calculated with the data collected from the pre-test. Fortunately, most of the Cronbach's alpha was in the acceptable range ($\alpha > 0.700$), except for 'Awareness of boundaries' ($\alpha = .616$), which was not

too far from the acceptable range. Thus, if this questionnaire would be used in the future, the researcher(s) should look into the statements under 'Awareness of boundaries' and consider changing some of the statements in order to ensure that the internal consistency of the scale is of an acceptable range.

Coding of qualitative data

Secondly, there are limitations that come with the coding of qualitative data. Similar to the limitations mentioned in the methodology, having open-ended questions allow for respondents to share more of their thoughts that quantitative data might not have been able to capture. However, as this is a questionnaire, there is no interaction between the researcher and respondents. While there was an interrater reliability exercise carried out, it was only done for a small sample and the rest of the qualitative coding done based on the researcher's interpretations of the excerpts made by the respondents, thus there could be some misinterpretations along the way. To overcome this, it would be good to have a second person to code the entire list of excerpts as well, to ensure the reliability of the coding of the excerpts. However, despite this limitation, having the open-ended questions provided insights into the kinds of boundaries that students are concerned with, which would have been impossible with just rating the various statements on a Likert scale.

Another limitation in the aspect of the coding of qualitative data is that there could be some excerpts that got neglected in the process of coding. For example, some excerpts from respondents' that mentioned wanting 'to learn how to work in big groups' or 'communication skills' at first glance does not fall into any of the categories of boundaries that was identified (i.e. cultural, disciplinary, or academia-society) as it is too general and vague. However, it could be that the student wanted to learn how to communicate with people from different cultures/disciplines/walks of life, but this was not well-expressed in their answers and hence being coded as 'other boundaries' or 'not a boundary'. As such, there is definitely more room for improvement and further deciphering of the excerpts in this coding exercise.

Assessing 'boundary crossing' awareness

The quantitative assessment of awareness of boundaries and boundary crossing is very complicated. The statements were formulated based on the rubrics as well as with the 'cultural boundaries', 'disciplinary boundaries' and 'academia-society boundaries' in mind. Students were then assessed based on the scores that we attached to the various options. While this served its purpose to investigate students' levels of awareness of boundaries and boundary crossing, there are some doubts as to the formulation and assignment of scores during the process of data clean-up and analysis. For example, respondents were given a high score if they disagreed with the statement of 'I hardly ever observe people having difficulty communicating with people from different disciplines". The high score would translate into the respondents having an awareness of boundaries. However, the statement is very general and not very specific. It did not state what context it is in, and it could be everyday lives of the students. There is a possibility that in a respondents' circle of friends, they might have friends from different disciplines but there is no difficulty in communication. Thus, there are many different factors that come into play and might affect the way students pick their responses and it might make it difficult to deduce for sure that the statements and scales does indeed measure what they are supposed to, even if the Cronbach's alpha deems it of an acceptable range. Furthermore, as this is a first study in trying to assess awareness levels towards boundary crossing, there are not much literature to draw parallels (or non-parallels) with. However, despite these limitations, this research and questionnaire is the first attempt to operationalise and investigate the levels of awareness towards boundary crossing, hence there is always room for improvement for the questionnaire and future research to be carried out.

5 Conclusion & Recommendations

Having studied the data and results of the analysis of the data collected from the pre- and post-test questionnaires, it can be seen that the EUW has some sort of an influence on students' levels of awareness of boundaries and boundary crossing. The quantitative results have shown that students are aware of boundaries, recognise the relevance and value to cross boundaries and have also reported to be willing and able to cross boundaries. Even though the growth in the various scales were negative, it also signals indirectly that students' levels of awareness might have improved, as they are more aware of the boundaries and crossing boundaries. Furthermore, from the bivariate analysis of the post-test, the positive significant correlation between perceived capability and the need for teacher support, hints that students would need teacher support to help them cross boundaries. This is in line with a research done by Fortuin & van Koppen (2016), where it was mentioned having "learning activities that involve interdisciplinary and transdisciplinary projects", together with "intensive group interaction" with people of different cultures and disciplines "contributes to a positive attitude or habitus to crossing boundaries". However, the paper also goes on to say that such experiences in a course alone is insufficient to enhance boundary crossing competences. Students also require "theoretical training and they need to be stimulated to reflect" (Fortuin & van Koppen, 2016). Thus, teacher support is definitely crucial in the process of raising awareness and eventually helping to cultivate boundary crossing skills in students.

On the other hand, the qualitative data showed that a majority of the boundaries that students encounter do not fall under the same boundaries that the course coordinators had in mind. This shows that students are aware of boundaries, but they mostly think about personal boundaries (e.g. comfort zones), physical boundaries (e.g. borders of a country, boundaries of their research area) or project boundaries (e.g. time and budget, scope of research), rather than 'cultural boundaries', 'disciplinary boundaries' and/or 'academia-society boundaries' that the course coordinators had in mind. Thus, knowing this information also helps to inform course coordinators what students actually think about boundaries and boundary crossing, and how to better align their delivery or materials to raise students' awareness towards boundary crossing.

While the results have shown that the EUW does indeed have an influence on students' levels of awareness of boundary crossing, there is still room for further improvement to work on improving the course, as well as to better prepare students to cross boundaries. As such, the following recommendations are suggestions for course coordinators and researchers to consider for any future improvements or research that will be carried out:

Recommendations for future European Workshops

With the results of this project, course coordinators will have a better insight into students' levels of awareness of boundary crossing as well as what students typically perceive boundaries to be. With this information, course coordinators will know that students' perception of boundaries is different from what was identified for the course. As such, to improve students' awareness levels towards boundary crossing and eventually build enhance their boundary crossing competences, there should be more attention being given to target and get students to recognise the three boundaries of cultural, disciplinary as well as academia-society boundaries. This can be done in several ways. Firstly, when briefings are given to introduce the European Workshop at the Academic Masters Cluster talk, the presenter should list these boundaries and make it known to the students that the EUW aims to make students aware of 'boundaries' as well as cultivate and enhance their 'boundary crossing' competences. Secondly, teachers should mention these boundaries during the course of the workshop and encourage students to actively reflect on them, as well as provide teacher support where possible.

Recommendations for future research

Taking into consideration the limitations of this particular research (Chapter 4.4), there are a few recommendations that can be made for future research into students' levels of awareness of boundary crossing:

Data collection methods

For the methodology of data collection, future researchers can consider conducting focus group discussions alongside the use of the questionnaires. This will enable researchers the chance to ask questions to the participants and have the chance to probe for and clarify information when unsure or if responses are vague. Researchers will then be able to get a clearer picture and a better understanding of participants' responses on their perception of boundaries and awareness of boundary crossing.

Improving the questionnaire as a tool

With regards to the instrument used for data collection, future researchers should look into improving the questionnaire as a tool. Due to time constraints for this research, the questionnaire was developed rather quickly and there was no time to test and analyse the results before the actual administration of the questionnaires. Researchers can look into the various scales and statements, as well as the results of the Cronbach's alpha carried out in this project, to see which statements can be improved or removed and the possibility of including new statements to the various scales.

More in-depth qualitative data analysis

Researchers can consider creating more codes for the qualitative analysis of the collected data. For example, excerpts that are related to 'working in a big group' and 'communication' are currently being categorised as 'other boundaries'. However, excerpts such as these could actually also be referring to the boundaries as identified by course coordinators, just that these are not too specific. As such, it would be interesting if more codes could be made to see the other boundaries that students most often perceive as boundaries.

Repeating this experiment with future EUW students

Researchers can consider repeating this experiment with the next group of EUW students, to see if the results would be similar or different. Testing it on another group of students could also provide new insights as well as enable comparison with the results from this experiment, to see if any conclusions can be drawn from it.

Other research

Finally, other research can also be carried out to see if students actually perceive the boundaries identified by the course coordinators (i.e. cultural, disciplinary and academia-society boundaries) to be boundaries. This is pertinent as if students do not perceive the presence of such boundaries in the first place, then there needs to be a different approach taken to educate and raise awareness in students to the existence of boundaries.

In conclusion, as there are many aspects of 'awareness of boundary crossing', it is difficult to actually have an instrument that can holistically measure levels of awareness. Furthermore, the fact that there are many different variables and factors in play that could affect the results of this study and makes it difficult to pinpoint an exact reason for certain results, makes it even more challenging in this quest to study awareness levels of boundary crossing. As with all (relatively) new concepts such as 'boundary crossing', there are definitely boundaries that needs to be crossed in order to explore further to have a better insight and understanding of this particular concept. Nevertheless, this research project provides the stepping stone for future research into better understanding how individuals perceive boundaries and boundary crossing. This will no doubt be useful information for educators in the design of courses and learning activities in order to develop students' boundary crossing competences and prepare them for the boundaries they have to cross in their future careers and in life.

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Appendix A – Boundary Crossing Rubric

Boundary crossing rubric to support inter- and transdisciplinary learning in an intercultural setting by Karen Fortuin, Carla Oonk and Judith Gulikers

	D **The student...**	**C** **The student...**	**B** **The student...**	**A** **The student...**
Identification 1: Identify one's own expertise and one's own limitations	Does not explicate which expertise (s)he possesses and which expertise might be missing to execute the project successfully.	explicates his/her own expertise in terms of knowledge, skills and network that can contribute to the project.	previous cell + identifies his/her own limitations regarding expertise needed to execute the project.	relates his/her own expertise to that of the other members of the project team and maps what kind of expertise is missing to execute the project successfully.
Identification 2: Identify other perspectives relevant for the project and problem at hand	does not actively explore other perspectives.	shows being aware of the existence of various perspectives, but does not explicitly address these different perspectives in the light of the project.	identifies people including their interests, perspectives, expertise and mutual relations relevant for executing the project.	Previous cell + the student explicates for which aspects of the project he/she needs other people and plans actions to contact these other people.
Coordination 1: Contact other people	does not take any action to contact other people or does take action, but only because it is a requirement of the course.	contacts a small number of other people that are close to the problem and easy to address (e.g. given by the teachers). prefers to contact external people in a digital way.	develops active and face to face contact with relevant other people.	initiates and organises collaborative meetings with relevant other people with the intention to collaboratively share ideas, develop new ideas and tune own ideas.
Coordination 2: Collaborate purposefully with other people	does not actively and purposefully collaborate with other people or is merely frustrated by the challenges that emerge in this collaboration.	carries out activities to discuss a limited number of other perspectives, closely related to his/her own background.	aims at purposeful collaborations with various relevant people to the project. Discovers and /or contributes to the development of a boundary object (BO) relevant for people involved to facilitate collaboration for executing the project.	Previous cell + uses the BO actively to accommodate multi-, inter- or transdisciplinary collaboration and checks whether everybody really contributes to the project. If not, (s)he takes action.

	D **The student...**	**C** **The student...**	**B** **The student...**	**A** **The student...**
Perspective making and learning from each other 1: (Re)consider perspectives	considers the project purely from his/her own perspective and interest	shows limited openness to other perspectives that are relevant for the project and / or, considers the input from other perspectives mainly for his/her own benefit (i.e. what can I use from you?)	actively explicates and/or discusses various perspectives that are relevant for the project and searches for ways to combine perspectives (i.e. how can the different perspectives contribute to and strengthen the project)	Previous cell + explicates how other perspectives influenced his/her own perspective on the project.
Perspective making and learning from each other 2: Learn from other people	merely aims to complete the project, not to learn from other people (i.e. shows no learning attitude at all)	Reflects on own learning process and development in an ad hoc fashion and is able to explicate these.	explicitly shows (the willingness) to learn from other people during the project.	actively searches for ways to learn from others and purposefully develop him/herself.
Perspective making and learning from each other 3: Stimulate others to learn (general)	shows no actions in stimulating other people to learn from each other.	reflects with team members on each other's role, contribution and development during the project, but does not actively transfer the results of these reflections into improved performance of other people during the projects.	initiates reflective actions between people involved in the project aimed at learning from the project (both process and content wise).	Previous cell + actively encourages other people's learning in the light of the project.

	D **The student...**	**C** **The student...**	**B** **The student...**	**A** **The student...**
Transformation 1 (start) Intend to develop a new, sustainable practice	shows an attitude of conducting the project for the sole purpose of passing the course	shows an attitude to want to develop a project result that serves a limited amount of perspectives	shows an attitude to want to develop a project result that serves multiple perspectives	Previous cell + shows an attitude of wanting to deliver a project result that is innovative or inspiring innovation
Transformation 2 (process) Envision new practices during project process	has difficulty and/or shows no interest to think out-of-the-box. Sticks to mainly traditional or obvious solutions	tries to include innovative elements in traditional solutions	shows out-of-the-box thinking serving multiple perspectives through weighing pros and cons of various possible solutions	Previous cell + clarifies a vision for the new to be developed practice, i.e. is able to explicate how the new practice would look like, how it functions and what needs to be done to realise this new practice
Transformation 3 (product) Integrate various perspectives, interests or expertise in a final product	shows merely a compilation of insights of students involved in the final project. Does not explicate the integration of multiple perspectives, interests or expertise	shows how own ideas and those of other students are integrated in the final product. Shows some insights in how other perspectives are integrated and how realistic the final product is in practice	shows convincingly how (s)he weighted multiple perspectives and interests in the final product, and considers its practical as well as its innovative character.	Previous cell + clearly explicates how to effectively inform other external people involved about the outcome of the final product
Transformation 4 (follow-up) Stimulate a follow-up on project results	finishes the project for school and shows no interests in follow-up activities	finishes the project and mentions a few options for follow-up activities	finishes the project, explicates how it can be implemented in practice and which steps need to be taken to do so.	Previous cell + shows enthusiasm and effort to be actively involved in follow-up activities

Appendix B – Pre-test Questionnaire & Post-test Questionnaire

(PRE-TEST) Awareness of Boundary Crossing Survey
File name: "GENERIC OUTPUT 30 MAY.SPV FILE"

Key:
- Original document of the survey is in black.
- Numbers in parenthesis in black, is the output variable in the SPSS export from Qualtrics
- Statistics computed on SPSS are included into this survey in **red**, e.g. **[A, B%]**, where A is the count of respondents and B is the percentage of the total
- For questions where a score is tabulated for the category, the scores assigned are indicated in **blue**, e.g. **[X]**, where X is the score assigned to each option in that sub question

Hello! My name is Cassandra Tho and I am a second year MES student. I am currently working on my minor thesis with the Education and Competence Studies (ECS) chair group. Having gone through the European Workshop (EUW) myself, I am curious to find out more about the boundary crossing aspect of EUW. My thesis is about investigating boundary crossing of students in the European Workshop. As such, I hope that you can spare me **15-20 mins** of your time to help me fill out this online survey.

As my study uses a pre- and post-test design (which means that I would need your help to fill this survey before the start of the EUW and again in a few weeks), **I would like to kindly request that you fill out your student number on the survey.** This will enable me to make comparisons on the data collected during the first and second half of the course. Please be assured that the results of this survey will be kept fully anonymous (to the instructors/teachers of the course) and confidential, and will only be used for the purpose of this thesis. This will in **NO** way affect your grade for the course. (It will only affect my grade! :))

WUR Student Number: _____
(Required to make comparisons with data collected from pre- and post-test)

Q1) What are your motivations to participate in the European Workshop?
(Please mention as many motivations that guided your decision)

Q2) What do you expect to learn from the European Workshop?
(Please mention as many learning expectations as possible)

Q3) What do you think is meant by the term *boundaries* in relation to the European Workshop?

Q4) What are some potential *boundaries* that you foresee that you will encounter during the European Workshop?

Q5) Please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) I am aware of which expertise I can and cannot contribute to a project.	[1]	[2]	[3]	[4]	[MV]
	2, 2.4%	11, 13.1%	40, 47.6%	31, 36.9%	0, 0%
2) I don't expect any difficulties collaborating with stakeholders in the research project. R	[4]	[3]	[2]	[1]	[MV]
	8, 9.5%	47, 56.0%	24, 28.6%	4, 4.8%	1, 1.2%
3) I have difficulty trying to understand concepts that are outside my area of study. R	[4]	[3]	[2]	[1]	[MV]
	6, 7.1%	52, 61.9%	20, 23.8%	6, 7.1%	0, 0%
4) I sometimes feel that there is a cultural gap between myself and other students from other countries.	[1]	[2]	[3]	[4]	[MV]
	5, 6.0%	18, 21.4%	43, 51.2%	16, 19.0%	2, 2.4%
5) I sometimes feel that there is a gap between myself and students from other study disciplines.	[1]	[2]	[3]	[4]	[MV]
	6, 7.1%	26, 31.0%	35, 41.7%	16, 19.0%	1, 1.2%
6) I do not have sufficient knowledge to do the European Workshop project on my own.	[1]	[2]	[3]	[4]	[MV]
	5, 6.0%	26, 31.0%	37, 44.0%	14, 16.7%	2, 2.4%
7) I hardly ever observe people having difficulty communicating with people from different disciplines. R	[4]	[3]	[2]	[1]	[MV]
	7, 8.3%	49, 58.3%	23, 27.4%	4, 4.8%	1, 1.2%
8) I expect that doing a project for a client is similar to doing a project for school. R	[4]	[3]	[2]	[1]	[MV]
	21, 25.0%	45, 53.6%	15, 17.9%	3, 3.6%	0, 0%
9) I do not understand what is meant by boundaries.	[1]	[1]	[1]	[1]	[MV]
	5, 6.0%	50, 59.5%	22, 26.2%	4, 4.8%	3, 3.6%
10) I hardly ever observe people having difficulty communicating with people from different countries. R	[4]	[3]	[2]	[1]	[MV]
	11, 13.1%	52, 61.9%	18, 21.4%	2, 2.4%	1, 1.2%
11) There is no difference between academic and professional practice. R	[4]	[3]	[2]	[1]	[MV]
	29, 34.5%	51, 60.7%	2, 2.4%	1, 1.2%	1, 1.2%

Q6) Please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) The best way to address a complex problem is to work in a multi-disciplinary group. (1MV)	[1] 0, 0%	[2] 3, 3.6%	[3] 41, 49.4%	[4] 34, 41.0%	[MV] 5, 6.0%
2) It is inefficient to take time to understand one another's views in a multi-disciplinary group. (1MV) R	[4] 22, 26.5%	[3] 51, 61.4%	[2] 9, 10.8%	[1] 0, 0%	[MV] 1, 1.2%
3) Having peers from various disciplines provides no additional insights for the project. (1MV) R	[4] 26, 31.3%	[3] 42, 50.6%	[2] 8, 9.6%	[1] 6, 7.2%	[MV] 1, 1.2%
4) Communication is important while working in a big, multi-disciplinary and multi-cultural group. (1MV)	[1] 0, 0%	[2] 0, 0%	[3] 21, 25.3%	[4] 62, 74.7%	[MV] 0, 0%
5) The presence of many different nationalities makes it difficult to arrive at a consensus. (1MV) R	[4] 8, 9.6%	[3] 51, 61.4%	[2] 19, 22.9%	[1] 2, 2.4%	[MV] 3, 3.6%
6) I do not see any value in working with citizens or lay-people who are not educated in the topic of our project. (2MV) R	[4] 26, 31.7%	[3] 53, 64.6%	[2] 2, 2.4%	[1] 0, 0%	[MV] 1, 1.2%
7) As society is facing many complex problems, people from all walks of life need to come together, share their knowledge and views, and collaborate to solve the problem. (1MV)	[1] 0, 0%	[2] 5, 6.0%	[3] 34, 41.0%	[4] 43, 51.8%	[MV] 1, 1.2%
8) I do not like to collaborate with people from other disciplines on a project. (1MV) R	[4] 28, 33.7%	[3] 51, 61.4%	[2] 1, 1.2%	[1] 1, 1.2%	[MV] 2, 2.4%
9) Differences in students' backgrounds adds creativity to the way we approach the problem and find solutions for the client. (1MV)	[1] 0, 0%	[2] 1, 1.2%	[3] 45, 54.2%	[4] 36, 43.4%	[MV] 1, 1.2%
10) Working with people from other disciplines is usually not worth the effort. (1MV) R	[4] 22, 26.5%	[3] 57, 68.7%	[2] 1, 1.2%	[1] 1, 1.2%	[MV] 2, 2.4%
11) I do not see the need to work with people from other countries. (1MV) R	[4] 40, 48.2%	[3] 37, 44.6%	[2] 4, 4.8%	[1] 0, 0%	[MV] 2, 2.4%

Q7) Please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) In this project I have the intention to step out of my comfort zone and try something new. (1MV)	[1] 0, 0%	[2] 6, 7.2%	[3] 54, 65.1%	[4] 22, 26.5%	[MV] 1, 1.2%
2) I like to develop my ability to communicate effectively while working in a big, multi-disciplinary and multi-cultural group. (1MV)	[1] 0, 0%	[2] 3, 3.6%	[3] 43, 51.8%	[4] 37, 44.6%	[MV] 0, 0%
3) I prefer to stick to what I know and use methods that I am familiar with. (2MV) R	[4] 6, 7.2%	[3] 40, 48.2%	[2] 32, 38.6%	[1] 3, 3.6%	[MV] 2, 2.4%
4) I like to learn from my fellow peers. (1MV)	[1] 0, 0%	[2] 0, 0%	[3] 45, 54.2%	[4] 38, 45.8%	[MV] 0, 0%
5) I am willing to set aside my preconceived notions of various cultures and work towards the shared common goal of the project.	[1] 0, 0%	[2] 5, 6.0%	[3] 42, 50.6%	[4] 35, 42.2%	[MV] 1, 1.2%
6) I prefer to only learn about issues related to my own discipline. (1MV) R	[4] 21, 25.3%	[3] 55, 66.3%	[2] 7, 8.4%	[1] 0, 0%	[MV] 0, 0%
7) I signed up for the EUW to be challenged to work in a multi-disciplinary group on a real-life problem offered by a client. (1MV)	[1] 1, 1.2%	[2] 4, 4.8%	[3] 35, 42.2%	[4] 43, 51.8%	[MV] 0, 0%
8) I feel that some of my negative experiences in previous group work/projects will prevent me from being open to others' opinions. (1MV) R	[4] 11, 13.3%	[3] 47, 56.6%	[2] 21, 25.3%	[1] 2, 2.4%	[MV] 2, 2.4%
9) When I have to work in groups, I like to work in a group with as much diversity as possible. (1MV)	[1] 1, 1.2%	[2] 28, 33.7%	[3] 38, 45.8%	[4] 11, 13.3%	[MV] 5, 6.0%
10) As citizens have not really been educated in solving environmental problems, it is better that we do not too intensively include them in the project work. (1MV) R	[4] 21, 25.3%	[3] 52, 62.7%	[2] 7, 8.4%	[1] 1, 1.2%	[MV] 2, 2.4%
11) I am willing to reach out to people whom I have not met before, to collaborate and tap on their expertise for a project. (1MV)	[1] 0, 0%	[2] 4, 4.8%	[3] 57, 68.7%	[4] 22, 26.5%	[MV] 0, 0%
12) I see differences between people as a hurdle in group work. (1MV) R	[4] 8, 9.6%	[3] 37, 44.6%	[2] 28, 33.7%	[1] 5, 6.0%	[MV] 5, 6.0%

Q8) Please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) I am able to contact people whom I do not know, to collaborate on a project. (2MV)	[1] 0, 0%	[2] 6, 7.3%	[3] 57, 69.5%	[4] 18, 22.0%	[MV] 1, 1.2%
2) I find it difficult to step out of my comfort zone and try something new. (2MV) R	[4] 11, 13.4%	[3] 46, 56.1%	[2] 22, 26.8%	[1] 3, 3.7%	[MV] 0, 0%
3) I am able to put myself in the shoes of others and see things from their perspective. (2MV)	[1] 1, 1.2%	[2] 6, 7.3%	[3] 54, 65.9%	[4] 20, 24.4%	[MV] 1, 1.2%
4) Teacher support is crucial to help me work with students from other nationalities. (2MV) **(TS)**	[1] 5, 6.1%	[2] 34, 41.5%	[3] 31, 37.8%	[4] 10, 12.2%	[MV] 2, 2.4%
5) I am able to integrate what I have learnt from school towards achieving the aim of a project for the client. (2MV)	[1] 1, 1.2%	[2] 5, 6.1%	[3] 58, 70.7%	[4] 16, 19.5%	[MV] 2, 2.4%
6) I find it difficult to communicate with people that do not share the same opinions as me. (2MV) R	[4] 8, 9.8%	[3] 53, 64.6%	[2] 18, 22.0%	[1] 2, 2.4%	[MV] 1, 1.2%
7) I am able to explicate my own capabilities at the start of a new project. (2MV)	[1] 1, 1.2%	[2] 17, 20.7%	[3] 53, 64.6%	[4] 9, 11.0%	[MV] 2, 2.4%
8) I find it difficult to explain a concept to someone who knows nothing about the concept/not educated in that discipline. (3MV) R	[4] 6, 7.4%	[3] 44, 54.3%	[2] 27, 33.3%	[1] 3, 3.7%	[MV] 1, 1.2%
9) The EUW teachers should support me to learn from 'the other' in the EUW. (2MV) **(TS)**	[1] 4, 4.9%	[2] 30, 36.6%	[3] 38, 46.3%	[4] 4, 4.9%	[MV] 6, 7.3%
10) I am able to identify knowledge and skills gaps in a project team. (2MV)	[1] 0, 0%	[2] 15, 18.3%	[3] 61, 74.4%	[4] 4, 4.9%	[MV] 2, 2.4%
11) I need teacher guidance to be able to collaborate with external stakeholders. (2MV) **(TS)**	[1] 9, 11.0%	[2] 32, 39.0%	[3] 35, 42.7%	[4] 5, 6.1%	[MV] 1, 1.2%
12) I am able to discuss topics that are outside my study area with peers from a different study program. (2MV)	[1] 0, 0%	[2] 7, 8.5%	[3] 64, 78.0%	[4] 9, 11.0%	[MV] 2, 2.4%
13) I find it difficult to apply what I learnt in school to the real world context. (2MV) R	[4] 7, 8.5%	[3] 53, 64.6%	[2] 19, 23.2%	[1] 1, 1.2%	[MV] 2, 2.4%
14) I will be able to communicate effectively with the client to deliver our findings as well as our plan of action. (2MV)	[1] 1, 1.2%	[2] 9, 11.0%	[3] 61, 74.4%	[4] 6, 7.1%	[MV] 5, 6.0%

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
15) I find it difficult to consider someone else's opinion when I have already formulated my own opinions. (2MV) R	[4] 6, 7.3%	[3] 51, 62.2%	[2] 25, 30.5%	[1] 0, 0%	[MV] 0, 0%
16) Without intensive teacher support, I am not able to work with students from other disciplines. (2MV) **(TS)**	[1] 23, 28.0%	[2] 53, 64.6%	[3] 5, 6.1%	[4] 1, 1.2%	[MV] 0, 0%
17) I am able to take into consideration my peers' perspectives and ideas, integrate them and develop a new idea. (3MV)	[1] 0, 0%	[2] 2, 2.5%	[3] 69, 85.2%	[4] 9, 11.1%	[MV] 1, 1.2%
18) I am able to take into consideration the client's demands and deliver a result that is both satisfactory for my peers and the client. (4MV)	[1] 1, 1.2%	[2] 5, 6.2%	[3] 63, 77.8%	[4] 8, 9.9%	[MV] 4, 4.9%
19) I find it difficult to relate to another person from a different country. (3MV) R	[4] 21, 25.9%	[3] 52, 64.2%	[2] 5, 6.2%	[1] 2, 2.5%	[MV] 1, 1.2%
20) I am able to explicate how to effectively inform lay people on the final outcome of a project. (3MV)	[1] 1, 1.2%	[2] 21, 25.9%	[3] 45, 55.6%	[4] 7, 8.6%	[MV] 7, 8.6%
21) The EUW teachers should make me aware of what it means to work with 'the other' (people with other backgrounds) in the EUW. (3MV) **(TS)**	[1] 6, 7.4%	[2] 37, 45.7%	[3] 28, 34.6%	[4] 4, 4.9%	[MV] 6, 7.4%

Nationality: _____ **Age**:_____

What is your study program? (Please circle)

MAM / MBI / MCL / MEE / MES / MLE / MPS / MUE / Others; Pls specify: _____

Which European Workshop are you participating in? _____

Did you have any working experience prior to starting your masters? Yes / No

Do you have any experience working in a multidisciplinary* group? Yes / No
*Multidisciplinary group means working with others from different study backgrounds

Email address: _____

(Please leave your email address only if you are interested to receive the results of this study)

Do you have any remarks or last comments?

Thank you for your time! :)

(POST-TEST) Awareness of Boundary Crossing Survey

File name: "31 July post-test generic output to include in report (descriptives).SPV FILE"

Key:
- Original document of the survey is in black.
- Numbers in parenthesis in black, is the output variable in the SPSS export from Qualtrics
- Statistics computed on SPSS are included into this survey in **red**, e.g. **[A, B%]**, where A is the count of respondents and B is the percentage of the total
- For questions where a score is tabulated for the category, the scores assigned are indicated in **blue**, e.g. **[X]**, where X is the score assigned to each option in that sub question.

Hello! Thank you for your time previously in filling the "pre-test" survey. As mentioned previously, my study uses a pre- and post-test design. Thus, I am back again, this time, for the post-test survey – to survey your experiences with the EUW, after going through 5 weeks of the workshop. As such, I hope that you can spare me 15-20 mins of your time to help me fill out this survey.

I would like to kindly request that you fill out your student number on the survey. This will enable me to make comparisons on the data collected during the first and second half of the course (no worries if you did not fill out the pre-test, your input is still very much wanted in this post-test!).

Please be assured that the results of this survey will be kept fully anonymous (to the instructors/teachers of the course) and confidential, and will only be used for the purpose of this thesis. This will in NO way affect your grade for the course. Thank you very much in advance! – Cassandra Tho

WUR Student Number: _____
(Required to make comparisons with data collected from pre- and post-test)

Nationality: _____ **Age**: _____

What is your study program? (Please circle)

MAM / MBI / MCL / MEE / MES / MLE / MPS / MUE / Others; Pls specify: _____

Which European Workshop are you participating in? _____

Did you have any working experience prior to starting your masters? Yes / No

Do you have any experience working in a multidisciplinary* group? Yes / No
*Multidisciplinary group means working with others from different study backgrounds

Email address: _____
(Please leave your email address only if you are interested to receive the results of this study)

Q1) Did you encounter any boundaries in the European Workshop? If so, please describe them.

Q2) Having gone through 5 weeks of the EUW, please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) I am aware of which expertise I can and cannot contribute to a project.	[1] 0, 0%	[2] 1, 1.2%	[3] 54, 63.5%	[4] 30, 35.3%	[MV] (0)
2) I don't expect any difficulties collaborating with stakeholders in the research project. (1MV) R	[4] 8, 9.5%	[3] 51, 60.7%	[2] 16, 19.0%	[1] 9, 10.7%	[MV] (1)
3) I have difficulty trying to understand concepts that are outside my area of study. R	[4] 8, 9.4%	[3] 47, 55.3%	[2] 26, 30.6%	[1] 4, 4.7%	[MV] (0)
4) I sometimes feel that there is a cultural gap between myself and other students from other countries.	[1] 1, 1.2%	[2] 12, 14.1	[3] 53, 62.4%	[4] 19, 22.4%	[MV] (0)
5) I sometimes feel that there is a gap between myself and students from other study disciplines.	[1] 2, 2.4%	[2] 20, 23.5%	[3] 53, 62.4%	[4] 10, 11.8%	[MV] (0)
6) I do not have sufficient knowledge to do the European Workshop project on my own.	[1] 11, 12.9%	[2] 36, 42.4%	[3] 29, 34.1%	[4] 9, 10.6%	[MV] (0)
7) I hardly ever observe people having difficulty communicating with people from different disciplines. R	[4] 11, 12.9%	[3] 55, 64.7%	[2] 15, 17.6%	[1] 4, 4.7%	[MV] (0)
8) I expect that doing a project for a client is similar to doing a project for school. (1MV) R	[4] 30, 35.3%	[3] 47, 55.3%	[2] 6, 7.1%	[1] 1, 1.2%	[MV] (0)
9) I do not understand what is meant by boundaries. (1MV) R	[4] 13, 15.5%	[3] 54, 64.3%	[2] 15, 17.9%	[1] 2, 2.4%	[MV] (0)
10) I hardly ever observe people having difficulty communicating with people from different countries. R	[4] 21, 25.0%	[3] 53, 63.1%	[2] 8, 9.5%	[1] 2, 2.4%	[MV] (1)
11) There is no difference between academic and professional practice. (1MV) R	[4] 32, 38.1%	[3] 48, 57.1%	[2] 2, 2.4%	[1] 2, 2.4%	[MV] (0)

Q3) Having gone through 5 weeks of the EUW, please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) The best way to address a complex problem is to work in a multi-disciplinary group. (1MV)	[1] 1, 1.2%	[2] 8, 9.9%	[3] 47, 58.0%	[4] 25, 30.9%	[MV] (3)
2) It is inefficient to take time to understand one another's views in a multi-disciplinary group. R	[4] 18, 21.2%	[3] 56, 65.9%	[2] 7, 8.2%	[1] 4, 4.7%	[MV] (0)
3) Having peers from various disciplines provides no additional insights for the project. R	[4] 26, 30.6%	[3] 53, 62.4%	[2] 4, 4.7%	[1] 2, 2.4%	[MV] (0)
4) Communication is important while working in a big, multi-disciplinary and multi-cultural group. (1MV)	[1] 0, 0%	[2] 1, 1.2%	[3] 15, 18.5%	[4] 65, 80.2%	[MV] (4)
5) The presence of many different nationalities makes it difficult to arrive at a consensus. (1MV) R	[4] 8, 9.4%	[3] 43, 50.6%	[2] 29, 34.1%	[1] 5, 5.9%	[MV] (0)
6) I do not see any value in working with citizens or lay-people who are not educated in the topic of our project. R	[4] 33, 39.3%	[3] 49, 58.3%	[2] 2, 2.4%	[1] 0, 0.0%	[MV] (1)
7) As society is facing many complex problems, people from all walks of life need to come together, share their knowledge and views, and collaborate to solve the problem.	[1] 1, 1.2%	[2] 2, 2.4%	[3] 45, 53.6%	[4] 36, 42.9%	[MV] (1)
8) I do not like to collaborate with people from other disciplines on a project. R	[4] 31, 36.5%	[3] 50, 58.8%	[2] 1, 1.2%	[1] 3, 3.5%	[MV] (0)
9) Differences in students' backgrounds adds creativity to the way we approach the problem and find solutions for the client. (1MV)	[1] 0, 0%	[2] 4, 4.8%	[3] 48, 57.8%	[4] 31, 37.3%	[MV] (1)
10) Working with people from other disciplines is usually not worth the effort. R	[4] 26, 31.3%	[3] 55, 66.3%	[2] 2, 2.4%	[1] 34, 41.0%	[MV] (2)
11) I do not see the need to work with people from other countries. R	[4] 43, 50.6%	[3] 35, 42.2%	[2] 5, 6.0%	[1] 0, 0%	[MV] (2)

Q4) Having gone through 5 weeks of the EUW, please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) In this project I have the intention to step out of my comfort zone and try something new. (1MV)	[1] 0, 0%	[2] 5, 6.0%	[3] 47, 56.0%	[4] 32, 38.1%	[MV] (0)
2) I like to develop my ability to communicate effectively while working in a big, multi-disciplinary and multi-cultural group. (1MV)	[1] 0, 0%	[2] 0, 0%	[3] 43, 51.8%	[4] 40, 48.2%	[MV] (1)
3) I prefer to stick to what I know and use methods that I am familiar with. (1MV) R	[4] 7, 8.2%	[3] 46, 56.8%	[2] 27, 33.3%	[1] 1, 1.2%	[MV] (3)
4) I like to learn from my fellow peers. (1MV)	[1] 0, 0%	[2] 2, 2.5%	[3] 46, 56.8%	[4] 33, 40.7%	[MV] (3)
5) I am willing to set aside my preconceived notions of various cultures and work towards the shared common goal of the project. (1MV)	[1] 0, 0%	[2] 2, 2.4%	[3] 55, 65.5%	[4] 27, 31.8%	[MV] (0)
6) I prefer to only learn about issues related to my own discipline. (1MV) R	[4] 28, 33.7%	[3] 44, 53.0%	[2] 8, 9.6%	[1] 3, 3.6%	[MV] (1)
7) I signed up for the EUW to be challenged to work in a multi-disciplinary group on a real-life problem offered by a client. (1MV)	[1] 1, 1.2%	[2] 5, 6.0%	[3] 38, 45.8%	[4] 39, 47.0%	[MV] (1)
8) I feel that some of my negative experiences in previous group work/projects will prevent me from being open to others' opinions. (1MV) R	[4] 9, 11.1%	[3] 42, 51.9%	[2] 25, 30.9%	[1] 5, 6.2%	[MV] (3)
9) When I have to work in groups, I like to work in a group with as much diversity as possible. (2MV)	[1] 4, 5.3%	[2] 25, 32.9%	[3] 34, 44.7%	[4] 13, 17.1%	[MV] (7)
10) As citizens have not really been educated in solving environmental problems, it is better that we do not too intensively include them in the project work. (1MV) R	[4] 28, 34.6%	[3] 42, 51.9%	[2] 10, 12.3%	[1] 1, 1.2%	[MV] (3)
11) I am willing to reach out to people whom I have not met before, to collaborate and tap on their expertise for a project. (1MV)	[1] 0, 0%	[2] 4, 4.8%	[3] 48, 57.8%	[4] 31, 37.3%	[MV] (1)
12) I see differences between people as a hurdle in group work. (1MV) R	[4] 5, 6.3%	[3] 32, 40.5%	[2] 35, 44.3%	[1] 7, 8.9%	[MV] (5)

Q5) Having gone through 5 weeks of the EUW, please rate the extent to which you agree/disagree to the following statements:

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
1) I am able to contact people whom I do not know, to collaborate on a project. (1MV)	[1] 0, 0%	[2] 13, 15.7%	[3] 44, 53.0%	[4] 26, 31.3%	[MV] (1)
2) I find it difficult to step out of my comfort zone and try something new. (1MV) R	[4] 8, 9.5%	[3] 50, 59.5%	[2] 25, 29.8%	[1] 1, 1.2%	[MV] (0)
3) I am able to put myself in the shoes of others and see things from their perspective. (2MV)	[1] 0, 0%	[2] 4, 4.9%	[3] 64, 79.0%	[4] 13, 16.0%	[MV] (2)
4) Teacher support is crucial to help me work with students from other nationalities. (2MV) **(TS)**	[1] 9, 11.3%	[2] 36, 45.0%	[3] 24, 30.0%	[4] 11, 13.8%	[MV] (3)
5) I am able to integrate what I have learnt from school towards achieving the aim of a project for the client. (1MV)	[1] 0, 0%	[2] 7, 8.6%	[3] 57, 70.4%	[4] 17, 21.0%	[MV] (3)
6) I find it difficult to communicate with people that do not share the same opinions as me. (2MV) R	[4] 8, 9.8%	[3] 46, 56.1%	[2] 24, 29.3%	[1] 4, 4.9%	[MV] (1)
7) I am able to explicate my own capabilities at the start of a new project. (1MV)	[1] 1, 1.2%	[2] 14, 16.9%	[3] 64, 77.1%	[4] 4, 4.8%	[MV] (1)
8) I find it difficult to explain a concept to someone who knows nothing about the concept/not educated in that discipline. (2MV) R	[4] 6, 7.2%	[3] 51, 61.4%	[2] 22, 26.5%	[1] 4, 4.8%	[MV] (0)
9) The EUW teachers should support me to learn from 'the other' in the EUW. (1MV) **(TS)**	[1] 4, 5.1%	[2] 32, 40.5%	[3] 39, 49.4%	[4] 4, 5.1%	[MV] (5)
10) I am able to identify knowledge and skills gaps in a project team. (1MV)	[1] 0, 0%	[2] 11, 13.4%	[3] 65, 79.3%	[4] 6, 7.3%	[MV] (2)
11) I need teacher guidance to be able to collaborate with external stakeholders. (2MV) **(TS)**	[1] 13, 16.0%	[2] 44, 54.3%	[3] 22, 27.2%	[4] 2, 2.5%	[MV] (2)
12) I am able to discuss topics that are outside my study area with peers from a different study program. (2MV)	[1] 0, 0%	[2] 10, 12.2%	[3] 62, 75.6%	[4] 10, 12.2%	[MV] (1)
13) I find it difficult to apply what I learnt in school to the real world context. (1MV) R	[4] 11, 13.3%	[3] 58, 69.9%	[2] 14, 16.9%	[1] 0, 0%	[MV] (1)
14) I will be able to communicate effectively with the client to deliver our findings as well as our plan of action. (2MV)	[1] 0, 0%	[2] 11, 13.8%	[3] 57, 71.3%	[4] 12, 15.0%	[MV] (3)

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
15) I find it difficult to consider someone else's opinion when I have already formulated my own opinions. (1MV) R	[4] 3, 3.6%	[3] 53, 63.1%	[2] 26, 31.0%	[1] 2, 2.4%	[MV] (0)
16) Without intensive teacher support, I am not able to work with students from other disciplines. **(TS)**	[1] 28, 33.3%	[2] 52, 61.9%	[3] 4, 4.8%	[4] 0, 0%	[MV] (1)
17) I am able to take into consideration my peers' perspectives and ideas, integrate them and develop a new idea.	[1] 0, 0%	[2] 4, 4.8%	[3] 66, 78.6%	[4] 14, 16.7%	[MV] (1)
18) I am able to take into consideration the client's demands and deliver a result that is both satisfactory for my peers and the client.	[1] 1, 1.2%	[2] 6, 7.4%	[3] 58, 71.6%	[4] 16, 19.8%	[MV] (4)
19) I find it difficult to relate to another person from a different country. R	[4] 23, 27.4%	[3] 46, 54.8%	[2] 14, 16.7%	[1] 1, 1.2%	[MV] (1)
20) I am able to explicate how to effectively inform lay people on the final outcome of a project.	[1] 0, 0%	[2] 15, 18.5%	[3] 56, 69.1%	[4] 10, 12.3%	[MV] (4)
21) The EUW teachers should make me aware of what it means to work with 'the other' (people with other backgrounds) in the EUW. **(TS)**	[1] 9, 10.8%	[2] 36, 43.4%	[3] 33, 39.8%	[4] 5, 6.0%	[MV] (2)

Do you have any remarks or last comments?

Thank you for your time! :)

Appendix C – Results of Cronbach's Alpha Test

Statements under the scale of 'Awareness of Boundaries'

Test # & Statements removed	Cronbach's α
1st test All the statements included, except: 7.9) I do not understand what is meant by boundaries	.495
2nd test Removed: 7.9) I do not understand what is meant by boundaries 7.3) I have difficulty trying to understand concepts that are outside my area of study.	.558
3rd test 7.9) I do not understand what is meant by boundaries 7.3) I have difficulty trying to understand concepts that are outside my area of study 7.1) I am aware of which expertise I can and cannot contribute to a project	.616

Statements included in the calculation of a score for this scale:

7.2) I don't expect any difficulties collaborating with stakeholders in the research project.
7.4) I sometimes feel that there is a cultural gap between myself and other students from other countries.
7.5) I sometimes feel that there is a gap between myself and students from other study disciplines.
7.6) I do not have sufficient knowledge to do the European Workshop project on my own.
7.7) I hardly ever observe people having difficulty communicating with people from different disciplines.
7.8) I expect that doing a project for a client is similar to doing a project for school.
7.10) I hardly ever observe people having difficulty communicating with people from different countries.
7.11) There is no difference between academic and professional practice.

Statements under the scale of 'Recognition of Relevance & Value to cross the Boundaries'

Test # & Statements removed	Cronbach's α
1st test (all the statements included)	.675
2nd test Removed: 8.3) Having peers from various disciplines provides no additional insights for the project	.728
3rd test Removed: 8.3) Having peers from various disciplines provides no additional insights for the project; 8.5) The presence of many different nationalities makes it difficult to arrive at a consensus	.733

Statements included in the calculation of a score for this scale:

8.1) The best way to address a complex problem is to work in a multi-disciplinary group.
8.2) It is inefficient to take time to understand one another's views in a multi-disciplinary group.
8.4) Communication is important while working in a big, multi-disciplinary and multi-cultural group.
8.6) I do not see any value in working with citizens or lay-people who are not educated in the topic of our project.
8.7) As society is facing many complex problems, people from all walks of life need to come together, share their knowledge and views, and collaborate to solve the problem.
8.8) I do not like to collaborate with people from other disciplines on a project.
8.9) Differences in students' backgrounds adds creativity to the way we approach the problem and find solutions for the client.
8.10) Working with people from other disciplines is usually not worth the effort.
8.11) I do not see the need to work with people from other countries.

Statements on Willingness to cross the boundaries

Test # & Statements removed	Cronbach's α
1st test (all the statements included)	.776
2nd test Removed: 9.3) I prefer to stick to what I know and use methods that I am familiar with.	.778

Statements included in the calculation of a score for this scale:

9.1) In this project I have the intention to step out of my comfort zone and try something new.
9.2) I like to develop my ability to communicate effectively while working in a big, multi-disciplinary and multi-cultural group.
9.4) I like to learn from my fellow peers.
9.5) I am willing to set aside my preconceived notions of various cultures and work towards the shared common goal of the project.
9.6) I prefer to only learn about issues related to my own discipline.
9.7) I signed up for the EUW to be challenged to work in a multi-disciplinary group on a real-life problem offered by a client.
9.8) I feel that some of my negative experiences in previous group work/projects will prevent me from being open to others' opinions.
9.9) When I have to work in groups, I like to work in a group with as much diversity as possible.
9.10) As citizens have not really been educated in solving environmental problems, it is better that we do not too intensively include them in the project work.
9.11) I am willing to reach out to people whom I have not met before, to collaborate and tap on their expertise for a project.
9.12) I see differences between people as a hurdle in group work.

Statements on Perceived capability to cross these boundaries

Test # & Statements removed	Cronbach's α
1st test (all the statements included except Teacher-support related questions)	.790
2nd test Removed: 15) I find it difficult to consider someone else's opinion when I have already formulated my own opinions	.798

Statements included in the calculation of a score for this scale:

10.1) I am able to contact people whom I do not know, to collaborate on a project.
10.2) I find it difficult to step out of my comfort zone and try something new.
10.3) I am able to put myself in the shoes of others and see things from their perspective.
10.4) Teacher support is crucial to help me work with students from other nationalities
10.5) I am able to integrate what I have learnt from school towards achieving the aim of a project for the client.
10.6) I find it difficult to communicate with people that do not share the same opinions as me.
10.7) I am able to explicate my own capabilities at the start of a new project.
10.8) I find it difficult to explain a concept to someone who knows nothing about the concept/not educated in that discipline.
10.9) The EUW teachers should support me to learn from 'the other' in the EUW.
10.10) I am able to identify knowledge and skills gaps in a project team.
10.11) I need teacher guidance to be able to collaborate with external stakeholders.
10.12) I am able to discuss topics that are outside my study area with peers from a different study program.

10.13) I find it difficult to apply what I learnt in school to the real world context.
10.14) I will be able to communicate effectively with the client to deliver our findings as well as our plan of action.
10.16) Without intensive teacher support, I am not able to work with students from other disciplines
10.17) I am able to take into consideration my peers' perspectives and ideas, integrate them and develop a new idea.
10.18) I am able to take into consideration the client's demands and deliver a result that is both satisfactory for my peers and the client.
10.19) I find it difficult to relate to another person from a different country.
10.20) I am able to explicate how to effectively inform lay people on the final outcome of a project.
10.21) The EUW teachers should make me aware of what it means to work with 'the other' (people with other backgrounds) in the EUW.

Statements on Teacher Support

Test # & Statements removed	Cronbach's α
1st test (all the statements included)	.818

Statements included in the calculation of a score for this scale:

10.4) Teacher support is crucial to help me work with students from other nationalities
10.9) The EUW teachers should support me to learn from 'the other' in the EUW.
10.11) I need teacher guidance to be able to collaborate with external stakeholders.
10.16) Without intensive teacher support, I am not able to work with students from other disciplines
10.21) The EUW teachers should make me aware of what it means to work with 'the other' (people with other backgrounds) in the EUW.

Appendix D – Comparisons between quantitative data

Note: The results shown in this appendix are based on the data from respondents who filled out both the pre- and post-test questionnaire

AWARENESS OF BOUNDARIES

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Whole Group	2.8628	2.9431	0.0803	No (0.079)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	2.9093	3.0055	0.0962	No (0.393)
Brno	2.8074	2.9118	0.1044	No (0.103)
Malta	2.8827	2.8980	0.0153	No (0.842)
Porto	2.9812	2.9934	0.0122	No (0.852)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Non-Dutch	2.8772	2.9599	0.0827	Yes (0.030)
Dutch	2.9323	2.9211	-0.0112	No (0.873)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
MES	2.8156	2.8816	0.066	No (0.209)
Others	2.9954	3.0259	0.0305	No (0.595)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No work experience	2.8234	2.9175	0.0941	Yes (0.041)
With work experience	2.9808	2.9799	-0.0009	No (0.987)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No MDGW experience	2.797	2.8618	0.0648	No (0.278)
With MDGW experience	2.9342	2.9786	0.0444	No (0.185)

RECOGNITION OF RELEVANCE AND VALUE TO CROSS BOUNDARIES

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Whole Group	3.331	3.2708	-0.0602	No (0.110)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	3.2838	3.1556	-0.1282	Yes (p=0.029)
Brno	3.3662	3.4137	0.0475	No (p=0.543)
Malta	3.3450	3.3381	-0.0069	No (p=0.512)
Porto	3.3199	3.2731	-0.0468	No (p=0.440)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Non-Dutch	3.3539	3.3047	-0.0492	Yes (0.237)
Dutch	3.2921	3.3181	0.026	No (0.587)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
MES	3.277	3.3085	0.0315	No (0.552)
Others	3.4004	3.3104	-0.09	Yes (0.009)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No work experience	3.2745	3.2544	-0.0201	No (0.320)
With work experience	3.3994	3.3729	-0.0265	No (0.403)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No MDGW experience	3.2971	3.2509	-0.0462	No (0.149)
With MDGW experience	3.3458	3.3316	-0.0142	No (0.377)

WILLINGNESS TO CROSS BOUNDARIES

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Whole Group	3.1079	3.1047	-0.0032	No (0.749)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	3.1014	3.1360	0.0346	No (0.729)
Brno	3.1520	3.1820	0.03	No (0.609)
Malta	3.0808	3.1974	0.1166	Yes (0.043)
Porto	3.1316	3.0656	-0.066	No (0.206)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Non-Dutch	3.1348	3.1563	0.0215	No (0.968)
Dutch	3.0881	3.148	0.0599	No (0.251)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
MES	3.0391	3.1024	0.0633	No (0.693)
Others	3.2160	3.2161	0.0001	No (0.999)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No work experience	3.0788	3.0812	0.0024	No (0.783)
With work experience	3.1645	3.237	0.0725	No (0.171)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No MDGW experience	3.1238	3.1266	0.0028	No (0.711)
With MDGW experience	3.1166	3.1637	0.0471	No (0.265)

PERCEIVED CAPABILITY TO CROSS BOUNDARIES

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Whole Group	2.8467	2.2420	-0.6047	Yes (0.000)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	2.6835	2.4615	-0.222	No (0.345)
Brno	2.8292	2.1708	-0.6584	Yes (0.003)
Malta	2.9016	2.0405	-0.8611	Yes (0.000)
Porto	2.9123	2.3746	-0.5377	Yes (0.001)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Non-Dutch	2.8197	2.3756	-0.4441	Yes (0.000)
Dutch	2.8972	1.9917	-0.9055	Yes (0.000)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
MES	2.7404	2.2583	-0.4821	Yes (0.000)
Others	2.9770	2.2220	-0.7550	Yes (0.000)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No work experience	2.7568	2.2149	-0.5419	Yes (0.000)
With work experience	2.9506	2.2734	-0.6772	Yes (0.000)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No MDGW experience	2.8667	2.2000	-0.6667	Yes (0.000)
With MDGW experience	2.8390	2.2580	-0.581	Yes (0.000)

TEACHER SUPPORT

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Whole Group	2.3754	2.1623	-0.2131	Yes (0.001)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Algarve/Faro	2.4577	2.4615	0.0038	No (0.973)
Brno	2.4000	2.0250	-0.375	Yes (0.025)
Malta	2.2095	1.9619	-0.2476	Yes (0.031)
Porto	2.4816	2.2947	-0.1869	Yes (0.137)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
Non-Dutch	2.1083	1.9917	-0.1166	No (0.060)
Dutch	2.5178	2.2533	-0.2645	Yes (0.005)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
MES	2.3895	2.1526	-0.2369	Yes (0.014)
Others	2.3581	2.1742	-0.1839	Yes (0.031)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No work experience	2.3459	2.1946	-0.1513	Yes (0.037)
With work experience	2.4094	2.125	-0.2844	Yes (0.012)

Group	Mean Scores		+/- Difference	Significant? (p value)
	Pre-test	Post-test		
No MDGW experience	2.3868	2.1579	-0.2289	Yes (0.055)
With MDGW experience	2.371	2.164	-0.207	Yes (0.008)

Appendix E - Comparisons between qualitative data

This section consists of tables which shows the distribution of the amount of reported boundaries as a percentage of all reported excerpts for the various open-ended questions collected from the open-ended questions that were in the pre-test questionnaire, divided according to various groups of students.

For the question: What are your motivations to participate in the European Workshop?

MOTIVATION	#	Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries
Total (272 Excerpts)	100.00	65.81	4.41	5.88	11.40	12.50
EUW Algarve	23.53	59.38	4.69	12.5	9.38	14.06
EUW Brno	25.00	67.65	5.88	2.94	11.76	11.76
EUW Malta	26.84	68.49	5.48	2.74	9.59	13.70
EUW Porto	24.63	67.16	1.49	5.97	14.93	10.45
Total (266 Excerpts)	100.00	65.79	4.51	5.64	11.65	12.41
Dutch	37.59	67.00	5.00	6.00	9.00	13.00
Non-Dutch	62.41	65.06	4.22	5.42	13.25	12.05
Total (266 Excerpts)	100.00	65.79	4.51	5.64	11.65	12.41
MES	47.37	73.02	3.97	2.38	10.32	10.32
Non-MES	52.63	59.29	5.00	8.57	12.86	14.29
Total (266 Excerpts)	100.00	65.79	4.51	5.64	11.65	12.41
No work experience	51.50	69.34	4.38	7.30	8.76	10.22
Yes work experience	48.50	62.02	4.65	3.88	14.73	14.73
Total (260 Excerpts)	100.00	65.77	4.23	5.77	11.92	12.31
No MDGW experience	24.23	63.49	4.76	6.35	12.70	12.70
Yes MDGW experience	75.77	66.50	4.06	5.58	11.68	12.18

For the question: What do you expect to learn from the European Workshop?

LEARNING EXPECTATIONS	#	Not a boundary	Cultural boundaries	Disciplinary boundaries	Academia-Society boundaries	Other boundaries
Total (268 Excerpts)	100.00	63.43	2.99	5.97	11.94	15.67
EUW Algarve	22.76	62.30	0.00	11.48	8.20	18.03
EUW Brno	26.12	58.57	7.14	4.29	10.00	20.00
EUW Malta	25.37	66.18	2.94	2.94	10.29	17.65
EUW Porto	25.75	66.67	1.45	5.80	18.84	7.25
Total (262 Excerpts)	100.00	63.74	2.67	6.11	11.83	15.65
Dutch	36.26	60.00	4.21	7.37	10.53	17.89
Non-Dutch	63.74	65.87	1.80	5.39	12.57	14.37
Total (262 Excerpts)	100.00	63.74	2.67	6.11	11.83	15.65
MES	48.85	57.81	3.13	5.47	14.06	19.53
Non-MES	51.15	69.40	2.24	6.72	9.70	11.94

Total (262 Excerpts)	100.00	63.74	2.67	6.11	11.83	15.65
No Work Experience	51.53	64.44	2.96	7.41	11.11	14.07
Yes work experience	48.47	62.99	2.36	4.72	12.60	17.32
Total (254 Excerpts)	100.00	64.57	2.76	5.51	11.81	15.35
No MDGW experience	25.20	68.75	3.13	4.69	10.94	12.50
Yes MDGW experience	74.80	63.16	2.63	5.79	12.11	16.32

For the question: What do you think is meant by the term 'boundaries' in relation to the European Workshop?

WHAT ARE BOUNDARIES?	#	Not a boundary	Cultural boundaries	Disciplinary boundaries	Academic/ Society boundaries	Other boundaries
Total (177 Excerpts)	100.00	8.47	18.64	18.64	5.65	48.59
EUW Algarve	25.42	15.56	22.22	15.56	6.67	40.00
EUW Brno	23.73	4.76	19.05	28.57	4.76	42.86
EUW Malta	26.55	6.38	19.15	21.28	4.26	48.94
EUW Porto	24.29	6.98	13.95	9.30	6.98	62.79
Total (174 Excerpts)	100.00	8.05	18.39	18.97	5.75	48.85
Dutch	40.23	2.86	20.00	21.43	4.29	51.43
Non-Dutch	5.98	11.54	17.31	17.31	6.73	47.12
Total (174 Excerpts)	100.00	8.05	18.39	18.97	5.75	48.85
MES	45.98	7.50	16.25	27.50	3.75	45.00
Non-MES	54.02	8.51	20.21	11.70	7.45	52.13
Total (174 Excerpts)	100.00	8.05	18.39	18.97	5.75	48.85
No Work Experience	47.13	10.98	15.85	18.29	6.10	48.78
Yes work experience	52.87	5.43	20.65	19.57	5.43	48.91
Total (165 Excerpts)	100.00	7.88	17.58	17.58	6.06	50.91
No MDGW experience	24.85	4.88	24.39	17.07	2.44	51.22
Yes MDGW experience	75.15	8.87	15.32	17.74	7.26	50.81