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Engagement within E-learning

An evaluation of an online course for
professionals from an engagement
perspective

Master's thesis in Learning and Leadership

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Abstract

The world is rapidly transforming into an increasingly digital society which has a great influence on people's everyday lives. The digital transformation is also affecting the education system, where complete courses or even full education programs are conducted in an online environment. Engagement is generally seen as an important factor for successful learning, and some research claim engagement as even more fundamental within E-learning. Therefore, the purpose of this study was: (1) to measure the level of engagement of the participants in the teacher free E-learning course Agenda 2030-linsen, provided by Miljöbron, from a multidimensional construct with the three dimensions behavioural, affective and cognitive engagement; and (2) to provide design recommendations for Miljöbron on adaptations for increasing the engagement. In order to answer the stated purpose, an instrument was developed, consisting of five questionnaires where each was representing the learning activities *Text*, *Film*, *Self-reflection*, *Quiz and Pairing*, and *Workshop*, that were identified via a course review. Each questionnaire was implemented in Agenda 2030-linsen and based on the amount of collected data, analyses were executed on all except *Workshop*. The results revealed that the course generates a relatively high engagement throughout all dimensions of engagement and learning activities, though the behavioural was significantly lower than both the affective and cognitive, in total. Thus, it is concluded that no major adaptations are needed to be done, but the recommendations provided regard measures that sought to increase the behavioural engagement.

Keywords: behavioural engagement, affective engagement, cognitive engagement, multidimensional construct, measuring engagement, E-learning.

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1. Introduction

As of today, mankind is right in the middle of a paradigmatic shift, between the former industrial society and a new, digital era. Digitalisation and new technology are seen as the driving factors of this development, even though they are developing in correspondence with other societal changes. Globalisation, urbanisation, individualisation, and an increasing knowledge society are all components that act in symbiosis with digitalisation and are contributing to transforming our way of living (Digitaliseringskommissionen, 2016). One fundamental reason behind the increase in digitalisation is that information to a higher extent occurs in a digital format, parallel with the fact that computers and mobile phones both have reached a wider spread and have become a more pivotal part of people's everyday life (Svenskt näringsliv, 2016).

The education system has also been affected by the digital transformation. The introduction of electronic calculators in the 1970s is seen to be the first step of the process (Winman et al., 2018), followed by the development of computer technology in the 1980s and 1990s, which made it possible to use computers as a valuable tool in mainstream education (Chin, 2006). Another reason for its rapid progress is that digital solutions can be scaled up at a relatively low cost (Chin, 2006; Digitaliseringskommissionen, 2016). This has benefitted the emergence of electronic learning – E-learning – which has created new conditions for educational practices (Bordbar et al., 2012).

The Commission of the European Communities (2001) refers to E-Learning as “the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration” (p. 2). E-learning can take place in a different set of environments, totally virtual or in a mix of a virtual and face-to-face environment (Bordbar et al., 2012). In the virtual classroom, the learner has more options to manage over when and where to conduct the education which makes the learning more individually adapted as well as more flexible (Bordbar et al., 2012; Svenskt näringsliv, 2016). This is in contrast with the traditional classroom setting where the learning provider is the one in control over the learning environment (Hamid, 2002). The many opportunities that E-learning offers is in line with the requirements for learning in a modern society and has generated a vast demand for E-learning from businesses and higher education (Bordbar et al., 2012). E-learning seems to offer a broader range of how learning can be conducted, at the same time as its progression seems inevitable. However, are there any concerns that need to be raised with this new way of educating?

In education, there is a growing consensus that *engagement* has a fundamental role in successful learning (Deng et al., 2020; Hew, 2016; Lam et al., 2012). Engagement could briefly be described as the learner's mental involvement in a task, and some argue that engagement plays an even more important role in E-learning than in a traditional learning environment (Meyer, 2014; Sun & Rueda, 2012). This, because online students have fewer ways to be

engaged with their institution due to the lack of physical presence. Moreover, in Massive Open Online Courses (MOOCs), a form of education where full courses are taken in an online environment, studies have shown that teacher presence has a positive effect on learner engagement (Hew, 2016; Jung & Lee, 2018) and also a direct effect on learner persistence (Jung & Lee, 2018). Though, many E-learning courses are conducted without any presence of teachers. This would imply that more responsibility in maintaining engagement is put both in the hands of the learner but also in the course design itself.

Based on the above, this master's thesis aims to investigate how different learning activities in a teacher free E-learning course have an impact on the participants' engagement. The course is called *Agenda 2030-linsen* and is provided by an organisation called Miljöbron. Miljöbron was founded in 1997 and their objective is to catalyse sustainability work within other organisations. They want to reduce the gap and increase cooperation between the academic sector, the business sector, and society by initialising collaboration projects where students with the appropriate competence are linked to organisations (Miljöbron, n.d.a). *Agenda 2030-linsen* was launched in September 2020 and is sold to other organisations interested in developing their sustainability work. The course is based on the Agenda 2030 including the 17 Global Goals, established by the United Nations, with the purpose to increase knowledge about sustainable development for all co-workers within the organisation. By doing so, and further implementing new insights from the course within the business model, the goal of *Agenda 2030-linsen* is that the companies buying the course should strengthen their competitiveness onwards (Miljöbron, n.d.b).

Because *Agenda 2030-linsen* is in its infancy and Miljöbron has the ambition to develop their web-based catalogue, there is an interest in gaining knowledge about how this can be done most effectively. Thus, investigating how different learning activities in the course correspond with engagement should contribute to further development.

1.1 Purpose and aim

The purpose of this master's thesis is to investigate the *Agenda 2030-linsen* as a case of an online learning course for professionals, from an engagement perspective. The rationale for this is the fundamental assumption that engagement is a crucial factor for successful learning. By investigating the course from its different learning activities, the expected outcome is to provide course-specific and general design recommendations that foster various forms of engagement, and that Miljöbron can consider when further developing their E-learning catalogue.

To correspond with the purpose, the study aims to answer the following research questions:

RQ1: How do participants experience their behavioural, cognitive and affective engagement in *Agenda 2030-linsen*?

RQ2: What adaptations in the learning design of *Agenda 2030-linsen* are likely to result in increased engagement of its participants?

1.2 Delimitations

The scope of this study will be to investigate how engagement can be increased within E-learning courses, by collecting empirical data from two out of three modules in the specific course Agenda 2030-linsen. As a result of this case study approach, one delimitation will be that the investigation only centres around engagement outcomes during the course and not how the engagement consists after completion. Thus, factors such as learning outcomes and training transfer will not be measured.

1.3 Thesis outline

To get a conception of how this thesis is outlined, this section provides a brief description of its structure, as follows:

- Chapter 2 presents the theoretical framework and contains the basis for engagement, how the concept is used in this study and how design factors can affect the engagement in learning situations.
- Chapter 3 presents the methodology used and contains a course review about Agenda 2030-linsen, how the instrument for the study was developed and implemented, and how the data was collected and analysed.
- Chapter 4 presents the results from the analysis of the data collected.
- Chapter 5 presents the discussion of the stated research questions, the limitations of the study as well as recommendations for future research.
- Chapter 6 presents the conclusions of the study.

2. Theoretical framework

This chapter aims to provide the reader with the theory that sets the framework for this study. First, the term engagement is presented in the context of education, followed by the conceptualisation specific for this study as well as how engagement can be measured. Then follows a section presenting how design factors within online education can affect learner engagement in general, but also what needs to be considered when conducting online learning for adults.

2.1 Engagement

Engagement is a word that originates from France and has occurred in the English vocabulary for about 500 years. To *engage* oneself often meant to mortgage one's lands and by doing so one was exposing oneself to risk, offering oneself as a guarantor of something promised. An engagement was a moral, often legal, obligation, but over the years the meaning of the term softened. Successively, *engage* has come to mean to *occupy the attention of*, with engagement the condition of being occupied. In terms of today, being *engaged* represents a state of being entirely present and not somewhere else (Axelson & Flick, 2011).

Engagement is also a widely used term in education and is considered a fundamental factor for successful learning (Deng et al., 2020; Hew, 2016; Lam et al., 2012) but, in terms of learning, what does *engagement* refer to? Ben-Eliyahu et al. (2018) define engagement as “the intensity of productive involvement with an activity” (p. 87), Axelson and Flick (2011) restrict it to the “students’ level of involvement in a learning process” (p. 41), while, within MOOCs, Jung and Lee (2018) define engagement as “the mental energy and effort that learners put into the MOOC learning process to achieve desired performance” (p.11). In the early stages of research, student engagement was conceptualised as a unidimensional construct. Factors, such as time spent on a task, the student's sense of belonging and psychological membership to a programme, and attention and effort expended in the work of learning was measured, among others, as a holistic indicator of the student's engagement (Deng et al., 2020).

However, more recent studies rather imply that engagement should be seen as a multidimensional construct, meaning dividing engagement into different components to be studied as disaggregated, though related (Ben-Eliyahu et al., 2018; Deng et al., 2020; Fredricks et al., 2004; Lam et al., 2014). By using a multidimensional construct, the effects of engagement can be examined simultaneously and dynamically, rather than separately (Fredricks et al., 2004). In research, engagement has been disaggregated into two to seven different components, such as behavioural, affective (emotional), cognitive, social, and academic (Deng et al., 2020). Yet, a three-part typology consisting of behavioural, affective and cognitive engagement has become the most predominant way of conceptualising the multidimensional construct (Lam et al., 2012). In this, one could be emotionally or cognitively absent, but behaviourally active. Likewise, one could be cognitively active working on a task but emotionally absent (Ben-Eliyahu et al., 2018). Hence, the study in this thesis will use the three-factor multidimensional construct for engagement. Each factor is described in the following three subsections.

2.1.1 Behavioural engagement

Depending on its context, behavioural engagement can have different meanings. In a traditional classroom setting, it often refers to participation, i.e., involvement in academic and social activities, a factor considered crucial for preventing student dropouts (Fredricks et al., 2004). It can also include in-class activities such as effort, paying attention, contributing to class discussion, raising a hand, etc. (Ben-Eliyahu et al., 2018; Fredricks et al., 2004), and these behavioural aspects also occur in MOOCs (Jung & Lee, 2018). In research about MOOCs, behavioural engagement is also the most common component of investigation, where discrete factors such as note-taking and film activity are considered easily observed (Deng et al., 2020). Furthermore, in E-learning, Tucker (2020) refers to behavioural engagement as “the actions and behaviours people take during learning, which may support or hinder learning”.

In this study, behavioural engagement will be represented by the actions and activity of the participants in Agenda 2030-linsen. For example, this could mean following instructions, making effort in the ongoing activity, and discussing with peers when encouraged to.

2.1.2 Affective engagement

In a classroom environment, affective engagement refers to the student’s emotional reactions to teachers or peers, such as interest, values, boredom and happiness, i.e., positive or negative emotions (Fredricks et al., 2004). Research has shown that students with high affective engagement are highly motivated to learn (Lam et al., 2014), and measures of affective engagement are sometimes combined with behavioural factors like participation (Ben-Eliyahu et al., 2018). Furthermore, in MOOCs, affective engagement is linked to the students’ positive emotions towards their teacher or peers, as well as the MOOC itself (Jung & Lee, 2018).

In the present study, affective engagement is also linked to positive or negative emotions, represented by the participant’s reaction while conducting different learning activities. For example, if the participant felt interested, joyful or frustrated during the activity.

2.1.3 Cognitive engagement

Cognitive engagement refers to mental investment, it “incorporates thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills” (Fredricks et al., 2004, p. 60). Cognitive engagement can also be described as the mental effort students’ put down in an activity or a task (Ben-Eliyahu et al., 2018), and students with high cognitive engagement also process the material more deeply as well as having a better understanding of it (Lam et al., 2014). Moreover, in some research cognitive engagement is not separated from affective engagement, with the argument that *rational thoughts* cannot be distinguished from emotions (Tucker, 2020).

However, in this study affective and cognitive engagement are measured separately, with the knowledge that both components probably overlap and interact dynamically, as well as with the behavioural engagement. While affective engagement is more about the participant’s

instinctively emotional reaction, cognitive engagement will rather be measured as the participant's mental presence and reflective actions in the ongoing learning activity. For example, if the participant tries to relate former knowledge when conducting the ongoing learning activity, or reflecting on the material itself.

2.2 Measuring engagement

Based on the idea that engagement can be studied as a multidimensional construct, consisting of the three dimensions behavioural engagement, affective engagement and cognitive engagement, prior research has developed instruments for measuring engagement in several different contexts. Primarily four studies, by Ben-Eliyahu et al. (2018), Deng et al. (2020), Fredricks et al. (2016) and Lam et al. (2014), constitute the foundation for developing the concept for measuring engagement in this study. What unites the literature is that the instruments have been developed as scales with questionnaires, using the participants' self-reported perception of their engagement as the method of collecting data. A summary of the four studies is presented in Table 2.1, listing target groups, in which context they were measured, examples of how statements were formulated, and which scale was used. The table is followed by a brief description of the studies.

Table 2.1: Description of the literature considered vital for developing the concept of measuring engagement in this study, with examples. (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

Source	Target group	Area of measurement	Example of items	Likert scale
Ben-Eliyahu et al. (2018)	Sixth-grade students	Activities in school and a museum	<i>During today's activity;</i> <i>I worked hard on the activity. (B)</i> <i>I felt bored. (A)</i> <i>I thought about how ideas in the activity related to other things. (C)</i>	YES!–yes–no–NO!
Deng et al. (2020)	MOOC participants	MOOC studies	<i>I took notes while studying the MOOC. (B)</i> <i>I enjoyed watching video lectures in the MOOC. (A)</i> <i>I often searched for further information when I encountered something in the MOOC that puzzled me. (C)</i>	1. Strongly Disagree 2. Disagree 3. Slightly Disagree 4. Slightly Agree 5. Agree 6. Strongly Agree
Fredricks et al. (2016)	Sixth to twelfth-grade students	Math and science	<i>I put effort into learning. (B)</i> <i>I enjoy learning new things in math and science class. (A)</i> <i>I think about different ways to solve a problem. (C)</i>	Not stated
Lam et al. (2014)	Junior secondary school students	School	<i>I pay attention in class. (B)</i> <i>I think what we are learning in school is interesting. (A)</i> <i>When I study, I try to connect what I am learning with my own experiences. (C)</i>	1 (strongly disagree) 2 (disagree) 3 (neutral) 4 (agree) 5 (strongly agree)

In the study by Ben-Eliyahu et al. (2018), the research was done on six different science activities where 786 sixth-grade students, from twelve public schools in the Midwest USA, participated. Based on the multidimensional construct, an Activity Engagement Survey was developed to measure the students' engagement in the science activities and to be answered directly after an activity. When developed, the survey was sent to an expert team who made a

judgement on where to categorise each item. Then, a series of factor analyses were conducted to investigate if engagement has three distinct facets and whether they combine. The result showed that the survey had the potential to be used to calculate an overall engagement as well as each dimension separately on similar target groups. Additionally, it is encouraged that further research investigate the multifaceted structure of engagement on older populations because most of the earlier research is focusing on the engagement of younger students.

In the study by Deng et al. (2020), the research was done on MOOC students with the purpose to develop and validate a scale to measure learner engagement based on a multidimensional construct. Initially, a scale was developed from items in existing literature followed by a modification process, including interviews, an exploratory survey, an expert review, a pilot survey, an item purification study and a construct validation survey. Unlike this study, Deng et al. (2020) finally ended up with an engagement scale consisting of four dimensions, with a social dimension added. Moreover, it was concluded that the engagement scale could be used to investigate the relationship between learner engagement and learning factors, such as motivation and self-efficacy, teaching context (e.g., assessment type, film feature), and learning outcomes.

In the study by Fredricks et al. (2016), in-depth interviews were conducted on how math and science engagement and disengagement were conceptualised. The participants consisted of 106 students from sixth to twelfth grade and 34 teachers, and the interviews were based on the multidimensional construct, also with social engagement as a fourth dimension. One of the findings was that both students and teachers linked their perception of being engaged or disengaged to emotions, such as happiness, pride, frustration and anxiety, and they encouraged these factors to be examined when further examining student engagement. From the interviews, an engagement scale was developed as a new way of measuring student engagement in math and science. The scale was validated by letting 3 936 sixth to twelfth-grade students answer the questionnaire, and it was concluded that the instrument could be used by teachers to identify students' risk of disengagement in math and science.

In the study by Lam et al. (2014), the research was done in junior secondary school where 3 420 students from 12 countries participated. The purpose of the study was to develop a scale based on the multidimensional construct that measured student engagement in school, which could be used internationally. To develop the engagement scale, 50 items were first generated in the footsteps of prior research. Then, items considered ambiguous and redundant were deleted, leading to 35 existing items that were sent to 18 researchers from 12 countries to be reviewed. Finally, 33 items were chosen and implemented on the scale. To validate the scale, correlation analyses were run on teacher support, peer support, academic performance, among others. The result showed that the developed engagement scale had high validity and it was concluded that a foundation to be used for further research on student engagement in schools around the world was established.

Later, in the chapter *Methodology*, the details of the scale used in this study will be closer described.

2.3 Learning activities and design factors for engagement

This section consists of three subsections. Since this study sought to measure the participants' engagement in different learning activities in Agenda 2030-linsen, the first subsection aims to present a clear and unambiguous description of what a learning activity is, and more specifically the conceptualisation for this study. The following subsection presents design factors and learning activities that can affect engagement in E-learning. Although the guidelines for designing an online course to increase engagement might not differ from the general recommendations, one notable aspect in Agenda 2030-linsen is that the participants are uniformly professionals and adults, and thus not students within the education system. Therefore, the last subsection presents factors to consider when developing online education for adults.

2.3.1 Learning activities

As the education system has developed, development has also been brought to the concept of learning activities. Learning activities have nowadays become more centred around the students' activity and their exploration of the tasks, rather than being teacher-guided instructional tasks (Guerrero-Roldán & Noguera, 2018). This could relate to the idea that students can engage to a higher extent when they feel that the activities are meaningful and of personal relevance (Giota, 2013). To illustrate, learning activities have been defined in several ways. Beetham and Sharpe (2005) propose that a learning activity is “a specific interaction of learner(s), with other(s) using specific tools and resources, orientated towards specific outcomes. Examples of learning activities might include solving problems, comparing and evaluating arguments, presenting facts or negotiating goals” (p. 28). On the other hand, the European Commission (2016) defines learning activities as “any activities of an individual organised with the intention to improve his/her knowledge, skills and competences” (p. 10).

In the context of E-learning, Levy (2008) defines learning activity as “an educational procedure designed to stimulate learning by online experience utilizing online learning systems and tools” (p. 1666), emphasising the presence of a digital environment. Complementary, Guerrero-Roldán and Noguera (2018) propose a comprehensive definition of learning activities as “intentional and organized sets of actions designed for online learning situations. In these situations, students actively and dynamically build knowledge and perform and demonstrate the acquisition of competences through their use of digital media” (p. 38). Furthermore, a learning activity can be described as an activity that consists of some kind of task, associated tools that facilitate conducting the task, learning content that is considered suitable, and where the operations have a logical sequence (Dagger et al., 2005).

Based on the definitions cited above, the following criteria constitute the definition of a learning activity in this study:

- it intends to increase the participant's knowledge, skills, competences' or understanding of a subject.
- it intends to activate the participant.
- the content must have a coherent sequence, with an evident start and end.

2.3.2 Design factors for engagement in E-learning

When designing and developing an E-learning course, several factors are important for promoting engagement. According to Khan et al. (2017), best practices regarding design refers to presenting information in a varied way and that the information is segmented appropriately, clarity in expectations, using active learning methods and facilitating the use of discussions. Likewise, Martin and Bollinger (2018) address giving students the possibility to collaborate and the use of active learning strategies, among others, as important factors for designing an engaging online environment. This can be exemplified by integrating discussion boards, chat sessions, or group tasks within the course. Furthermore, studies in MOOCs have shown that interaction between peers can encourage knowledge sharing as well as construction among participants (Hew, 2016).

Creating conditions for interaction between students is one way of promoting engagement in E-learning. Another way, according to Meyer (2014), is to increase interaction between the student and the content itself. Films are widely used as a resource in E-learning in general, and in Agenda 2030-linsen films, together with texts, are the most frequently occurring learning activity. In an empirical study by Guo et al. (2014) on how film production decisions affect student engagement in online educational films, data from 6,9 million watching sessions across four courses on the edX MOOC platform were analysed. From their result, they found that film length was the most significant factor for engagement, thus recommending that films should be shorter than six minutes. Also, films with a more personal feel, in an informal setting, could generate more engagement than top-notch productions. Furthermore, the result showed that films, where instructors speak fairly fast and with enthusiasm, generated higher engagement (Guo et al., 2014).

Another factor for promoting engagement in E-learning is to provide the learning content with authenticity. In a paper by Britt (2015), on how online strategies can be used to better engage online students, ten factors are presented regarding authenticity. One of these is the need for real-world relevance, meaning that the tasks should be as near a professional way of working as possible. Another is, as mentioned earlier, to provide both multiple sources as well as different perspectives so that the learner needs to have a critical approach when working with the material. The use of reflective activities is also a way to create authenticity, forcing the learner to make choices and reflect on a metacognitive level. Moreover, using multiple interpretations and outcomes rather than single correct answers are also seen as a method for making the content authentic.

2.3.3 Andragogy and design for adult E-learning

One learning theory that has been developed for adult education is called *andragogy*. A prominent researcher within the area, Malcolm S. Knowles, originally defined andragogy as “the art and science of helping adults learn” (Knowles, 1970, p. 43), in contrast to pedagogy which rather focuses on teaching younger learners. To distinguish the two concepts, Knowles (1970) highlights four crucial assumptions that characterise the learner, as the individual matures: the first is that the learner becomes a self-directed person, rather than primarily being dependent on others; the second is that over the years, the learner accumulates experience beneficial for learning; the third is that the readiness to learn becomes more oriented towards areas where the learner finds interest in; the fourth is that the learning goes from being more subject-centred to performance-centred, and how the knowledge can immediately be applied. While the assumptions about the adult learner seem reasonable, criticism has been brought towards having an andragogical approach when designing an online course. Arghode et al. (2017) criticise the andragogical assumption that adults learn identically, that the focus tends to be more on the process, rather than content, and that the tenets of andragogy might not align with all adults’ prior experiences.

To generate higher participant engagement in adult education, Arghode et al. (2017) propose that the design of an online learning environment for adults should be simple, easy and effective. In the likings of what Hew (2016) and Martin and Bollinger (2018) encourage, Arghode et al. (2017) suggest creating online discussion forums to promote self-directed learning. The design should also allow flexibility for the learners to conduct the course at their own pace, and using online activities as well as films in the course design can further encourage self-directed learning. Activities in the online course should, as Britt (2015) also claimed, be authentic and related to the work. In addition, work-authentic activities are considered more engaging for the adult learner (Waight & Stewart, 2005).

3. Methodology

The following chapter describes how the work process for this study was conducted, where a quantitative research approach was chosen as the main method for collecting data. First, a course review was carried out to identify its structure and which learning activities that occurred. Then, an instrument for measuring engagement was developed, which was later validated via a pre-study. The insights from the pre-study were then transferred to the main study, which constituted the basis for the data analysis.

3.1 Research approach

For the research method a quantitative approach was chosen. A quantitative research approach is generally used for examining the relationship among variables (Creswell, 2003), and is applicable when the investigation is based on equivalent and thus comparable data, to the extent that the data can be expressed and analysed with numerical values (Esiasson et al., 2012). One of the main characteristics of a quantitative approach is also that it enables a vast amount of data to be collected and analysed under a relatively short period of time (Denscombe, 2018; Esiasson et al., 2012). The data collection itself usually includes an experimental or predestined approach, such as surveys, and when the data is collected it is suitable to perform a statistical analysis (Creswell, 2003; Denscombe, 2018). This research approach is in contrast with a qualitative equivalent, where the data collection sample is generally smaller but more profound. With a qualitative approach, the analysis is also usually performed in parallel with the data collection, which is why the research questions are harder to predestinate (Denscombe, 2018).

Since the objective of the study was to investigate the participants' level of engagement in different learning activities in Agenda 2030-linsen and on that basis provide design recommendations to Miljöbron for increasing it further, it was of interest to collect a large number of answers. The course itself was also fully web-based which allowed interaction with the participants during the course, in connection with the learning activities. Hence, a quantitative research approach was considered most suitable, where a survey consisting of five different questionnaires was constructed and implemented in the course. Though, in order to develop the survey, it was important to know how the course was structured and what it contained. Therefore, a course review of Agenda 2030-linsen was conducted in advance, which is presented in the following section.

3.2. Empirical setting

This section first presents a description of the course that this study was centred around – Agenda 2030-linsen – with its purpose, structure and expected outcome. This is followed by a subsection where the learning activities identified in the course are presented.

3.2.1 About Agenda 2030-linsen

Agenda 2030-linsen was launched in September 2020 and is provided by Miljöbron as an E-learning course, and is sold to other organisations. The course is based on Agenda 2030, established by the United Nations (Miljöbron, n.d.b), which is a global agreement on achieving

four worldly challenges until 2030: (1) abolish extreme poverty; (2) reduce inequalities and injustices in the world; (3) promote peace and justice; and (4) solve the climate crisis (UNDP, n.d.).

One of the co-founders and product developers of the course, M. Ahrin-Larsson (Personal communication, February 4, 2021) describes the purpose of the course:

Syftet med Agenda 2030-linsen är att ge alla medarbetare en hållbarhetslins. Alltså en blick där hållbarhet är med i tanken vid varje beslut som fattas. Det är först då som vi kan göra skillnad på riktigt och hela företaget kan ändra sitt arbetssätt.

[The purpose of Agenda 2030-linsen is to provide all employees with a sustainability lens. In other words, a point of view where sustainability is included in every decision that is made. Then, real actions can be made towards changing the company's way of working.]

The course is divided into three modules. The first module is about increasing knowledge, where the term *sustainability* is defined, the basis of the UN:s Agenda 2030 is taught and how sustainability can be implemented within the company's business model. The second module is a workshop where the participants are encouraged to conduct the workshop with their co-workers. The workshop centres around how Agenda 2030 can be one of the pillars when developing new business strategies. The third module is reserved for employees that work on a strategic level, where the results from the workshop in the second module are collected, sorted, and ranked based on feasibility and possible profitability. The aim is to end up with an action plan on how the company can implement the best ideas in their scope (Miljöbron, n.d.b). As mentioned earlier, this module was not included in the analysis.

3.2.2 Learning activities in Agenda 2030-linsen

To correspond with this master's thesis scope, there was an interest in identifying which learning activities occur in Agenda 2030-linsen. Based on the definition of a learning activity, as proposed in section 2.3.1, ten different learning activities were identified in the first two modules of the course and are presented in Table 3.1.

Table 3.1: Identified learning activities in Agenda 2030-linsen, followed by their description and occurrence in the course.

Learning activity	Description	No. of occurrences
Text	Educating texts that presented facts, data and different perspectives. In general, the texts were estimated to include 200–400 words per section. All texts were in Swedish and provided by Miljöbron for Agenda 2030-linsen.	12 texts (23 texts w/ Combination)
Extra material – text	Complementary texts to the course material. The extra material was to be found on external homepages and not obligatory to read.	15 texts
Film	Educating films that primarily presented facts, data and different perspectives, but some also aimed to inspire. With <i>Combination</i> included, the shortest film was 57 seconds, the longest film was 17 minutes and 38 seconds, and the mean length for all films was 4 minutes and 47 seconds. One film was in Swedish and the rest was in English. Most films were externally made and linked from Youtube, while some were made by Miljöbron.	4 films (18 films w/ Combination)
Extra material – film	Complementary films to the course material. The extra material was to be found on external homepages and not obligatory to watch.	6 films
Combination (text + film)	Texts and films, as described above, that occurred within the same section and had relating content.	11 Combination sections
Self-reflection	Exercises where the task was to reflect on previous material in the course and how it could relate to oneself or the company. Each self-reflecting exercise was to be submitted in the course, and some of them were encouraged to be discussed with a colleague. The recommended time for completion was 5–30 minutes.	8 exercises
Quiz and Pairing	Short quizzes, containing 1–3 multiple choice questions, and pairing exercises, with a drag and drop function where single items in one column should be paired with a corresponding item in another column. Both exercises examined previous material and were obligatory to pass to move forward in the course. If not passing, the participant had to repeat the same exercise and the questions did not differ.	4 exercises
Case study	Exercises where the participant first learned about other organisations and then reflected on how their business model relates to sustainability.	2 case studies
Clicker	Illustrations on which the participant clicked for more information, similar to flashcards.	3 clickers
Workshop	The workshop centred around how the Agenda 2030 could be one of the pillars when developing new business strategies, including activities such as brainstorming, selecting and concretising ideas. This exercise was encouraged to perform in groups and the estimated time for completion was two hours.	1 workshop

3.3 Instrument design and validation

This section describes the process of how the instrument for measuring engagement in this study was developed and validated. The section is divided into three subsections: the first presents how and which learning activities in Agenda 2030-linsen were selected for further investigation; the second how the survey was designed and provides an example of how items were formulated; and the third subsection describes how the survey was validated via a pre-study.

3.3.1 Learning activities – selection

In Agenda 2030-linsen, ten different learning activities occur, which are described in Table 3.1. The learning activities were identified by an analysis of the course, based on the definition of a learning activity presented in section 2.3.1. Out of the ten learning activities, five were considered most appropriate for further research and are presented in Table 3.2.

Table 3.2: Learning activities in Agenda 2030-linsen. Rows strikethrough represents learning activities not chosen for further research.

Learning activity	Occurrence
Text	12 texts (23 texts w/ Combination)
Extra material – text	15 texts
Film	4 films (18 films w/ Combination)
Extra material – film	6 films
Combination (text + film)	11 Combination sections
Self-reflection	8 exercises
Quiz and Pairing	4 exercises
Case study	2 case studies
Clicker	3 clickers
Workshop	1 workshop

The selection should fulfil three criteria: have a relatively high frequency of occurrence or be extensive, be easy for the participants to recall, and be relevant in a wider learning context. Thus, learning activities such as *Text* and *Film* were chosen to investigate separately, rather than *Combination (text + film)*. This is because it was considered both difficult to communicate the difference between the activities to the respondents, and also that the result from the latter would be more difficult to conclude from. Furthermore, the learning activity *Clicker* was not selected due to low frequency, and *Case study* was considered too similar to *Workshop*, which also was a more extensive learning activity.

The content in the different learning activities were considered relatively similar throughout the course. Since the study did not focus on learning outcomes or training transfer, each learning

activity was processed uniformly and statements in the later presented questionnaires did not refer to specific chapters or sections within the course.

3.3.2 Survey design

The main method for collecting data was a survey consisting of five questionnaires, which was implemented in Agenda 2030-linsen. The concept behind survey research is that it provides a quantitative description of trends or attitudes of a population by generalising the result from a sample of the studied population (Creswell, 2003), which in this study consisted of participants in the course. Using surveys is beneficial for saving time when collecting data, i.e., there is no delay in receiving data. The use of surveys also fastens the collection itself, meaning that there is no need to transcribe the data, as when using interviews as a method (Denscombe, 2018).

The data consisted of the participants' self-reported estimation of their engagement. Though being easy to administer, some possible obstacles needed to be considered. For example, as Azavedo (2015) states, there are some critiques that self-reporting does not capture engagement in real-time compared to more precise instruments, such as eye-tracking. While not having the possibility to eye-track the participants, it was important to make the self-report valid and reliable. To fulfil this, the structure of the questionnaires followed the suggestion by Carini et al. (2006) – being in connection to recent activities, formulated clearly and unambiguously, and the information requested was potentially verifiable. How the five questionnaires were implemented in Agenda 2030-linsen is further described in section 3.4.

The questionnaires were adapted from earlier research within the area of measuring engagement. A literature review was conducted, based on the steps presented by Easterby-Smith et al. (2018). The initialising step was to establish the scope of the review, including identifying keywords and search terms. Search terms, such as “measuring engagement”, “E-learning”, “behavioral engagement”, “affective engagement”, “cognitive engagement”, and “online learning” were identified and used both separately and combined. The second step was to implement these search terms into scholar databases, primarily Mendeley and Google Scholar. Literature found relevant and that included engagement scales was analysed systematically. Also, such articles were used for backward citation tracking to further identify literature relevant for the scope. In the third step, the literature was organised and summarised, and sources considered vital for this study are presented in Table 2.1. The selected literature should measure engagement from a multidimensional construct, use an engagement scale for self-reporting and be linked to engagement within education.

No literature was found that measured engagement in specific learning activities within an E-learning course. Therefore, a brainstorming session was conducted to generate items for the engagement scale used in this study, based on the literature review's outcome. As in line with what Österlin (2010) proposes, the brainstorm session was done written on a whiteboard in parallel with discussions. Items regarding each dimension of engagement on each learning activity were listed and then documented. Then, items within each engagement factor, from each learning activity, were organised and linguistically refined to have a cross-sectional

uniformity. Each item was also critically examined to be traceable back to one of the sources. Hence, five questionnaires, titled *Text*, *Film*, *Self-Reflection*, *Quiz and Pairing*, and *Workshop*, were designed to be implemented in Agenda 2030-linsen and were distributed via Microsoft Forms. Each questionnaire contained statements based on the three factors of engagement: *Behavioural*, *Affective*, and *Cognitive*, using a five-point Likert scale for response. Moreover, the questionnaire *Workshop* included three additional statements regarding the participants' general impression of the course, the influx of new knowledge and its relevance for their work. Table 3.3 presents an extract from the questionnaire *Text*, implemented in Agenda 2030-linsen. All the questionnaires in their original form can be found in Appendix A–E.

Table 3.3: Extract from questionnaire *Text*, implemented in Agenda 2030-linsen. Note: (1) (R) indicates reversed item; (2) the questionnaire is translated from Swedish.

Item	Engagement Factor	Likert scale
I read everything, regardless of length.	Behavioural	1 – Strongly disagree 2 – Disagree 3 – Neutral 4 – Agree 5 – Strongly agree
I read the extra material provided.	Behavioural	
When I read the texts, I was focused.	Behavioural	
If there was something I did not understand, I read it again until I understood it.	Behavioural/ Cognitive	
I took notes while reading the texts.	Behavioural	
When I read the texts, I felt that it was rewarding.	Affective	
When I read the texts, I felt bored. (R)	Affective	
When I read the texts, I felt interested.	Affective	
When I read the texts, I felt joy.	Affective	
When I read the texts, I felt frustrated. (R)	Affective	
I enjoyed reading the texts.	Affective	
I thought about how the content of the texts could relate to my work.	Cognitive	1 – Never 2 – Rarely 3 – Sometimes 4 – Often 5 – Always
I tried to associate the content of the texts with prior knowledge.	Cognitive	
When I read the texts, I reflected on the content.	Cognitive	

From Table 3.3 it should be noted that the item “If there was something I did not understand, I read it again until I understood it” was listed in both of the categories *Behavioural engagement* or *Cognitive engagement*. This was based on the fact that some inconsistency has occurred in previous research regarding similar statements. For example, Lam et al. (2014) list “If I have trouble understanding a problem, I go over it again until I understand it.” (p. 231) in the category *Behavioural engagement*, while Deng et al. (2020) list “When I had trouble understanding a concept or an example, I went over it again until I understood it.” (p. 262) in the category

Cognitive engagement. Thus, in this study's later analyses, items similar to "If there was something I did not understand, I read it again until I understood it" were measured in both categories to see where it fitted best.

The Likert scale presented in Table 3.3 was adapted from earlier work by Lam et al. (2014), Ben-Eliyahu et al. (2018), and Deng et al. (2020), to measure the three types of engagement. The use of a five-point Likert scale, with a neutral midpoint, was chosen based on the guidelines presented by Easterby-Smith et al. (2018) and Persson (2016), saying that it allows the possibility for the respondents to not take a stand on a statement. Persson (2016) also argues that offering a midpoint alternative strengthens the reliability. Others, such as Esiasson et al. (2012), have refrained from recommending a midpoint alternative, though pointing out that a neutral response could be as substantial as a non-neutral. Whether or not, the same authors also claim that a midpoint alternative does not seem to affect the relative distribution between other answer alternatives, why a five-point Likert scale was considered most suitable.

3.3.3 Pre-study

A pre-study was performed on five employees from a municipality company in the region of Västra Götaland and was distributed by Miljöbron. The idea of the pre-study was primarily to get an estimate of the general validity of the instrument and to identify possible conceptual issues. To validate, a reliability analysis was performed in IBM SPSS Statistics 26 where the reliability coefficient, Cronbach's alpha, was calculated. Cronbach's alpha represents the internal consistency between items and generally ranges from 0 to 1. A high value shows a high internal consistency, indicating stability as well as reliability (Persson, 2016), and as a rule of thumb a threshold of 0,70 is considered adequate (Hair et al., 2014).

The analysis was first performed on items within each factor of engagement in each learning activity. This means that Cronbach's alpha was calculated on the statements in each type of engagement (behavioural, affective, and cognitive), respectively. Then, Cronbach's alpha was calculated on the items in each learning activity, to see how the items in a questionnaire correlated. Categories with values considered inadequate were modified to see if it was possible to reach an adequate level, by removing potential sources of error. The result from the analysis is presented in Table 3.4.

Table 3.4: Cronbach's alpha, based on the data from the pre-study. *Cronbach's alpha, new*, represents the internal consistency after removing items making the internal consistency inadequate. *Total internal consistency* represents the analysis between all items in a learning activity. Note: the items *If there was something I did not understand, I read/watched it again until I understood it*, were analysed as Behavioural engagement.

Learning activity	Dimension	Cronbach's alpha	Item(s) removed	Cronbach's alpha, new
Text	Behavioural engagement	0,98	-	-
	Affective engagement	0,39	1	0,78
	Cognitive engagement	0,73	-	-
	Total internal consistency	-0,17	1	0,5
Film	Behavioural engagement	0,57	1	0,73
	Affective engagement	-0,03	1	0,89
	Cognitive engagement	0,83	-	-
	Total internal consistency	0,51	2	0,77
Self-reflection	Behavioural engagement	0,67	-	-
	Affective engagement	0,32	1	0,77
	Cognitive engagement	0,00	1	0,86
	Total internal consistency	0,50	2	0,68
Quiz and Pairing	Behavioural engagement	-1,03	1	0,18
	Affective engagement	0,51	1	0,67
	Cognitive engagement	-	-	-
	Total internal consistency	0,66	2	0,68
Workshop	Behavioural engagement	0,97	-	-
	Affective engagement	0,62	1	0,89
	Cognitive engagement	0,61	1	0,85
	Total internal consistency	0,93	2	0,97

By the time the survey was ready, the test group had already started Agenda 2030-linsen. Therefore, the five questionnaires forming the survey were merged and handed out together afterwards, instead of being implemented separately within the course, as in the later main study. The survey was distributed by Miljöbron and was handed out to six employees, where five answers were received. Even though the relative response rate was high, the amount of data received from the pre-study was considered too small to conclude from, and it would have no direct effect on the design of the main study.

Though the amount of data from the pre-study were not considered enough to have a direct impact on the design of the main study, some notable findings were identified. One was that in

four out of five questionnaires, an item regarding frustration (see Table 3.3 for example) was recommended by the used software to be removed, to increase Cronbach's alpha. Another was that the result from the items regarding behavioural engagement in the questionnaire *Quiz and Pairing* was insufficient, as seen in Table 3.4. Apart from those two possible errors, the result indicated that the survey produced was reliable. Hence, even though the pre-study generated some valuable information, the reliability analysis was considered necessary in the later main study.

In the pre-study, analyses were made on items in the learning activities *Text* and *Film* that had not been categorised as either behavioural engagement or cognitive engagement in advance, as mentioned in section 3.3.2. The item was formulated as *If there was something I did not understand, I read/watched it again until I understood it*, depending on which learning activity it was related to. The result is presented in Table 3.5.

Table 3.5: Cronbach's alpha from analyses on the items *If there was something I did not understand, I read/watched it again until I understood it* (I4), from the questionnaires *Text* and *Film*.

Learning activity	Dimension	Cronbach's alpha with I4	Cronbach's alpha without I4
Text	Behavioural engagement	0,98	0,98
	Cognitive engagement	0,73	0,73
Film	Behavioural engagement	0,57	0,16
	Cognitive engagement	0,71	0,83

The result shows that in the questionnaire *Text*, the item did not affect whether it was categorised as behavioural engagement or cognitive engagement. In the questionnaire *Film*, however, Cronbach's alpha was higher when the item was categorised as behavioural engagement, and not as cognitive engagement. This was seen as an indication that the item should rather be categorised as behavioural engagement than cognitive engagement. Though, because of the small amount of data, the same analyses were done in the later main study.

3.4 Data Collection

The main study consisted of the same survey, with the five questionnaires on the learning activities *Text*, *Film*, *Self-reflection*, *Quiz and Pairing*, and *Workshop*, as in the pre-study. Apart from the way of distributing the pre-study, where the survey was handed out afterwards, the questionnaires were implemented separately and in different parts of Agenda 2030-linsen to be answered during the course. Based on how the course was structured, combined with the recommendation by Carini et al. (2006) as well as the demand of Miljöbron, each questionnaire was implemented in close connection to parts of the course where a high frequency of the corresponding learning activity was considered. Moreover, since the survey was divided into five separate questionnaires, the possibility to link the respondents' answers was missing. In order to compare the result from the different questionnaires, it was considered a necessity to

use the same sample group for the analysis. To solve this, the respondents were therefore encouraged to identify themselves by using the same, unique alias throughout the whole survey.

The survey was active in the course for 39 days, between March and April 2021. During this period, 71 people started the course and consisted mainly of employees from a Swedish company within the private sector. Due to time-limitation and the fact that the five questionnaires were implemented chronologically in different parts of Agenda 2030-linsen, the response rate varied. As a result of an inevitable deadline for the survey, more answers were received in the questionnaires located early in the course while fewer were received in the questionnaires located later in the course. The number of participants, respondents and the response rate from the questionnaires are presented in Table 3.6.

Table 3.6: Number of participants that finished the sections where the questionnaires were implemented during the period of this study, number of respondents in the questionnaires and the response rate.

Questionnaire	No. of participants	No. of respondents	Response rate (%)
Text	71	52	73,2
Film	69	41	59,4
Self-reflection	55	32	58,2
Quiz and Pairing	49	22	44,9
Workshop	9	9	100,0

To make the analyses, the first step was to match the respondents' unique aliases with their answers in the different questionnaires, by sorting the respondents in alphabetic order in Microsoft Excel. For the analysis to be as adequate as possible, two criteria needed to be fulfilled: (1) the respondents should have submitted answers on the questionnaires *Text*, *Film*, *Self-reflection* and *Quiz and Pairing*; and (2) the respondents chosen alias should be possible to identify in all of the questionnaires mentioned in (1).

Due to an insufficient number of respondents in the questionnaire *Workshop*, it was chosen to completely remove that questionnaire for the analysis. For the four remaining questionnaires, 14 respondents fulfilled the two criteria, a number considered on the lower side. To provide a better setting for the analysis, the five respondents from the pre-study were therefore added to the main study. Thus, the analysis was conducted with 19 respondents.

3.5 Data analysis

In the following two subsections, the analyses made for the main study are presented. First, a reliability analysis (Cronbach's alpha) was made, followed by calculations of mean and

standard deviation, σ . Then, a Repeated Measures ANOVA was conducted. All analyses and calculations were executed in IBM SPSS Statistics 26.

3.5.1 Reliability Analysis

As in the pre-study, a reliability analysis was performed by calculating Cronbach's alpha for each factor of engagement, with 0,70 as a threshold value for indicating good internal consistency. The result from the analysis is presented in Table 3.7.

Table 3.7: Cronbach's alpha, based on the data from the main study. *Cronbach's alpha, new*, represents the internal consistency after removing items making the internal consistency inadequate. *Total internal consistency* represents the analysis between all items in a learning activity. Note: the items *If there was something I did not understand, I read/watched it again until I understood it*, were analysed as Behavioural engagement.

Learning activity	Dimension	Cronbach's alpha	Item(s) removed	Cronbach's alpha, new
Text	Behavioural engagement	0,66	-	-
	Affective engagement	0,83	-	-
	Cognitive engagement	0,69	-	-
	Total internal consistency	0,88	-	-
Film	Behavioural engagement	0,76	-	-
	Affective engagement	0,84	-	-
	Cognitive engagement	0,88	-	-
	Total internal consistency	0,89	-	-
Self-reflection	Behavioural engagement	0,50	1	0,69
	Affective engagement	0,81	-	-
	Cognitive engagement	0,91	-	-
	Total internal consistency	0,92	-	-
Quiz and Pairing	Behavioural engagement	0,57	1	0,61
	Affective engagement	0,74	-	-
	Cognitive engagement	-	-	-
	Total internal consistency	0,84	-	-

Overall, the result from the reliability analysis indicated adequate internal consistency, where 12 out of 16 categories exceeded the value of 0,70 on Cronbach's alpha. Of the four categories that did not exceed 0,70 on Cronbach's alpha, there were two categories, *Behavioural engagement* and *Cognitive engagement* in *Text*, considered close enough to not be adjusted. From the remaining two categories *Behavioural engagement* in *Self-reflection* and *Behavioural*

engagement in *Quiz and Pairing* one item was removed, respectively, to increase Cronbach's alpha.

In the category *Behavioural engagement* in *Self-reflection* an item formulated as "If the exercise encouraged discussion, e.g., with a colleague, I did" was removed, which increased Cronbach's alpha from 0,50 to 0,69. This was considered an adequate adjustment and the item was also removed from any further analyses in this study. Also, in the category *Behavioural engagement* in *Quiz and Pairing*, Cronbach's alpha was insufficient. With a value of 0,57, an item formulated as "I took a guess when conducting the exercises" was removed which increased Cronbach's alpha to 0,61. However, this adjustment was not considered adequate, leading to that no conclusions were drawn from this category in further analyses.

As in the pre-study, analyses were made on items in the learning activities *Text* and *Film* that had not been categorised as either behavioural engagement or cognitive engagement in advance. The result is presented in Table 3.8.

Table 3.8: Cronbach's alpha from analyses on the items *If there was something I did not understand, I read/watched it again until I understood it* (I4), from the questionnaires *Text* and *Film*.

Learning activity	Dimension	Cronbach's alpha with I4	Cronbach's alpha without I4
Text	Behavioural engagement	0,66	0,57
	Cognitive engagement	0,66	0,69
Film	Behavioural engagement	0,76	0,69
	Cognitive engagement	0,83	0,88

The result shows that Cronbach's alpha is higher in both *Text* and *Film* when item I4 is categorised as *Behavioural engagement*, rather than *Cognitive engagement*. Thus, based on this result together with the recommendation by Lam et al. (2014), item I4 was further categorised as *Behavioural engagement*.

3.5.2 Mean values, standard deviations and Repeated Measures ANOVA

To get a general idea of where on the Likert scale the answers were centred, the mean values were calculated for all items in each category, i.e., each dimension of engagement of all learning activities, and the mean of the three dimensions over all learning activities. To get a perception of the average spread around the mean values, the standard deviations were also calculated for all mean values.

To see if any statistical significance occurred between the mean values, a *Repeated Measures Analysis of Variance (ANOVA)* was done between each dimension of engagement in each learning activity, the total engagement of all learning activities, and the engagement between

the learning activities. The process was following the steps of Field (2013) where the level of significance, p , was set to 0,05. A process chart of the analysis is presented in Figure 3.1.

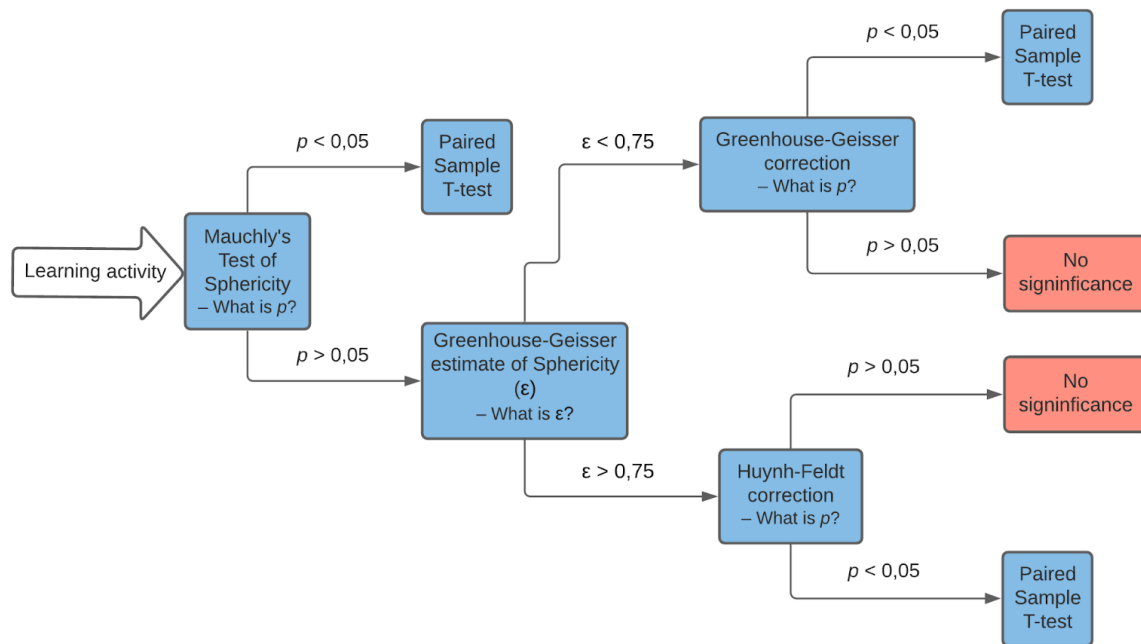


Figure 3.1: Process chart of Repeated Measures ANOVA, following the steps of Field (2013).

In the first step, *Mauchly's Test of Sphericity* was done on the current mean values, based on the hypothesis that the variances of the differences between conditions are equal. From the test, the level of significance was presented. If $p < 0,05$, significance existed between the tested means. From this, the second step would be to investigate between which dimensions of engagement the significance occurred, by a *Paired Sample T-test*. On the other hand, if $p > 0,05$, a correction for violations of sphericity would be necessary to adjust the degrees of freedom, df. Then, the second step would be to investigate which correction needed to be done, by looking at the *Greenhouse-Geisser Estimate of Sphericity*, ϵ , from the Mauchly's Test.

If $\epsilon < 0,75$, the third step would be to investigate the level of significance by looking at the *Greenhouse-Geisser correction* value. If $p < 0,05$, the last step would be to do a *Paired Sample T-test*. If $p > 0,05$, no statistical significance between the tested means occurred. If $\epsilon > 0,75$, then the third step would be to investigate the level of significance by looking at the *Huynh-Feldt correction* value. If $p < 0,05$, the last step would be to do a *Paired Sample T-test*. If $p > 0,05$, no statistical significance between the tested means.

4. Results

In this chapter, the results from the analysis of the survey are presented. The first section presents the calculated mean values and standard deviations of the learning activities, and the second presents the results from the Repeated Measures ANOVA, investigating whether significance occurs between the three dimensions of engagement and between the learning activities.

4.1 Mean values and standard deviations

In Table 4.1, the calculated mean values and standard deviations from the four questionnaires *Text*, *Film*, *Self-reflection* and *Quiz and Pairing* are presented. The numerical values for response were based on a five-point Likert scale, with 3 as a neutral midpoint. Furthermore, mean values and standard deviations for all questionnaires are presented in Appendix A–D.

Table 4.1: No. of respondents, N, the mean value and standard deviations, σ , for each learning activity and dimension of engagement. Note: *Behavioural engagement* in the category *Quiz and Pairing* is highlighted red due to insufficient values of Cronbach's alpha.

Learning activity	Dimension	N	Mean	σ
Text	Behavioural engagement	19	3,41	0,723
	Affective engagement	19	3,75	0,721
	Cognitive engagement	19	3,68	0,652
	All three dimensions	19	3,62	0,602
Film	Behavioural engagement	19	3,38	0,851
	Affective engagement	19	3,94	0,665
	Cognitive engagement	19	3,60	0,907
	All three dimensions	19	3,64	0,675
Self-reflection	Behavioural engagement	19	3,65	0,820
	Affective engagement	19	3,48	0,746
	Cognitive engagement	19	3,82	0,805
	All three dimensions	19	3,89	0,607
Quiz and Pairing	Behavioural engagement	19	3,72	0,891
	Affective engagement	19	3,63	0,661
	Cognitive engagement	19	4,32	0,582
	All three dimensions	19	3,65	0,704
Total	Behavioural engagement	19	3,48	0,618
	Affective engagement	19	3,70	0,548
	Cognitive engagement	19	3,85	0,623
	All three dimensions	19	3,68	0,549

From the table, among the learning activities, the lowest mean is found in *Film* and the dimension *Behavioural engagement*, with a value of 3,38, whereas the highest mean is found in *Quiz and Pairing* and the dimension *Cognitive engagement*, with a value of 4,32. The lowest standard deviation is found in *Quiz and Pairing* and the dimension *Cognitive engagement*, with a value of 0,582, whereas the highest standard deviation is found in the learning activity *Film* and the dimension *Cognitive engagement*, with the value 0,907. Moreover, the result shows that the mean values for all categories are higher than the neutral midpoint value and thus located in the upper range. As a complement to Table 4.1, a graphical representation of the mean values is presented in Figure 4.1.

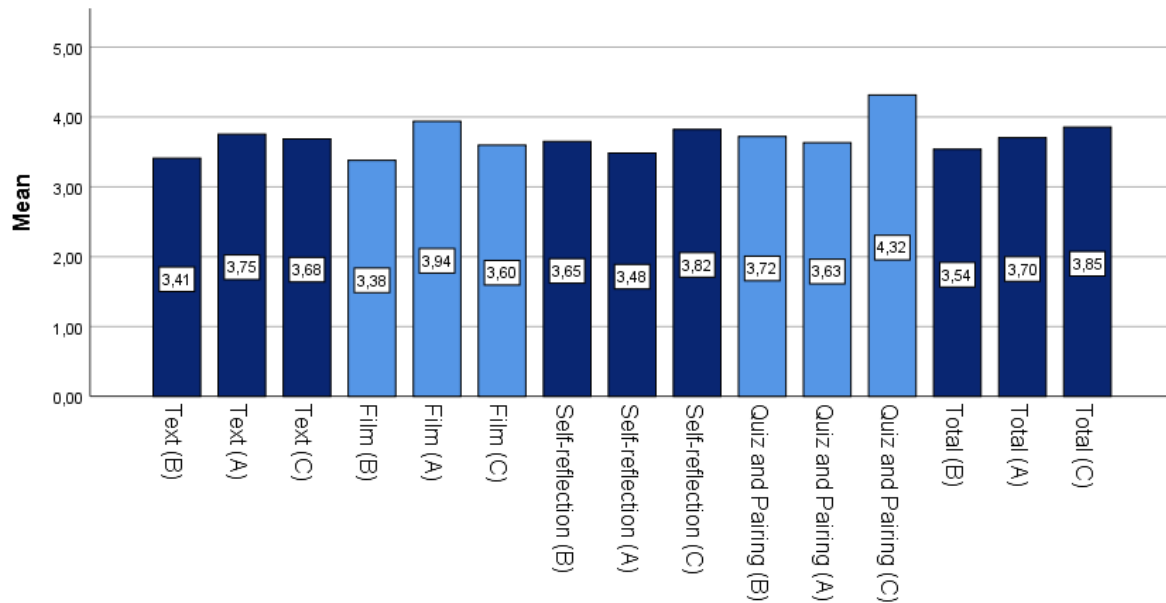


Figure 4.1: Mean values of each learning activity and dimension of engagement. (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

4.2 Repeated Measures ANOVA

In the following subsection, the results from the Repeated Measures ANOVA are presented for each learning activity and for the total engagement of all learning activities. Also, the results from the Paired Sample T-test are presented, showing where significant differences occur between the dimensions of engagement. In the accompanying figures, boxes highlighted in green represent the steps made for the current analysis.

4.2.1 Total engagement

Figure 4.2 presents the steps from the Repeated Measures ANOVA of all learning activities, investigating whether significance occurs between the three dimensions of engagement. In each step, decisive values for the process are presented.

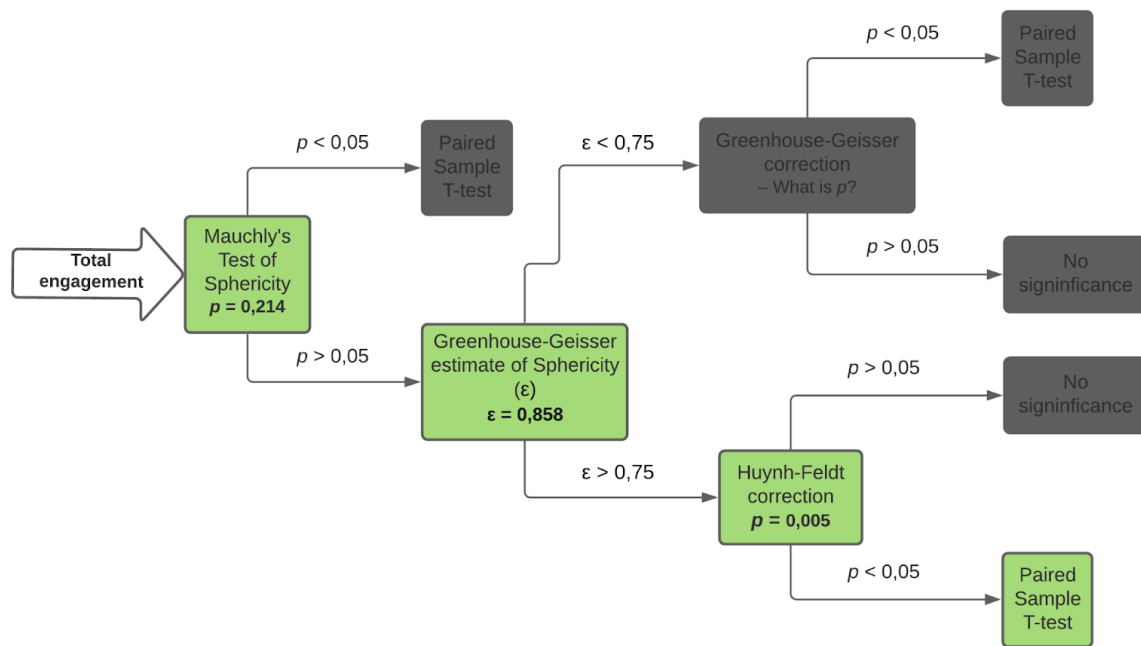


Figure 4.2: Process chart of Repeated Measures ANOVA, for the total engagement of the learning activities, presenting decisive value for each step.

The Repeated Measures ANOVA shows that significance occurs, leading to a Paired Sample T-test. The result is presented in Table 4.2.

Table 4.2: Paired Sample T-test, for the total engagement of the learning activities, presenting the difference between means (Δ_{mean}), T-test statistic (t), Degrees of Freedom (df) and Significance (p). (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

Compared dimensions of engagement	Δ_{mean}	t	df	p
Total (B) - Total (A)	-0,163	-2,296	18	0,034
Total (A) - Total (C)	-0,159	-1,751	18	0,097
Total (B) - Total (C)	-0,315	-3,083	18	0,006

The Paired Sample T-test shows that significance occurs between *Behavioural engagement* and *Affective engagement*, with a value of $p = 0,034$ and between *Behavioural engagement* and *Cognitive engagement*, with a value of $p = 0,006$. This means that both *Affective engagement* and *Cognitive engagement* have a statistically significant higher mean value than *Behavioural engagement* in the total engagement of all learning activities.

4.2.2 Text

Figure 4.3 presents the steps from the Repeated Measures ANOVA of the learning activity *Text*, investigating whether significance occurs between the three dimensions of engagement. In each step, decisive values for the process are presented.

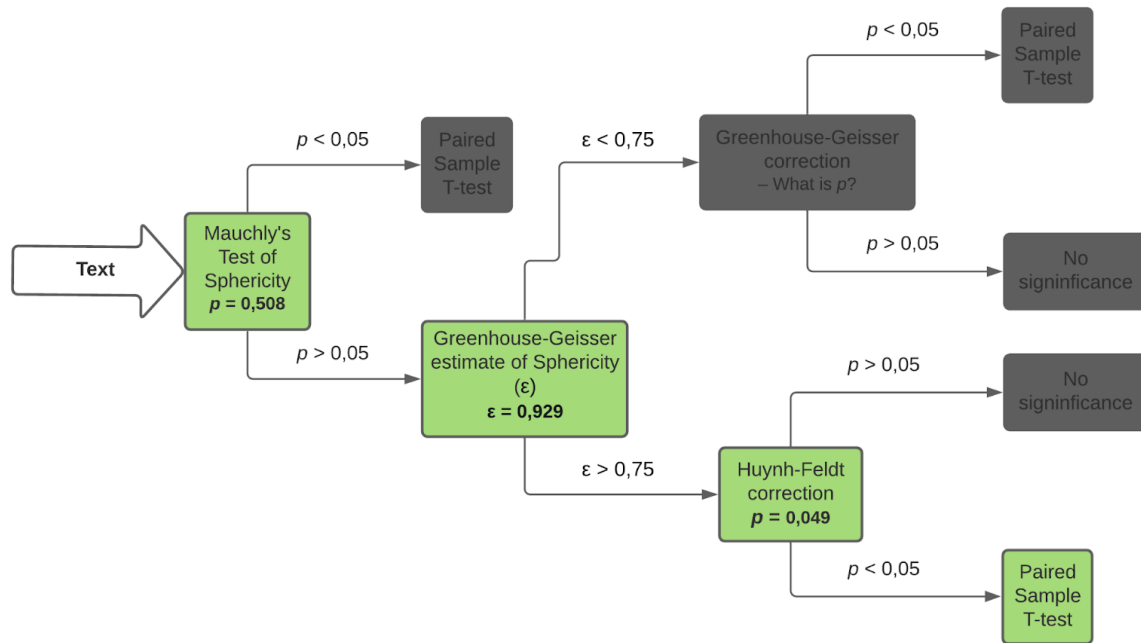


Figure 4.3: Process chart of Repeated Measures ANOVA, for the learning activity *Text*, presenting decisive value for each step.

The Repeated Measures ANOVA shows that significance occurs, leading to a Paired Sample T-test. The result is presented in Table 4.3.

Table 4.3: Paired Sample T-test, for the learning activity *Text*, presenting the difference between means (Δ_{mean}), T-test statistic (t), Degrees of Freedom (df) and Significance (p). (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

Compared dimensions of engagement	Δ_{mean}	t	df	p
Text (B) - Text (A)	-0,345	-2,83	18	0,011
Text (A) - Text (C)	0,070	0,48	18	0,637
Text (B) - Text (C)	-0,274	-1,76	18	0,095

The Paired Sample T-test shows that significance occurs between *Behavioural engagement* and *Affective engagement*, solely, with a value of $p = 0,011$. This means that *Affective engagement* has a statistically significant higher mean value than *Behavioural engagement* in the learning activity *Text*.

4.2.3 Film

Figure 4.4 presents the steps from the Repeated Measures ANOVA of the learning activity *Film*, investigating whether significance occurs between the three dimensions of engagement. In each step, decisive values for the process are presented.

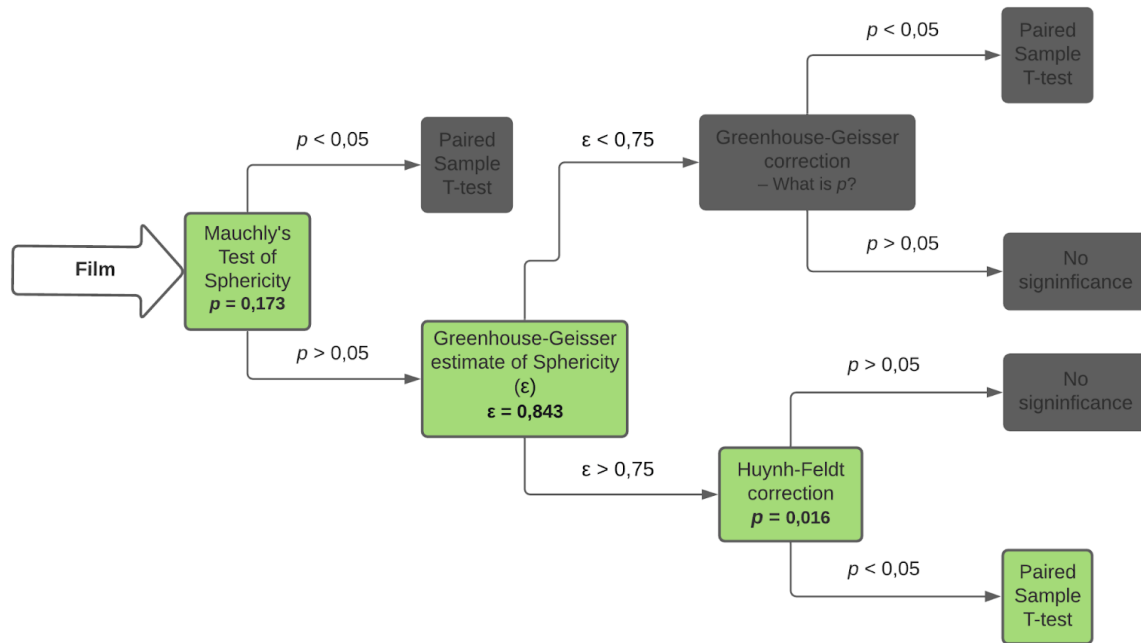


Figure 4.4: Process chart of Repeated Measures ANOVA, for the learning activity *Film*, presenting decisive value for each step.

The Repeated Measures ANOVA shows that significance occurs, leading to a Paired Sample T-test. The result is presented in Table 4.4.

Table 4.4: Paired Samples T-test, for the learning activity *Film*, presenting the difference between means (Δ_{mean}), T-test statistic (t), Degrees of Freedom (df) and Significance (p). (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

Compared dimensions of engagement	Δ_{mean}	t	df	p
Film (B) - Film (A)	-0,560	-3,245	18	0,004
Film (A) - Film (C)	0,342	2,298	18	0,034
Film (B) - Film (C)	-0,2175	-1,014	18	0,324

The Paired Sample T-test shows that significance occurs between *Behavioural engagement* and *Affective engagement*, with a value of $p = 0,004$, and between *Affective engagement* and *Cognitive engagement*, with a value of $p = 0,034$. This means that *Affective engagement* has a statistically significant higher mean value than both *Behavioural engagement* and *Cognitive engagement* in the learning activity *Film*.

4.2.4 Self-reflection

Figure 4.5 presents the steps from the Repeated Measures ANOVA of the learning activity *Self-reflection*, investigating whether significance occurs between the three dimensions of engagement. In each step, decisive values for the process are presented.

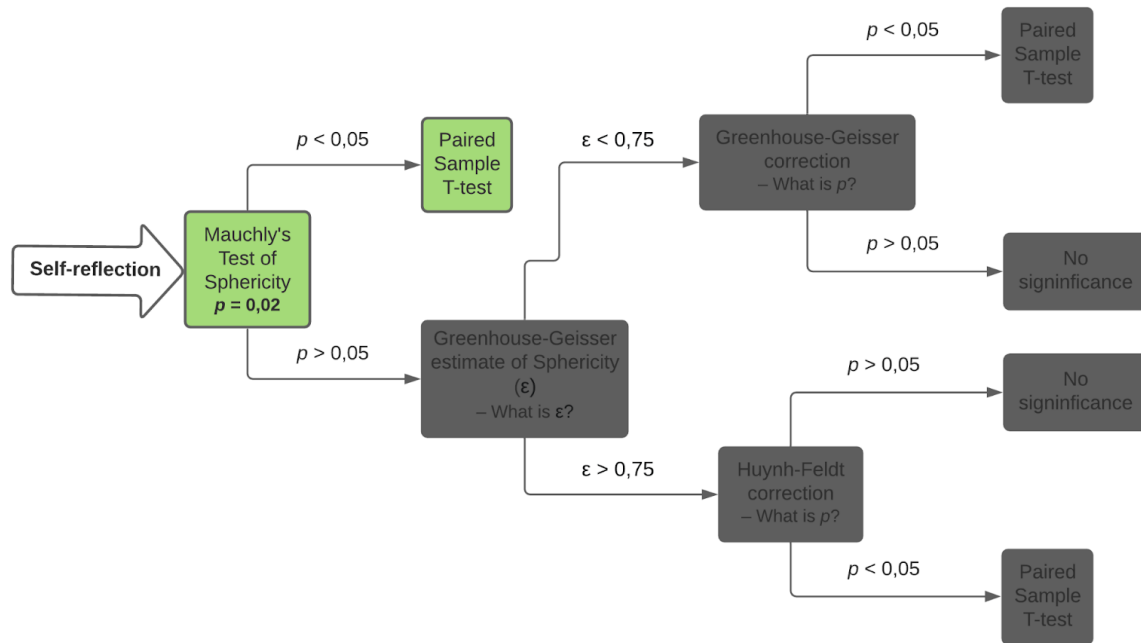


Figure 4.5: Process chart of Repeated Measures ANOVA, for the learning activity *Self-reflection*, presenting decisive value for each step.

The Repeated Measures ANOVA shows that significance occurs, leading to a Paired Sample T-test. The result is presented in Table 4.5.

Table 4.5: Paired Sample T-test, for the learning activity *Self-reflection*, presenting the difference between means (Δ_{mean}), T-test statistic (t), Degrees of Freedom (df) and Significance (p). (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

Compared dimensions of engagement	Δ_{mean}	t	df	p
Self-reflection (B) - Self-reflection (A)	0,165	1,345	18	0,195
Self-reflection (A) - Self-reflection (C)	-0,337	-2,866	18	0,010
Self-reflection (B) - Self-reflection (C)	-0,172	-0,943	18	0,358

The Paired Sample T-test shows that significance occurs between *Affective engagement* and *Cognitive engagement*, solely, with a value of $p = 0,010$. This means that *Cognitive engagement* has a statistically significant higher mean value than *Affective engagement* in the learning activity *Self-reflection*.

4.2.5 Quiz and Pairing

Figure 4.6 presents the steps from the Repeated Measures ANOVA of the learning activity *Quiz and Pairing*, investigating whether significance occurs between the three dimensions of engagement. In each step, decisive values for the process are presented.

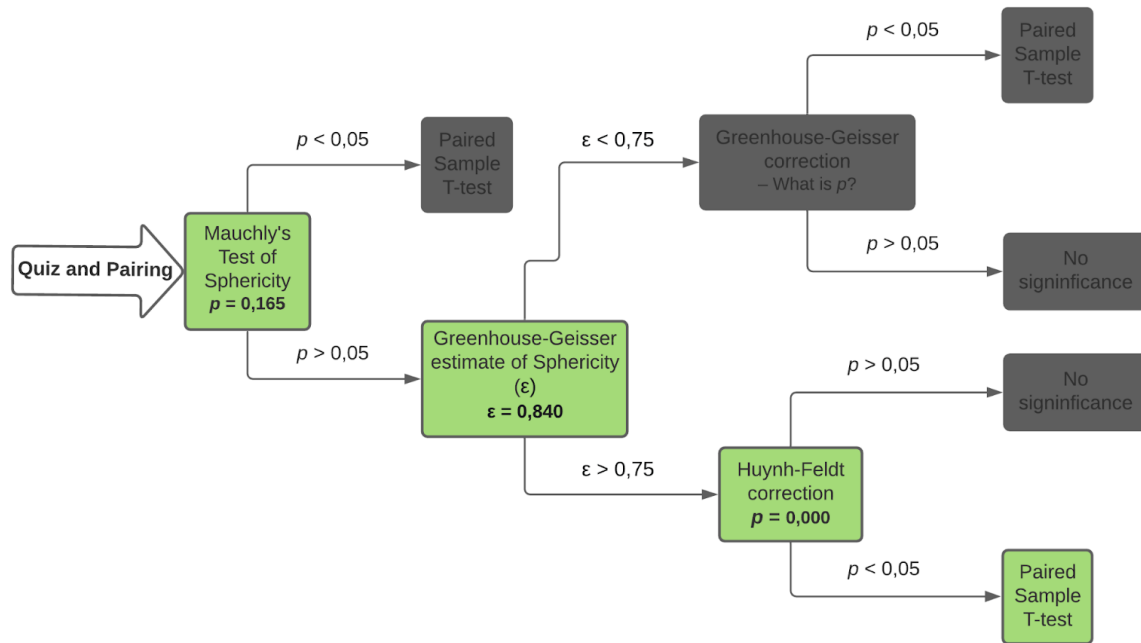


Figure 4.6: Process chart of Repeated Measures ANOVA, for the learning activity *Quiz and Pairing*, presenting decisive value for each step.

The Repeated Measures ANOVA shows that significance occurs, leading to a Paired Sample T-test. The result is presented in Table 4.6.

Table 4.6: Paired Sample T-test, for the learning activity *Quiz and Pairing*, presenting the difference between means (Δ_{mean}), T-test statistic (t), Degrees of Freedom (df) and Significance (p). (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement. Note: the behavioural engagement in *Quiz and Pairing* were insufficient, see Table 3.7.

Compared dimensions of engagement	Δ_{mean}	t	df	p
Quiz and Pairing (B) - Quiz and Pairing (A)	0,088	0,698	18	0,494
Quiz and Pairing (A) - Quiz and Pairing (C)	-0,684	-4,489	18	0,000
Quiz and Pairing (B) - Quiz and Pairing (C)	-0,597	-3,227	18	0,005

The Paired Sample T-test shows that significance occurs between *Affective engagement* and *Cognitive engagement*, with a value of $p = 0,000$ and between *Behavioural engagement* and *Cognitive engagement*, with a value of $p = 0,005$. This means that *Cognitive engagement* has a statistically significant higher mean value than both *Affective engagement* and *Behavioural engagement* in the learning activity *Quiz and Pairing*. Though, it should be noted that the category *Behavioural engagement* did not achieve an adequate value on Cronbach's alpha, as presented in Table 3.7, why the result might not be reliable.

4.2.6 Learning activities

Figure 4.7 presents the steps from the Repeated Measures ANOVA, investigating whether significance occurs between the learning activities with the mean value of all three dimensions of engagement combined. In each step, decisive values for the process are presented.

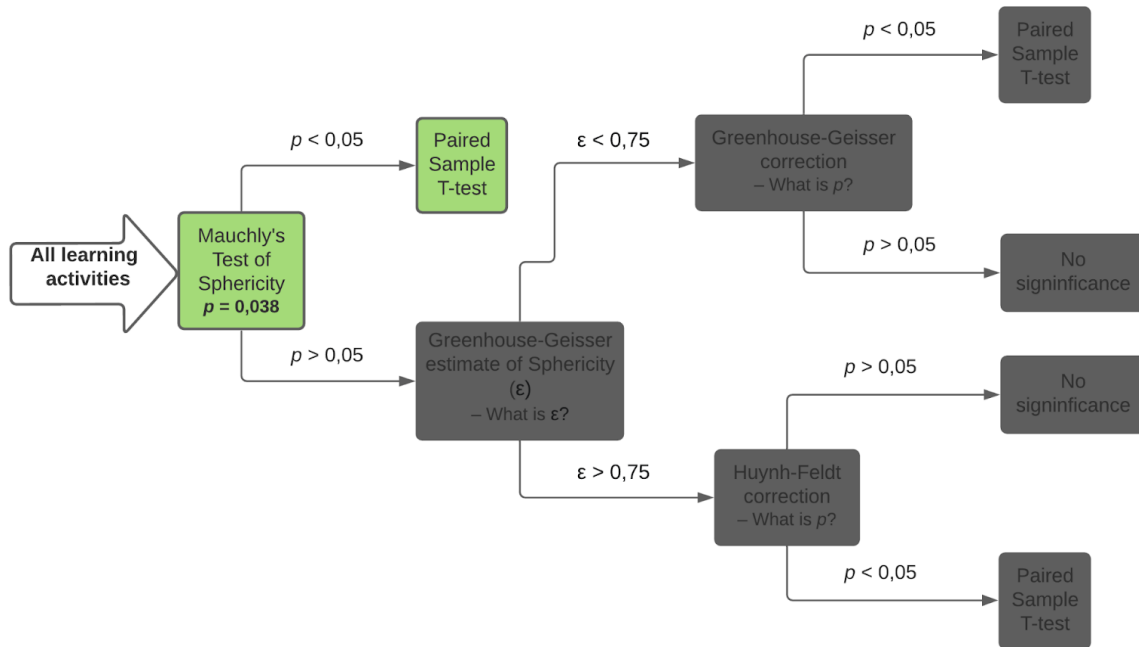


Figure 4.7: Process chart of Repeated Measures ANOVA, calculated between the learning activities, presenting decisive value for each step.

The Repeated Measures ANOVA shows that significance occurs, leading to a Paired Sample T-test. The result is presented in Table 4.7.

Table 4.7: Paired Sample T-test, for the learning activities, presenting the difference between means (Δ_{mean}), T-test statistic (t), Degrees of Freedom (df) and Significance (p). (B) refers to Behavioural engagement, (A) refers to Affective engagement, and (C) refers to Cognitive engagement.

Compared learning activities	Δ_{mean}	t	df	p
Text - Film	−0,022	−0,314	18	0,757
Text - Self-reflection	−0,035	−0,251	18	0,804
Text - Quiz and Pairing	−0,273	−2,554	18	0,020
Film - Self-reflection	−0,014	−0,094	18	0,926
Film - Quiz and Pairing	−0,251	−2,433	18	0,026
Self-reflection - Quiz and Pairing	−0,237	−1,554	18	0,138

The Paired Sample T-test shows that significance occurs between *Text* and *Quiz and Pairing*, with a value of $p = 0,020$ and between *Film* and *Quiz and Pairing*, with a value of $p = 0,026$. This means that both *Text* and *Film* have a statistically significant lower mean value than *Quiz and Pairing*.

5. Discussion

The purpose of this study was to investigate the *engagement* of the participants in the teacher free E-learning course Agenda 2030-linsen, from a multidimensional construct consisting of the three dimensions behavioural, affective and cognitive engagement. To do this, an engagement scale was developed based on prior research from the four studies by Ben-Eliyahu et al. (2018), Deng et al. (2020), Fredricks et al. (2016) and Lam et al. (2014), as a survey consisting of five questionnaires. Each questionnaire corresponded with one of the learning activities *Text*, *Film*, *Self-reflection*, *Quiz and Pairing*, and *Workshop*, chosen for investigation from a conducted course review. Though, due to an insufficient number of respondents in *Workshop*, it was decided to remove that questionnaire from the analysis. Moreover, from the analyses made, the results revealed that the average engagement level was relatively high and consistent across all dimensions of engagement and learning activities, with mean values throughout located in the upper range on the five-point Likert scale.

In the following two sections, the outcome of the stated research questions will be discussed. Then, the research approach, instrument design and data collection are critically examined and its limitations are stated, followed by recommendations for future research.

5.1 RQ1: How do participants experience their behavioural, cognitive and affective engagement in Agenda 2030-linsen?

The first research question to be answered regards the state of engagement that Agenda 2030-linsen generates from the three dimensions *Behavioural engagement*, *Cognitive engagement* and *Affective engagement*, based on the participants' self-reported experience. As the result reveals, the short answer would be that the course generates a relatively high level of engagement, in all three dimensions. Of the four measured learning activities, every calculated mean value is located in the upper range on the five-point Likert scale, with the lowest value 3,38 and the highest 4,32. Since all the mean values are higher than the neutral midpoint, together with relatively low standard deviations in all measured areas, this would also indicate that no learning activity deviates by reflecting a distinctly lower engagement.

The overall high engagement in Agenda 2030-linsen is not too surprising. Seeing how the course is designed, it offers a wide range of different learning activities and thus, as Khan et al. (2017) highlight as best practice for promoting engagement, presents information in a varied way. Also, from observing the course, Agenda 2030-linsen offers a high grade of authenticity and the ambition to generate a feeling of work relevance for the participants is clearly noticeable, which is in line with what Britt (2015) and Waight and Stewart (2005) claim is important for increasing engagement in E-learning for adults. It intends to provide the participants' point of view where sustainability is included in every business decision that is made – an intention which can be identified in the learning activity *Self-reflection* where the participants are consistently encouraged to reflect on how the course material could relate to their company. Another factor that could support the result of high engagement in Agenda 2030-linsen is, as Arghode et al. (2017) state, the possibility to conduct the course when suitable

for the participants. Seeing as the participants are taking the course in parallel with their other work tasks, it might be beneficial for the engagement to be able to prioritise the course based on their own situation.

Besides showing that the behavioural engagement was significantly lower than both the affective and cognitive engagement, in total, the result showed that no significance occurred between the latter two. This should question the need for a multidimensional construct, consisting of three dimensions of engagement, in the current study. Instead, as in some research, the affective and cognitive engagement could be measured as one and not separated. This on the basis that rational thoughts, that refers to cognitive engagement, and emotions, that refers to affective engagement, cannot be distinguished (Tucker, 2020). On the other hand, in the learning activities *Film*, *Self-reflection*, and *Quiz and Pairing*, significance occurs between the affective and cognitive engagement. Therefore, the results would implicate the need for the three-factor multidimensional construct, though one should be aware that the factors of engagement interact and are not isolated (Ben-Eliyahu et al., 2018; Fredricks et al., 2004; Lam et al., 2014). Thus, if being aware of the different facets of engagement when designing an E-learning course, the designer should have more possibilities to construct a dynamically engaging course.

Even though the generally high level of engagement is not too surprising, the relatively low spreading between the engagement of the learning activities is. The result showed that significance only occurred between *Quiz and Pairing*, and *Text* and *Film*, where though the first had significantly higher mean values than the latter two, the differences were relatively low. Similar to what Khan et al. (2017) and Martin and Bollinger (2018) state, there was an expectation that the more activating learning activities, such as *Self-reflection* and *Quiz and Pairing* would have a distinctly higher mean value than the considered more passive activities *Text* and *Film*. One possible explanation for the low distinction could be that the wide variety of learning activities, together with the offered flexibility when conducting is what generates the high engagement. Since many of the learning activities are based on each other rather than standing alone, the engagement is perhaps reflected holistically rather than in each learning activity. Another explanation could be that the participants started the course with a high level of engagement and that the learning activities maintained it.

5.2 RQ2: What adaptations in the learning design of Agenda 2030-linsen are likely to result in increased engagement of its participants?

Based on the results of this study, with a generally high level in all dimensions of engagement, no major adaptations are considered needed for the course design. However, looking at the results in detail, minor differences can be identified between the three dimensions. In particular, the behavioural engagement appears to be generally lower than both the affective and cognitive engagement, in several learning activities. Thus, adaptations in the course design that would increase the behavioural engagement appear to be the most worthwhile effort to improve the overall engagement in the course.

One interesting finding was found from the answers in the questionnaires *Text* and *Film*, which Deng et al. (2020) state as a factor of behavioural engagement. An item formulated as *I took notes while reading the texts/watching the films* had relatively low mean values, 2,26 ($\sigma = 1,558$) in *Text* (Appendix A) and 2,21 ($\sigma = 1,398$) in *Film* (Appendix B). As of today, note-taking is nowhere mentioned or encouraged in the course, and thus, one adaptation that could be beneficial for increasing the behavioural engagement is to continuously exhort the participants to do this. Especially since most of the course is singly carried out and not in groups, why it would be more difficult to be inspired by the behaviour of others.

Another finding regarding the behavioural engagement was found in the questionnaire *Self-reflection*. In the item *If the exercise encouraged discussion, e.g., with a colleague, I did*, the mean value was relatively low, 1,58 ($\sigma = 1,071$) (Appendix C). As of today, the participants are encouraged to discuss some of the self-reflecting exercises with colleagues, but as the results indicate this is not followed to a high extent. Ben-Eliyahu et al. (2018), Fredricks et al. (2004) and Jung and Lee (2018) state that discussion between peers is a factor for behavioural engagement, so to increase the engagement in this category one adaptation could be to exhort the participants to discuss rather than just encourage. Furthermore, Hew (2016), Khan et al. (2017) and Martin and Bollinger (2018) highlight the importance of discussion for increasing the overall engagement. To facilitate discussion, another adaptation could be to implement discussion boards or chat functions in the course, both for communication between peers as well as with Miljöbron in their role as experts.

5.3 Limitations

Despite having made the best efforts to conduct a coherent study, the research approach and its actual implementation into practice are subject to a number of limitations to be considered when interpreting the results.

The engagement scale developed for this study showed generally high levels of internal consistency when calculating Cronbach's alpha, both when conducting the reliability analysis in the pre-study as well as in the main study. This, together with the basis that each item was developed in the footsteps of Ben-Eliyahu et al. (2018), Deng et al. (2020), Fredricks et al. (2016) and Lam et al. (2014), implies that the scale measures the three dimensions of engagement, unambiguously. Therefore, based on the same principles, future research should be able to use the engagement scale in this study as a foundation for similar investigations. However, one concern that could be held against the scale is the low sample size when conducting the reliability analyses. In the pre-study, the analysis was based on the answers from 5 respondents, which further were used as a complement to the 14 respondents in the main study. Additionally, due to an insufficient number of respondents in *Workshop*, the questionnaire was completely removed for the analysis in the main study. Hence, if using the engagement scale in future research, the recommendation would be to not exclude a reliability analysis.

Since the engagement scale was inspired by prior research and conditions indicating a possibility to collect a vast amount of data, it was considered close at hand to choose a quantitative approach for the study. As discussed in the paragraph above, using this approach facilitated the possibility to develop a solid instrument for measuring engagement. Relative to the first research question, the results generated a clear conception of how the participants' experienced their engagement in Agenda 2030-linsen. Likewise, relative to the second research question the results, together with prior research, has also made it possible to provide propositions on how certain adaptations can be made that would likely increase the engagement. Yet, there was an expectation that the result of the study would reflect a larger variation between the engagement in the learning activities, which would facilitate the possibility to recommend adaptations on a more detailed level. Due to time-limitation, the survey was closed during a period when answers still were coming in. It is possible that a larger sample size would have generated more variation in the results. Alternatively, to get a more profound perception of where and why the engagement fluctuates in a learning activity, interviews with some of the participants could have served as a complement to the survey.

As a consequence of the fact that the data collection was closed before all the respondents had completed the course, together with the choice of letting the participants' use their aliases, 14 answers were used for the analysis of the main study. This was considered on the lower side, why the 5 answers from the pre-study were added to the analysis. There are some notable aspects of the choice of not using all the answers from the main study as well as by adding the 5 answers from the pre-study to consider.

The choice of using 14 answers from the main study and thus remove a relatively large number of respondents, could be argued to be problematic from an ethical point of view. This, because the removed respondents had put time and effort in answering the questionnaires. However, the conditions for answering the questionnaires were clearly stated, with instructions on using the same alias throughout the survey. At the same time, some of the removed respondents were not used because they had not completed all the questionnaires before the data collection was closed. This was of course unfortunate, but the ambition to use the same sample group for the analysis was considered more valuable for the study than the risk of *wasting* the respondents time and effort. Another concern of removing some of the respondents is that those used could potentially be more ambitious and eager to complete the course, which also could have affected the overall high engagement.

By mixing the two sample groups, the possibility to completely follow one of the suggestions by Carini et al. (2016) was removed, seeing as the sample group from the pre-study did not answer the questionnaires in close connection to the learning activities. This could mean that their self-reported experience of engagement might not have been as reliable as the sample group from the main study. On the other hand, by mixing the two groups a larger sample size was received in total, and there is also a possibility that the different professional backgrounds of the two sample groups could have had a positive impact on the result, by providing more breadth to the study.

Another consequence of closing the data collection when answers were still coming in was the decision to remove the questionnaire *Workshop* from the analysis. The workshop consists of group activities where the participants are supposed to develop ideas on how their company can implement sustainability within the business model. In contrast to the other learning activities, peer discussions and active learning are natural elements of the workshop, factors that research has stated as advantageous for increasing the engagement in E-learning courses (Ben-Eliyahu et al., 2018; Fredricks et al., 2004; Hew, 2016; Jung & Lee, 2018; Khan et al., 2017; Martin & Bollinger, 2018). Thus, due to its characteristics and unique structure, it would have been interesting to analyse the result from the workshop. Also, since there were statements in the questionnaire regarding the general impression of the course, the influx of new knowledge and its relevance for their work, an analysis of the result from the workshop could have contributed to a deeper understanding of the participants' engagement in the course.

5.4 Future research

Few would question the importance of engagement for successful learning (Deng et al., 2020; Hew, 2016; Lam et al., 2012). This is not least reflected in research, where studies, such as the ones of Ben-Eliyahu et al. (2018), Deng et al. (2018), Fredricks et al. (2004; 2016), Jung and Lee (2018), and Lam et al. (2012; 2014) have investigated how the engagement of students is expressed, throughout the education system. Such scholars also imply that engagement should be seen as a multidimensional construct. However, less have tried mapping the engagement of the participants, from a multidimensional construct, in different learning activities. This study has contributed to such, by measuring the engagement of adult professionals in Agenda 2030-linsen. To continue developing and confirm the reliability of the engagement scale, one recommendation would be to apply the instrument in both similar environments but also in the ordinary school system.

Furthermore, the results show that the engagement of the participants was high in all three dimensions in Agenda 2030-linsen. With that being said, the results do not reveal either what the participants have learned or how the outcome of the course is transferred into the companies' business model. Based on the assumption that engagement is critical for successful learning, it would thus be interesting to investigate how these factors relate. Another recommendation is therefore to do a similar study, where an element of training transfer is also added. To concretise, this could be done by comparing two or more groups on how the engagement of each group correlates with to which extent their gained knowledge has been transferred into real actions of the company.

Since the survey was closed due to time constraints, in a stage where the number of answers in the questionnaire *Workshop* was considered too low, the engagement in this learning activity was not measured. With its unique characteristics in relation to the other learning activities, it would have been interesting to do a study where the workshop is not excluded. The lapse of data primarily leaves a gap to fill regarding the learning activity *Workshop*, but to further validate the instrument developed, future research should also use the engagement scale on

larger sample sizes. Moreover, seeing as the workshop, like the rest of the course, is conducted without an instructor, it would have been interesting to do a comparison study between two groups where one is under the lead of an instructor whereas the other is not. This, to measure if the engagement is affected by having a facilitator to consult or not.

6. Conclusion

This study aimed to investigate the engagement of the participants in the teacher free E-learning course Agenda 2030-linsen, based on the assumption that engagement plays a vital role for successful learning. The instrument used was developed in the footsteps of Ben-Eliyahu (2018), Deng et al. (2020), Fredrick et al. (2016) and Lam et al. (2014), consisting of five questionnaires that measures engagement from the three dimensions Behavioural, Affective and Cognitive engagement. The results show that Miljöbron has developed a course that engages throughout all the measured learning activities, with all the calculated mean values of the engagement located in the upper range on the five-point Likert scale, in all three dimensions of engagement. Also, the reliability analyses in both the pre-study and the main study indicates that the instrument developed in this study has a high validity. Thus, it is concluded that it should have the potential to constitute a foundation when measuring engagement in similar learning environments, as well as in the ordinary school system.

Even though Agenda 2030-linsen engages throughout the measured learning activities, some significant differences occur. In total, the behavioural engagement is significantly lower than both the affective and cognitive engagement. Accordingly, the recommendations provided to Miljöbron for increasing the behavioural engagement is to both exhort the participants to take notes during the learning activities, and to discuss with colleagues rather than encourage, as of today. Furthermore, facilitating discussion between participants as well as between participants and Miljöbron, for example by implementing chat functions within the course would be favourable for increasing the overall engagement (Hew, 2016; Khan et al., 2017; Martin & Bollinger, 2018).

Prior research has concluded that learner engagement is fundamental for successful learning (Deng et al., 2020; Hew, 2016; Lam et al., 2012). Some also claim that a high level of engagement are even more important in an online environment (Meyer, 2014; Sun & Rueda, 2012), due to the generally fewer ways to interact with the teachers or instructors whose presence have shown to have a positive effect on the learner engagement (Hew, 2016; Jung & Lee, 2018). Based on these conditions, this study has shown that Miljöbron has developed a teacher free E-learning course that generates a high engagement of its participants, throughout all dimensions of engagement, in all measured learning activities. With Agenda 2030-linsen has Miljöbron, together with the suggestions for adaptations provided in this thesis, created a firm foundation when further developing their E-learning course catalogue.

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Appendix

A. Text

Formulär – Text

I det första formuläret ges påståenden kopplade till de texter du hittills läst under kursens gång, till exempel om de globala målen och Triple Bottom Line: People, Planet, Profit. Alltså ber vi dig bara ta ställning utifrån de texter du läst inom kursen, och inget annat.

* Obligatoriskt

1. Vänligen fyll i ditt valda smeknamn nedan. *

2. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

	1 – Stämmer mycket dåligt	2 – Stämmer ganska dåligt	3 – Varken eller	4 – Stämmer ganska bra	5 – Stämmer mycket bra
Jag läste allt, oavsett längd.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag läste det extramaterial som tillhandahölls.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag var fokuserad när jag läste texterna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Om det var någonting jag inte förstod, läste jag det igen tills jag förstod.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I samband med texterna förde jag anteckningar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag läste texterna, kände jag att det var givande.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag läste texterna, kände jag mig uttråkad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag läste texterna, kände jag mig intresserad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag läste texterna, kände jag glädje.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag läste texterna, kände jag frustration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag tyckte om att läsa texterna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

	1 – Aldrig	2 – Sällan	3 – Ibland	4 – Ofta	5 – Alltid
Jag funderade över hur innehållet i texterna kunde relatera till mitt arbete.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag försökte koppla innehållet i texterna till tidigare kunskap.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag läste texterna reflekterade jag över innehållet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Om det är något ytterligare du vill kommentera gällande texterna eller som komplement till ovanstående påståenden, vänligen gör det nedan.

Det här innehållet har inte skapats och stöds inte av Microsoft. Data du skickar kommer att skickas till formulärets ägare.

 Microsoft Forms

4/28/2021

Questionnaire – Text

Item	Engagement Factor	Mean	σ
Jag läste allt, oavsett längd.	Behavioural	4,143	1,099
Jag läste det extramaterial som tillhandahölls.	Behavioural	2,286	1,267
Jag var fokuserad när jag läste texterna.	Behavioural	4,071	0,917
Om det var någonting jag inte förstod, läste jag det igen tills jag förstod.	Behavioural	4,429	0,852
I samband med texterna förde jag anteckningar.	Behavioural	2,286	1,590
När jag läste texterna, kände jag att det var givande.	Affective	4,214	0,699
När jag läste texterna, kände jag mig uttråkad. (R)	Affective	3,786	1,122
När jag läste texterna, kände jag mig intresserad.	Affective	3,929	1,207
När jag läste texterna, kände jag glädje.	Affective	3,071	1,072
När jag läste texterna, kände jag frustration. (R)	Affective	3,429	1,089
Jag tyckte om att läsa texterna.	Affective	4,071	0,917
Jag funderade över hur innehållet i texterna kunde relatera till mitt arbete.	Cognitive	3,429	0,646
Jag försökte koppla innehållet i texterna till tidigare kunskap.	Cognitive	3,500	1,225
När jag läste texterna reflekterade jag över innehållet.	Cognitive	3,929	0,616

B. Film

Formulär – Film

Nu är det dags för ytterligare ett formulär! I detta ges påståenden kopplade till de filmer du hittills sett under kursens gång, till exempel den där Johan Rockström pratade om Global Commons Alliance och Ted Talket av Edward Freeman om Business is about purpose. Alltså ber vi dig bara ta ställning utifrån de filmer du sett inom kursen, och inget annat.

* Obligatoriskt

1. Vänligen fyll i ditt tidigare valda smeknamn nedan. *

2. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

	1 – Stämmer mycket dåligt	2 – Stämmer ganska dåligt	3 – Varken eller	4 – Stämmer ganska bra	5 – Stämmer mycket bra
Jag tittade på hela filmerna, oavsett längd.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag tittade på det extramaterial som tillhandahölls.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag var fokuserad när jag tittade på filmerna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Om det var någonting jag inte förstod, tittade jag igen tills jag förstod.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I samband med filmerna förde jag anteckningar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag tittade på filmerna, kände jag att det var givande.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag tittade på filmerna, kände jag mig uttråkad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag tittade på filmerna, kände jag mig intresserad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag tittade på filmerna, kände jag glädje.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag tittade på filmerna, kände jag frustration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag tyckte om att titta på filmerna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4/28/2021

3. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

1 – Aldrig 2 – Sällan 3 – Ibland 4 – Ofta 5 – Alltid

Jag funderade över hur
innehållet i filmerna
kunde relatera till mitt
arbete.

☐☐☐☐☐

Jag försökte koppla
innehållet i filmerna till
tidigare kunskap.

☐☐☐☐☐

När jag tittade på
filmerna reflekterade
jag över innehållet.

☐☐☐☐☐

4. Om det är något ytterligare du vill kommentera gällande filmerna eller som
komplement till ovanstående påståenden, vänligen gör det nedan.

Det här innehållet har inte skapats och stöds inte av Microsoft. Data du skickar kommer att skickas till formulärets ägare.

 Microsoft Forms

4/28/2021

Questionnaire – Film

Item	Engagement Factor	Mean	σ
Jag tittade på hela filmerna, oavsett längd.	Behavioural	4,714	0,825
Jag tittade på det extramaterial som tillhandahölls.	Behavioural	2,857	1,562
Jag var fokuserad när jag tittade på filmerna.	Behavioural	4,214	0,802
Om det var någonting jag inte förstod, tittade jag igen tills jag förstod.	Behavioural	3,714	1,139
I samband med filmerna förde jag anteckningar.	Behavioural	2,214	1,369
När jag tittade på filmerna, kände jag att det var givande.	Affective	4,429	0,646
När jag tittade på filmerna, kände jag mig uttråkad. (R)	Affective	4,214	0,975
När jag tittade på filmerna, kände jag mig intresserad.	Affective	4,357	0,745
När jag tittade på filmerna, kände jag glädje.	Affective	3,214	0,975
När jag tittade på filmerna, kände jag frustration. (R)	Affective	3,786	0,975
Jag tyckte om att titta på filmerna.	Affective	4,071	1,072
Jag funderade över hur innehållet i filmerna kunde relatera till mitt arbete.	Cognitive	3,214	0,975
Jag försökte koppla innehållet i filmerna till tidigare kunskap.	Cognitive	3,429	1,284
När jag tittade på filmerna reflekterade jag över innehållet.	Cognitive	3,786	0,893

C. Self-reflection

Formulär – Självreflektion

Nu är det dags för ytterligare ett formulär! I detta ges påståenden kopplade till de övningar du genomfört i kursen, liksom den du precis besvarade om hur de globala målen kan kopplas till din bransch. Alltså ber vi dig bara ta ställning utifrån de självreflekterande övningar du genomfört inom kursen, och inget annat.

* Obligatoriskt

1. Vänligen fyll i ditt tidigare valda smeknamn nedan. *

2. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

	1 – Stämmer mycket dåligt	2 – Stämmer ganska dåligt	3 – Varken eller	4 – Stämmer ganska bra	5 – Stämmer mycket bra
Jag svarade på frågorna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Om övningen uppmuntrade till diskussion, med till exempel en kollega, gjorde jag det.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag ansträngde mig för att skriva ett bra svar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag svarade på frågorna utan att tänka efter.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag att det var givande.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag mig uttråkad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag mig intresserad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag glädje.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag frustration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

1 – Aldrig 2 – Sällan 3 – Ibland 4 – Ofta 5 – Alltid

Jag försökte ta flera aspekter i beaktning när jag svarade på frågorna.

☐☐☐☐☐

Jag ansträngde mig för att se min/företagets roll i sammanhanget.

☐☐☐☐☐

Jag försökte koppla det jag lärt mig i kursen till frågorna.

☐☐☐☐☐

Jag försökte koppla mina tidigare erfarenheter till frågorna.

☐☐☐☐☐

Jag reflekterade innan jag besvarade frågorna.

☐☐☐☐☐

4. Om det är något ytterligare du vill kommentera gällande övningarna eller som komplement till ovanstående påståenden, vänligen gör det nedan.

Det här innehållet har inte skapats och stöds inte av Microsoft. Data du skickar kommer att skickas till formulärets ägare.

 Microsoft Forms

4/28/2021

Questionnaire – Self-reflection

Item	Engagement Factor	Mean	σ
Jag svarade på frågorna.	Behavioural	3,571	1,158
Om övningen uppmuntrade till diskussion, med till exempel en kollega, gjorde jag det.	Behavioural	1,357	0,745
Jag ansträngde mig för att skriva ett bra svar.	Behavioural	3,500	1,019
Jag svarade på frågorna utan att tänka efter. (R)	Behavioural	2,429	1,016
När jag genomförde övningarna, kände jag att det var givande.	Affective	3,714	0,994
När jag genomförde övningarna, kände jag mig uttråkad. (R)	Affective	3,643	1,216
När jag genomförde övningarna, kände jag mig intresserad.	Affective	3,786	0,802
När jag genomförde övningarna, kände jag glädje.	Affective	2,857	0,949
När jag genomförde övningarna, kände jag frustration. (R)	Affective	3,214	1,051
Jag försökte ta flera aspekter i beaktning när jag svarade på frågorna.	Cognitive	3,571	0,938
Jag ansträngde mig för att se min/företagets roll i sammanhanget.	Cognitive	3,643	1,082
Jag försökte koppla det jag lärt mig i kursen till frågorna.	Cognitive	3,714	0,914
Jag försökte koppla mina tidigare erfarenheter till frågorna.	Cognitive	3,929	1,141
Jag reflekterade innan jag besvarade frågorna.	Cognitive	3,929	1,072

D. Quiz and Pairing

Formulär – Quiz/ihopparning

Nu är det dags för ytterligare ett formulär! I detta ges påståenden kopplade till de övningar där två kort ska matchas, liksom den du precis genomförde om företag och smarta affärsmodeller, och tidigare genomförda quiz om till exempel värdeerbjudande. Alltså ber vi dig bara ta ställning utifrån de ihopparnings-övningar och quiz du genomfört inom kursen, och inget annat.

* Obligatoriskt

1. Vänligen fyll i ditt tidigare valda smeknamn nedan. *

2. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

	1 – Stämmer mycket dåligt	2 – Stämmer ganska dåligt	3 – Varken eller	4 – Stämmer ganska bra	5 – Stämmer mycket bra
Jag chansade när jag genomförde övningarna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag ansträngde mig för att svara rätt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Om jag svarade fel, repeterade jag studiematerialet innan jag svarade igen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Om jag svarade fel första gången, svarade jag igen utan att tänka efter.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag att det var givande.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag mig uttråkad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag mig intresserad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag glädje.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde övningarna, kände jag frustration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Vänligen ange det svar som bäst stämmer överens med nedanstående påstående. *

1 – Aldrig

2 – Sällan

3 – Ibland

4 – Ofta

5 – Alltid

Jag reflekterade över
svarsalternativen innan
jag besvarade frågorna.

☐☐☐☐☐

4. Om det är något ytterligare du vill kommentera gällande övningarna eller som komplement till ovanstående påståenden, vänligen gör det nedan.

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 Microsoft Forms

4/28/2021

Questionnaire – Quiz and Pairing

Item	Engagement Factor	Mean	σ
Jag chansade när jag genomförde övningarna.	Behavioural	4,429	0,646
Jag ansträngde mig för att svara rätt.	Behavioural	3,857	1,351
Om jag svarade fel, repeterade jag studiematerialet innan jag svarade igen.	Behavioural	2,929	1,592
Om jag svarade fel första gången, svarade jag igen utan att tänka efter. (R)	Behavioural	4,357	0,842
När jag genomförde övningarna, kände jag att det var givande.	Affective	3,786	0,699
När jag genomförde övningarna, kände jag mig uttråkad. (R)	Affective	4,000	0,961
När jag genomförde övningarna, kände jag mig intresserad.	Affective	3,714	1,069
När jag genomförde övningarna, kände jag glädje.	Affective	2,929	0,997
När jag genomförde övningarna, kände jag frustration. (R)	Affective	3,571	0,938
Jag reflekterade över svarsalternativen innan jag besvarade frågorna.	Cognitive	4,357	0,633

E. Workshop

Formulär – Workshop och uppsummerande intryck

Nu är det dags för det sista formuläret! Det här formuläret är uppdelat i två avsnitt, där avsnitt ett är kopplat till workshopen och avsnitt två fokuserar på ditt allmänna intryck av hela kursen.

* Obligatoriskt

Workshop

I detta avsnitt ges påståenden kopplade till workshopen i sin helhet. Alltså ber vi dig bara ta ställning utifrån workshopen du precis genomfört, och inget annat.

1. Vänligen fyll i ditt tidigare valda smeknamn nedan. *

2. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

	1 – Stämmer mycket dåligt	2 – Stämmer ganska dåligt	3 – Varken eller	4 – Stämmer ganska bra	5 – Stämmer mycket bra
Jag genomförde workshopen i grupp.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag deltog aktivt under workshopen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag var passiv under workshopen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag diskuterade med andra under workshopen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag ansträngde mig för att resultatet av workshopen skulle bli så bra som möjligt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jag tog workshopen på allvar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde workshopen, kände jag att det var givande.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde workshopen, kände jag mig uttråkad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde workshopen, kände jag mig intresserad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde workshopen, kände jag glädje.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
När jag genomförde workshopen, kände jag frustration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Vänligen ange de svar som bäst stämmer överens med nedanstående påståenden. *

1 – Aldrig 2 – Sällan 3 – Ibland 4 – Ofta 5 – Alltid

Jag försökte ta flera aspekter i beaktning när jag genomförde workshopen.

☐☐☐☐☐

Under workshopen försökte jag se företagets roll i sammanhanget.

☐☐☐☐☐

Under workshopen utnyttjade jag det jag tidigare lärt mig i kursen.

☐☐☐☐☐

Under workshopen försökte jag förstå hur andra resonerade.

☐☐☐☐☐

Under workshopen förstod jag bättre vilka möjligheter/utmaningar inom hållbarhet som berör företaget.

☐☐☐☐☐

4. Om det är något ytterligare du vill kommentera gällande workshopen eller som komplement till ovanstående påståenden, vänligen gör det nedan.

Uppsummerande intryck

Nu är du alldeles strax färdig med Agenda 2030-linsen och vi vill härmed passa på att tacka för att du medverkat i vår studie. Som avslutning skulle vi önska att du tar ställning till nedanstående tre påståenden, gällande ditt allmänna intryck av kursen.

Ifall du har några frågor till oss som genomför studien nås vi på karlema@student.chalmers.se (<mailto:karlema@student.chalmers.se>) eller elvirag@student.chalmers.se (<mailto:elvirag@student.chalmers.se>).

Med vänliga hälsningar,
Karl Emanuelsson och Elvira Gustafsson

5. Vänligen ange det svar som bäst stämmer överens med nedanstående påstående.

1 – Stämmer
mycket dåligt 2 – Stämmer
ganska dåligt 3 – Varken eller 4 – Stämmer
ganska bra 5 – Stämmer
mycket bra

Jag har lärt mig mycket
under kursen.

☐ ☐ ☐ ☐ ☐

6. Kommentar på ovanstående påstående.

7. Vänligen ange det svar som bäst stämmer överens med nedanstående påstående.

1 – Stämmer
mycket dåligt 2 – Stämmer
ganska dåligt 3 – Varken eller 4 – Stämmer
ganska bra 5 – Stämmer
mycket bra

Kursens innehåll var
mycket relevant för min
yrkesutövning.

☐ ☐ ☐ ☐ ☐

8. Kommentar på ovanstående påstående.

9. Vänligen ange det svar som bäst stämmer överens med nedanstående påstående.

1 – Stämmer
mycket dåligt 2 – Stämmer
ganska dåligt 3 – Varken eller
4 – Stämmer
ganska bra 5 – Stämmer
mycket bra

Kursens upplägg var
mycket bra.

☐☐☐☐☐

10. Kommentar på ovanstående påstående.

Det här innehållet har inte skapats och stöds inte av Microsoft. Data du skickar kommer att skickas till formulärets ägare.

 Microsoft Forms

5/13/2021



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