Writing a master's thesis: Associations between the grade, self-efficacy for thesis writing, approaches to writing, and experiences of the thesis as a teaching and learning environment

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Abstract: Master's thesis writing is a challenging endeavor, requiring students to engage in deeper learning processes and apply several academic competencies. This study investigates the associations between students' approaches to master's thesis writing, the perceptions of the thesis as a teaching-learning environment, self-efficacy for thesis writing, and thesis grade. The data consist of engineering students' answers (N=283) to a survey and their thesis grade, gathered from the study register of a Finnish university. The findings indicate a positive association between the thesis grade, deep and organized approach to thesis writing, and self-efficacy, as well as levels of interest and relevance for thesis writing. This study identified three groups of thesis writers who differed from each other in their approaches to thesis writing: 1) Students applying a dissonant approach; 2) Students applying a deep and organized approach; 3) Students applying an unorganized approach. Students applying a deep and organized approach to thesis writing differed significantly from the other two groups, scoring higher in their experiences of the elements of the thesis as a learning environment, self-efficacy for thesis writing, and thesis grade. This study highlights its results in conjunction with previous research and offers practical implications for master's thesis writing support.

Keywords: master's thesis writing, approaches to thesis writing, thesis as a teaching-learning environment, thesis grade, self-efficacy for thesis writing

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1. Introduction

The process of writing a master's thesis can be both rewarding and challenging for university students. The thesis is generally viewed as a pinnacle of university studies, as it usually is required at the end of studies. Students commonly experience the thesis as an unforgettable achievement in their career and an important milestone in learning to conduct research (Ylijoki, 2003) and becoming specialists. However, the thesis can also be a source of challenges for students (de Kleijn et al., 2014; Wagener, 2018; Ylijoki, 2003). Through the thesis work, students have to demonstrate their capacity to conduct and report their research independently while at the same time they are still learning how to conduct research and report on it (de Kleijn et al., 2012; Ylijoki, 2003).

In the master's thesis writing process, students may struggle with having to employ an independent, methodical, and critical approach to research. The master's thesis as a more extensive and demanding learning task embodies a wide range of academic competences (Tuononen & Parpala, 2021), often requiring the students to shift their earlier approaches to writing and learning (Ylijoki, 2003). Such a shift may involve engaging in deeper learning processes and writing from deeper perspectives (Scardamalia & Bereiter, 1987; Wisker, 2019). The deep approach to writing has been described as an attempt to create a coherent whole by reflecting from various perspectives while the surface approach to writing is seen as a more fact-producing and assignment-focused approach lacking coherence (Biggs, 1988a, 1988b; Prosser & Webb, 1994). The deep approach to writing has been connected to better writing outcomes or grades (Biggs, 1988b; Lavelle, 1993; Petri , 2007). Similar variation has been recognized within the widely researched framework of student approaches to learning (SAL), which refer to ways in which the students intend to approach studying and learning (Entwistle et al., 2006; Gijbels et al., 2005). Approaches to learning, which can be applied in individual ways (Lindblom-Ylänne & Lonka, 1999), are generally understood to be related to how students perceive the teaching and learning environment (TLE) (Kember et al., 2008; Parpala et al., 2010; Prosser & Trigwell, 1997), i.e. they are context sensitive.

However, writing approaches of university students have received limited research attention in specific writing contexts such as that of the master's thesis. Prior related writing research has concentrated more on students' conceptions of writing (Lavelle & Guarino, 2003; Lavelle & Zuercher, 2013; Lonka et al., 2008), which can include broader and more integrative conceptions related to specific processes of writing (Lonka et al., 2014) or strategies of writing (Lavelle, 2007), as well as to experiences of being a writer (Lavelle & Bushrow, 2007). Furthermore, research on writing conceptions has often lacked a specific writing context or writing task (Arias-Gundín et al., 2021), concentrating more, for instance, on conceptions of university essay writing in general (Lavelle & Guarino, 2003; Lavelle & Zuercher,

2013) or on the lengthier process of doctoral level writing (Cerrato-Lara et al., 2017; Lonka et al., 2014). Therefore, understanding the nature of students' deeper intentions and processes among more novice academic writers seems to be lacking in specific writing contexts such as that of the master's thesis.

This more specific context of the master's thesis should be investigated further for several reasons. First, as the master's thesis represents a culmination of the master's degree, its importance as a part of higher education teaching and learning is unquestionably high. Second, the master's thesis requires both advanced disciplinary knowledge and diverse academic competences, such as critical thinking, academic writing skills, and an ability to view and discuss from multiple perspectives (Tuononen et al., 2019). These advanced requirements can pose challenges for the thesis writers and may contribute to increased anxiety, prolonged studies, or even dropout (Ylijoki, 2003). It can be thus argued that understanding how students approach the master's thesis can reveal important insights about their ability to tackle this complex task. Furthermore, to build a more holistic understanding of the thesis process, it is essential to comprehend the nature of the elements of the thesis as a teaching and learning environment and to see the associations of these elements with students' approaches and their writing quality (i.e., grade). Such findings can also contribute to thesis supervision practices and the teaching of academic writing in higher education.

The present study aims to investigate the nature of student approaches to master's thesis writing and how these approaches are connected to the experiences of the thesis as a learning environment, self-efficacy for thesis writing, and the final outcome of the thesis, i.e., the thesis grade. The thesis grade, an outcome of a rigorous grading process involving independent graders and carefully crafted evaluation criteria, can serve as a more objective measure of the writing success.

2. Literature review

2.1 Approaches to writing

Novice writers have been found to lack a deeper, reflective approach to writing while more experienced writers seem to employ a deeper approach, reflecting from various perspectives and considering audience's needs more carefully (Scardamalia & Bereiter, 1987). These distinct ways of approaching writing are named as knowledge telling and knowledge transforming. Knowledge telling, employed more by novice writers, involves more direct reliance on memory and reporting of facts without deeper reflection. Knowledge transforming, more common among experienced writers, entails deeper reflection and reconstruction of ideas. Knowledge telling and knowledge transformation bear similarities with deep and surface approaches in writing, a distinction that has been further investigated in

numerous studies (see, for instance, Biggs, 1988b, 1988a; Ellis et al., 2007; Green, 2007; Lavelle, 1993; Lavelle & Zuercher, 2013; Prosser & Webb, 1994).

The deep approach to writing in Biggs's (1988a) work is described as affective, including higher levels of interest and enjoyment. Writers utilizing the deep approach aim to create a coherent whole of the topic by connecting it to their previous experiences, to their existing knowledge, and to their own viewpoint and the task in question (Biggs, 1988a; Prosser & Webb, 1994). The deep approach to writing has been linked to more skillful use of academic conventions, genre appropriateness, focus on the reader, and usage of rhetorical features (Biggs, 1988b, 1988a; Ellis et al., 2006; Green, 2007; Prosser & Webb, 1994). A positive association has been identified between the deep approach to writing, perceptions of the learning environment, and the writing grade (Ellis et al., 2007).

In turn, writing with a surface approach involves a more pragmatic motivation to complete the writing assignment requirements by presenting facts about the topic in question, in the fashion of listing key points (Biggs, 1988a; Prosser & Webb, 1994) and without the intention of creating a particularly coherent whole. Students applying the surface approach were found to revise more frequently, focusing more on linguistic features (Biggs, 1988a). A third approach identified in Biggs's work was the achieving approach to writing, which entails a desire to gain good grades by applying an organized approach to time management. The achieving approach can be utilized in combination with either the deep or the surface approaches. Furthermore, the deep and surface approaches to writing were sometimes found to be used with varying focus (Biggs, 1988b), hence named as the mixed approach. Later work has identified the surface approach to writing to involve a sensation of information gathering (lacking criticality), as well as negative, anxious feelings and a lack of understanding of academic conventions (Green, 2007).

Continuing with the deep-surface paradigm in writing, Lavelle's (1993) study developed a comprehensive model and inventory, the Inventory of Processes in College Composition, which included writing strategies and conceptions of writing. The deep approach was characterized through reflective and revision strategies of writing and the surface approach through little personal investment, more focus on mechanics, a product orientation, and little consideration of audience. Later work by Lavelle (2001, 2007) has revealed that the deep approach involves active agency in meaning making, complex revision, and awareness of writing as a tool for learning. The surface approach to writing entails more passivity, reproduction of information, and focus on micro-level editing. In sum, Lavelle's work has focused more on specific writing-related strategies and general writing-related conceptions, which were linked to the deep-surface paradigm (Biggs et al., 1999).

However, the more specific writing strategies or general conceptions of writing are not within the core interest of the present study; we aim to focus on the intentions and processes level, i.e., the deep – surface paradigm within approaches

to thesis writing. We aim to explore how these approaches are connected to perceptions of the thesis as a learning environment, self-efficacy to thesis writing, and thesis grade. Biggs (1988a) contended that approaches to writing are closely related to the student approaches learning framework, which has received wide research attention (Biggs, 1987; Entwistle, 1991; Lindblom-Ylänne et al., 2018; Marton & Säljö, 1976; Parpala et al., 2010). In the present study, we have adapted an instrument based on HowULearn (Parpala et al., 2010), a survey using the SAL framework and widely used in Finland, to the thesis context. Hence, the following section reviews the central work within the framework of student approaches to learning.

2.2 Approaches to learning

Approaches to learning refer to students' intentions in their studying and learning, to their learning processes (Entwistle et al., 2006; Gijbels et al., 2005), and to ways in which they tackle their learning assignments and learning in general (Parpala & Lindblom-Ylänne, 2012). The deep approach to learning is characterized by the attempt to understand meaning by connecting previously acquired knowledge and experiences to what is learned (Biggs, 1987; Entwistle & Peterson, 2004), using evidence and critical thinking, and having intrinsic motivation for learning (Entwistle & McCune, 2004). The surface approach, in turn, could be described as an external imposition to studying, an intention to cope minimally with course expectations, and a utilizing of unreflective learning strategies, such as memorizing and reproducing facts (Entwistle & Peterson, 2004; Parpala et al., 2010; Struyven et al., 2006; Trigwell & Prosser, 1991). The surface approach can often lead to a fragmented knowledge base, meaning that information can lack coherence and consist of disconnected pieces of information (Entwistle, 2009). According to recent evidence, the traditional surface approach based on mere memorization in the present-day demands of university studying is quite rare: hence, the traditional surface approach was proposed to be renamed as the unreflective approach by Lindblom-Ylänne et al. (2018), the result of which would be the fragmented knowledge base. Further evidence of the surface approach involving difficulties with relating the pieces of ideas together and understanding the contents as whole have been reported, for instance, by Parpala et. al. (2021) and Asikainen et. al. (2020). The term unreflective approach to thesis writing will be utilized in the present article instead of the term surface approach to writing, based on this recent research on the nature of the surface approach in the 21st century (Asikainen et al., 2020; Lindblom-Ylänne et al., 2018; Parpala, Mattsson, et al., 2021), upon which the present study is built and extended into the thesis writing context (see Section 3.4 Data analysis and Appendix A for further clarification of this choice). A third element, organized studying, refers to the ways students control their time and

study efforts. Organized studying can be understood more as an approach to studying than to learning (Entwistle & McCune, 2004).

Previous research has identified that these possible combinations of approaches to learning can be coherent or *dissonant,* meaning that they do not always form a theoretically predictable whole (Lindblom-Ylänne & Lonka, 1999; Meyer, 2000). These individual combinations of approaches to learning have been called study orchestrations (Lindblom-Ylänne & Lonka, 1999; Meyer, 1991). Such individual study orchestrations have been revealed by several person-oriented studies, identifying four different study profiles based on the approaches to learning: (1) students applying a deep approach; (2) organized students; (3) students applying a surface approach; and (4) unorganized students applying a deep approach (Asikainen et al., 2020; Parpala et al., 2010; Salmisto et al., 2017). However, a recent large-scale study by Parpala et al. (2021) identified slightly distinct learning profiles from the earlier studies mentioned above. Students applying a deep and organized approach represented the majority of the students in this study. Students applying a deep and unorganized approach represented the second largest profile. This study also identified two kinds of dissonant profiles, in which the scores for the deep and unreflective approaches were both either high or average.

It is important to note here that approaches to learning reflect the relationship between the learner and the context (Struyven et al., 2006) and therefore are connected with the learning environment (Entwistle & Peterson, 2004; Parpala & Lindblom-Ylänne, 2012). This means that the learning context, i.e., how teaching is organized and executed, is connected with different approaches to learning (Trigwell et al., 1999). Thus, student approaches to learning are not fixed and depend highly on the context. Prior research in SAL has mainly focused on student approaches to learning in a general fashion, without the specific contextual scope of a particular course / learning task. In the present study, we want to extend the SAL framework into the specific context of the master's thesis.

2.3 Experiences of the teaching and learning environment

Due to the context sensitivity, approaches to learning have been connected to how the student experiences the teaching and learning environment (TLE) (Asikainen, 2014; Entwistle & Peterson, 2004; Parpala et al., 2010; Struyven et al., 2006). TLE is understood to refer to the psychological, social and pedagogical contexts in which learning takes place (Fraser, 1998). A positive perception of the TLE has been connected with a deep approach while a negative perception with an unreflective approach (Parpala et al., 2010; Richardson, 2005; Salmisto et al., 2017).

Earlier studies that have focused on the social and pedagogical perspectives of the TLE have investigated constructive alignment, peer and teacher support, and aspects linked to the sensation of interest and relevance (Entwistle et al., 2002; Hyytinen et al., 2019; Parpala et al., 2010). Constructive alignment means that

teaching targets, methods, and evaluation should be aligned (Biggs, 2003). Peer support refers to the support students may give each other during studies or on a particular learning task, such as the thesis. Teacher support can be understood as perceived quality of teacher feedback, which in the thesis context would mean the perceived quality of supervisory feedback. Interest and relevance refer to how interesting, relevant, and enjoyable the learner perceives the topic / task in question. Much evidence exists on the importance of these TLE elements to learning processes. For instance, interest and relevance was identified to play an important role in high-quality learning by Salmisto et al., (2017), who found that students applying the deep approach experienced the TLE more positively, particularly in interest and relevance. In another study by Coertjens et al. (2016), interest and relevance was found to be negatively associated with unreflective studying. Peer support has been connected to the deep approach (Coertjens et al., 2016; Entwistle et al., 2003). The ways students perceived the quality of constructive feedback has been connected to the deep and organized approach to learning (Postareff et al., 2018). In sum, these studies highlight the importance of a supportive TLE, which should involve peer and teacher support, and elements that evoke interest.

Another often measured construct related to student learning is self-efficacy, which refers to a person's perception of their ability to perform a particular task (Bandura, 1977). In educational contexts, self-efficacy has been demonstrated to both predict and mediate students' actions and learning outcomes (Lane et al., 2006; Linnenbrink & Pintrich, 2003; Van Dinther et al., 2011). Low self-efficacy beliefs have been connected to the unreflective approach (Hailikari & Parpala, 2014; Phan, 2011) and high self-efficacy beliefs conversely with the deep approach (Diseth, 2011; Hyytinen et al., 2018; Linnenbrink & Pintrich, 2003). Within the specific process of master's thesis writing, the role of thesis writing self-efficacy has not been widely explored in prior literature to our knowledge.

2.4 Associations between approaches to learning, TLE and study success

Several studies have examined the connection between approaches to learning and study success. The deep approach has been associated with a higher GPA and the unreflective approach with a lower GPA (Hermann et al., 2017; Trigwell & Prosser, 1991). The organized study approach has been connected with higher grades (Salmisto et al., 2017) and with study success (Asikainen et al., 2014). However, in another study the deep approach was not connected with study success while the unreflective approach (negative relationship) and organized approach were found to predict study success (Diseth & Martinsen, 2003). This result could be explained by the context of the exam-oriented evaluation in question not evoking or demanding the deep approach. In other words, course assignments and evaluation may not always demonstrate quality of learning processes (Asikainen et al., 2013).

In a recent study (Parpala et al 2021), the deep and organized study profile was connected with the highest academic achievement and the deep and unorganized approach profile with lower academic achievement and lower self-efficacy beliefs. The dissonant approaches were found to be associated with lower academic achievement and lower self-efficacy. Their findings indicate that the dissonant study profiles as well as the deep and unorganized study profile may represent the students who struggle more in their studies.

2.5 Previous perspectives on the master's thesis writing process

Differences between low and high grade theses and the ways these refer to citations were identified by Petric (2007). Low grade theses seemed to utilize citations in the fashion of knowledge telling, lacking analysis and reflection. Higher grade theses, in turn, were found to utilize a variety of rhetorical ways to cite sources, displaying deeper reflection and connection between the citations. In another study, the deep approach to learning correlated positively with the thesis grade while the unreflective approach to learning correlated negatively with the thesis grade (Tuononen & Parpala, 2021). In this study, the following academic competencies were found to predict the master's thesis grade: analyzing and structuring information, making arguments, and looking for solutions. These competencies were thought to be interrelated to the deep approach to learning, although the deep approach to learning scale did not predict the master's thesis grade directly in this study. The approaches to learning in this study referred to the student approaches to learning in general and were not contextualized specifically for the thesis, which could explain why there was not a stronger association between the master's thesis grade and deep level learning processes.

Prior studies of the master's thesis process have concentrated on, for example, the supervisory perspective (Vehviläinen & Löfström, 2014), student-initiated questions as a part of academic supervision (Vehviläinen, 2009), and the supervisory perspective combined with student satisfaction concerning supervision (de Kleijn et al., 2012, 2014). Thesis writers who perceived more affiliation from their supervisor received higher thesis grades and were, in general, more satisfied (de Kleijn et al., 2012). Similarly, satisfaction with thesis supervision was found to be related to positive affect, which in turn correlated with the thesis grade and interest in the research subject (Wagener, 2018). These studies have revealed useful insights into the importance of supervisory affiliation, feedback, and balanced control (de Kleijn et al., 2012, 2014)) as well as into the need to support the thesis writers' agency (Vehviläinen, 2009; Vehviläinen & Löfström, 2014). However, to our knowledge, prior literature has not explored the thesis process from a more holistic, student perspective. Such a holistic perspective of the thesis process would include thesis writing approaches, experiences of the thesis as a TLE, self-efficacy for thesis writing, and thesis grade.

3. Method

3.1 Aim and research questions

The present study aims to investigate the associations between master's thesis writers' approaches to thesis writing, self-efficacy for thesis writing, experiences of the thesis as a TLE, and the thesis grade. The research questions are posed as follows:

1) What kind of approaches to thesis writing, experiences of the thesis as a TLE, and self-efficacy for thesis writing do the master's thesis writers report?

2) How are the approaches to thesis writing, self-efficacy beliefs, experiences of the thesis as a TLE, and thesis grade related to each other?

3) What kinds of different writer groups can be identified based on the approaches to thesis writing, and do these groups differ in terms of self-efficacy, experiences of the thesis as a TLE, and thesis grade?

3.2 Participants, data collection and context

The participants (N=283) were master's thesis writers from two different engineering schools at a Finnish research-intensive university. The writers were approached by email after submitting their thesis for review in the university's electronic system. This administrative system is used mainly for the submission and grading of bachelor's and master's theses as well as some other study administrative procedures. The school administrators gave the thesis writers' contact information to the first author after each submission date, who then sent the invitation to participate in the study by email. The survey link was sent to the thesis writers by e-mail, asking them to participate and reflect on their recent thesis writing experiences, and informing them that participation was voluntary. Students had the option to choose whether to answer the survey in Finnish or in English. Informed consent was ensured by asking the participants to give their consent to using their survey responses in the research. Furthermore, separate permission was requested to obtain the thesis grade from the study register and to link this data with the survey responses. The informed consent form explained that the privacy of the participants would be ensured throughout the lifecycle of the research project and that the participants could decide to withdraw from the study and have their data deleted at any point they wished.

The data were gathered at different submission dates during the years 2018-2020. Before the data gathering, the research permits to collect and manage this specific kind of data were applied and granted from the university's data management office, following the data protection regulations in place. The study follows the EU General Data Protection Regulation (GDPR). The study did not involve any threat to the physical integrity of the participants. It did not cause any exposure to exceptionally strong stimuli, which could have caused long-term mental harm

beyond the risks of daily life. Furthermore, it did not involve participants under the age of 15, requiring parental consent. Following these principles of the Finnish Advisory Board on Research Integrity (2019), this study did not require separate ethical review or approval in Finland.

The survey was sent to 718 students. A total of 313 students, or 44%, responded to the survey, but not all respondents granted permission to use their answers in research. The final N=283 consisted of 79% male, 20% female, 1% no report, percentages very similar to the gender breakdown in these engineering schools (74% male, 26% female). The language of master's theses is more commonly English: 81% of these writers wrote their thesis in English and 19% in Finnish. Of these writers, 188 reported their native language as Finnish and 11 as Swedish, and the rest represented a wide range of different mother tongues. Thus, most of the thesis writers in this study were writing in their second language.

In this university context, the engineering master's thesis writers often apply for a thesis internship either at an outside company/organization or as a part of a professor's project. Through this initial application, they express interest in the internship topic; thus, the thesis topic can often be a real-world problem or research topic from the company or professor's project. In fact, 72% of the thesis writers in this study worked with an outside company or organization on the thesis, and 81% of the writers received monetary compensation (salary or scholarship) for the master's thesis project. These thesis writers often have a thesis supervisor from the university as well as an advisor who can be from the outside company/organization or from the university. The university-based thesis supervisors may have attended optional pedagogical training, including courses on thesis supervision, but we do not have further information about this. In this university, thesis writing seminars/courses are not obligatory for thesis writers. Approximately 10% of the participants in our study had participated in a specific course for thesis writers. Thus, we can conclude that the thesis writing contexts can vary from person to person and from one supervisor to another.

3.3 Data

The data were gathered using modified survey items from the HowULearn questionnaire, formerly the Learn questionnaire (Parpala & Lindblom-Ylänne, 2012). The HowULearn survey has been validated in various contexts (Herrmann et al., 2017; Rytkönen et al., 2012; Sakurai et al., 2016). The items measuring self-efficacy in the HowULearn questionnaire originate from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich & DeGroot, 1990). The original items from the HowULearn questionnaire, which were in both Finnish and English, were modified and contextualized to fit into the master's thesis context and rewritten in English and Finnish by two authors of this study and two other researchers (who have developed the HowULearn survey in their research). The modified items (English

and Finnish versions) were then tested in multiple focus groups consisting of master's thesis writers in two different Finnish universities, after which the items were slightly modified to ensure better understanding. To ensure that students could answer the survey in the language they felt more comfortable with, they were able to choose which language they wanted to answer the survey in (Finnish or English).

Approaches to thesis writing consisted of 11 items total: deep approach, unreflective approach, and organized approach. Self-efficacy beliefs for thesis writing included 5 items in total. Experiences of the thesis as a teaching and learning environment consisted of 13 items in total: feedback and supervision; thesis objectives and requirements (reflecting constructive alignment); interest & relevance; and peer support. (The final scales and items can be found in Appendix A.)

The items were measured with a five-point Likert scale. The data also included background questions as well as the thesis grades obtained separately from the study register.

3.4 Data analysis

SPSS version 27 was used for the statistical analyses. In the first phase, initial screening of the data was performed. The data are considered acceptable in order to prove normal univariate distribution (George & Mallery, 2010). Missing data analysis was conducted. The per item missing data values were very low, ranging from 0-1.1%, and the average amount of missing values in the data was 0.2%. The missing data were not imputed.

As mentioned earlier, the original HowULearn survey items (Parpala & Lindblom-Ylänne, 2012) were rewritten and contextualized into the thesis writing context. Therefore, in the second phase of analysis, exploratory factor analysis (EFA) was chosen to explore the factor structure and to examine how the newly contextualized questionnaire items function in this new context. The three sets of items (11 items measuring approaches to learning, five items measuring self-efficacy beliefs, 13 items measuring experiences of the thesis as a teaching and learning environment) were separately subjected to an exploratory factor analysis, using principal axis factoring and Promax rotation (see, for instance, Costello & Osborne, 2005; de Winter & Dodou, 2012). An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the samples were factorable: for approaches to thesis writing (KMO=.783), for self-efficacy beliefs (KMO =.796), and for experiences of the teaching and learning environment TLE (KMO =.856). Thus, the data were suitable to conduct factor analysis (Bartlett's test $p < .001$).

For approaches to thesis writing, the solution yielded a 3-factor solution (labeled deep, unreflective, and organized approaches to thesis writing); for self-efficacy, a one-factor solution was identified, which is in line with several previous studies

(Herrmann et al., 2017; Parpala & Lindblom-Ylänne, 2012; Rytkönen et al., 2012). For experiences of the teaching and learning environment, a four factor-solution was identified (labeled interest and relevance; feedback and supervision; peer support; thesis objectives and requirements), similar again to previous studies (Herrmann et al., 2017; Parpala & Lindblom-Ylänne, 2012; Rytkönen et al., 2012). The Cronbach's alphas for the final scales were all above .60, which can be considered acceptable.

Appendix A presents the final scales and items, the Cronbach's alphas, and the factor loadings for each item. The deep approach to thesis writing scale contains items tapping into the intention of writing reflectively and from multiple perspectives. The unreflective approach to thesis writing is measured through items concerning the experience of a fragmented knowledge base which is rather a result of the unreflective approach (Entwistle, 2009; Lindblom-Ylänne et al., 2018). The items measuring the organized approach concern aspects related to time management and organization of the thesis project. The self-efficacy for thesis writing items aim to measure the level of confidence the writers had about tackling the thesis and understanding the contents. The feedback and supervision scale contains items measuring how useful the writers experienced their thesis supervisor's feedback in relation to developing the thesis or understanding its contents. The peer support items, in turn, concern the thesis writer's contact with other thesis writers and the experienced support they got from these contacts. The thesis objectives and requirements scale contains items measuring the constructive alignment of objectives and assessment in the thesis context. The interest and relevance scale contains items about the level of meaningfulness and relevance the thesis writer experienced with the thesis. Because the scale measuring thesis objectives and requirements remained only with two items, it was removed from the subsequent analysis because a scale with only two items may not accurately identify an underlying construct (Eisinga et al., 2013; Marsh et al., 1998).

The third phase of analysis utilized a variable-oriented approach, exploring how the approaches to thesis writing, self-efficacy, and experiences of the thesis as a TLE were related to each other and how they are related to the thesis grade. Pearson correlation was used to explore these relationships.

The fourth phase of analysis entailed a person-oriented approach, investigating thesis writer profiles based on the variation within approaches to thesis writing using K-means analysis. K-means cluster analysis was run with both three and four solutions. In addition, two-step cluster analysis indicated that both three and four cluster solutions were possible. The solution with three clusters was chosen because the clusters it produced differed more from each other than those in the four-cluster solution and made more theoretical sense, resembling the recent findings of Parpala, Mattsson, et al. (2021).

The differences in the experiences of the thesis as a TLE, self-efficacy beliefs for thesis writing, and thesis grade between the identified clusters were then explored by using ANOVA tests, post-hoc tests and effect sizes.

4. Results

Table 1 provides summaries of the sample, showing the mean scores and standard deviations for the master's thesis grade, and the scales measuring the approaches to thesis writing, self-efficacy, and TLE for thesis writing. The participants' mean score for the thesis grade 3.96 with a standard deviation of 0.7 resembles the general mean thesis grade from all students from these two schools (School 1: 3.90; *SD* 0.7; School 2: 3.89 *SD* 0.66 in 2019). The mean for the deep approach is quite high, (4.10) while the mean for the unreflective approach (2.34) is conversely quite low. The organized approach is somewhere in the middle (3.53). Self-efficacy mean is quite high (4.01). Out of the three scales measuring the thesis as a TLE (peer support, feedback and supervision, interest and relevance), peer support scores have the lowest mean (3.06) while the means for feedback and supervision as well as interest and relevance are relatively high (3.85 and 3.75 respectively).

Table 1. Descriptive statistics of thesis grade, approaches to thesis writing, self-efficacy for thesis writing, and experiences of the thesis as TLE (Scale:1-5)

	Min.	Max.	*M*	*SD*
Master's thesis grade	1	5	3.96	0.70
Approaches to thesis writing				
Unreflective approach to thesis writing	1.00	4.67	2.34	0.71
Deep approach to thesis writing	2.20	5.00	4.10	0.50
Organized approach to thesis writing	1.00	5.00	3.53	0.83
Self-efficacy for thesis writing	1.80	5.00	4.01	0.69
Thesis as a TLE				
Feedback and supervision	1.00	5.00	3.85	0.95
Peer support	1.00	5.00	3.06	1.03
Interest and relevance	1.00	5.00	3.75	0.87

Table 2 shows the relationship between the scales measuring the approaches to thesis writing, self-efficacy for thesis writing, experiences of the thesis as TLE, and the thesis grade (Pearson correlation).

Table 2. Pearson correlations between thesis grade, approaches to thesis writing, self-efficacy for thesis writing, and experiences of the thesis as a TLE

	1	2	3	4	5	6	7
Thesis grade	--						
Deep approach to thesis writing	.297**	--					
Organized approach to thesis writing	.218**	.358**	--				
Unreflective approach to thesis writing	-.278**	-0.065	-.367**	--			
Self-efficacy for thesis writing	.353**	.277**	.411**	-.451**	--		
Feedback and supervision	.184**	.218**	.194**	-.262**	.270**	--	
Interest and relevance	.409**	.363**	.368**	-.369**	.510**	.454**	--
Peer support	.243**	.254**	0.087	-0.064	.232**	.296**	.315**

The deep approach to thesis writing is positively related to the organized approach to thesis writing, while the organized approach to thesis writing is negatively related to the unreflective approach to thesis writing. Self-efficacy for thesis writing is positively related to the deep and organized approaches to thesis writing, while it is negatively related to the unreflective approach to thesis writing. All the scales describing students' experiences of the thesis as a TLE correlated positively with each other. The deep and organized approaches to thesis writing as well as self-efficacy had a positive relationship with all the scales measuring the thesis as a TLE, excluding the relationship between the organized approach and peer support, which was not found to be significant. The unreflective approach to thesis writing was negatively associated with all the scales measuring the thesis as a TLE except peer support. Finally, all the scales excluding the unreflective approach to thesis writing had a positive, significant relationship with the thesis grade. The unreflective approach had a significant, negative relationship with the thesis grade.

Cluster analysis (K-means) results revealed three groups: 1) Students applying a dissonant approach to thesis writing 2) Students applying a deep approach to thesis writing, and 3) Students applying an unorganized approach to thesis writing (see Table 3).

Table 3. K-means clustering: thesis writing groups. Means and standard deviations of approaches to thesis writing

Thesis writing groups	1. Students applying a dissonant approach to thesis writing (n=58) Mean (*SD*)	2. Students applying a deep and organized approach to thesis writing (n=146) Mean (*SD*)	3. Students applying an unorganized approach to thesis writing (n=79) Mean (*SD*)
Deep approach to thesis writing	4.17 (*.49*)	4.24 (*.41*)	3.77 (*.51*)
Unreflective approach to thesis writing	3.18 (*.48*)	1.90 (*.41*)	2.55 (*.64*)
Organized approach to thesis writing	3.63 (*.51*)	4.05 (*.53*)	2.51 (*.47*)

In the first group, students applying a dissonant approach (n=58), the scores for the deep and organized approaches to thesis writing were slightly above average, and the score for the unreflective approach was higher than average. In the second group (n=146), students applying a deep and organized approach, the scores on deep and organized approaches were high (above average) while the unreflective approach score was low (lower than average). In the third group (n=79), students applying an unorganized approach, the students scored the lowest on the organized approach (lower than average), lower than average in the deep approach, and close to average on the unreflective approach.

One-way ANOVA indicated that the differences in the approaches to thesis writing scores between the three thesis writer groups were statistically significant (p= .000), and post-hoc comparisons (Bonferroni) indicated that the three groups differed from each at a statistically significant level in the organized approach and unreflective approach. In the deep approach, Group 1 and Group 3 as well as Group 2 and Group 3 differed from each other at a statistically significant level. However,

Group 1 and Group 2 did not differ from each other at a statistically significant level in the deep approach.

Effect sizes were calculated using the eta squared (η^2), which illustrates the effect size of the clusters on the variables. The following thresholds have been suggested by Cohen (1988) for interpreting Eta squared (η^2): small (η^2= 0.01), medium (η^2= 0.06), and large (η^2= 0.14) effects. Organized studying was the variable that differentiated the three groups the most, as the effect size was large (η^2= 0.618). The effect sizes for the unreflective approach (η^2.=0.504) and deep approach (η^2= 0.170) can also be considered large.

Next, differences in self-efficacy for thesis writing, thesis as a TLE (interest and relevance, feedback and supervision, peer support) and thesis grade were explored relative to the identified three groups. Because Levene's test indicated that the homogeneity of variance condition was violated in the TLE scales between groups, Kruskal Wallis test was run to analyze the differences. The Kruskal Wallis test result indicated that there were statistically significant differences between the three groups in thesis grade (p=.000), self-efficacy (p=.000), interest and relevance (p=.000), and feedback and supervision (p=.000).

Table 4. Results of the Kruskal Wallis test and effect sizes

	Group 1: Students applying a dissonant approach to thesis writing n = 58		Group 2: Students applying a deep and organized approach to thesis writing n= 146		Group 3: Students applying an unorganized approach to thesis writing n= 79				
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*H*	*p*	η^2
Master's thesis grade	3.69	0.79	4.19	0.55	3.75	0.69	33.5	.000	.119
Self-efficacy for thesis writing	3.79	0.75	4.28	0.53	3.64	0.67	52.7	.000	.187
Interest and relevance	3.48	0.95	4.06	0.7	3.36	0.87	37.7	.000	.134
Feedback and supervision	3.59	1.04	4.08	0.85	3.58	0.95	21.0	.000	.074
Peer support	3.02	1.16	3.19	0.99	2.85	0.97	5.1	.075	.018

Differences in peer support, however, were not statistically significant between the three groups (p=.075). Effect sizes were calculated using the eta squared (η^2). The effect size of the groups on self-efficacy for thesis writing is large η^2= 0.187). The effect size was medium for thesis grade (η^2= 0.119), interest and relevance (η^2=0.134) as well as for feedback and supervision (η^2= 0.074). For peer support, the effect size is small *(η^2= 0.018).* Table 4 reports the mean scores, standard deviations for the variables between the groups, and the results of the Kruskal Wallis and effect sizes.

Dunn-Bonferroni post-hoc tests indicated that Group 2 differed significantly from Groups 1 and 3 in thesis grade, self-efficacy, interest and relevance, as well as experiences of feedback and supervision with higher scores. However, the differences were not significant between Group 1 and Group 3 as to their thesis grade, self-efficacy, and the scales measuring TLE. As mentioned earlier, experiences in peer support were not found to be significant between any of the groups.

5. Discussion and conclusions

The present study has aimed to reveal new insights into the master's thesis writing process through three perspectives. The first aim was to understand the nature of student approaches to thesis writing, the experiences of the thesis as a TLE, and self-efficacy for thesis writing at our context. The second aim was to explore the associations between thesis writing approaches, experiences of the thesis as a TLE, self-efficacy for thesis writing, and the thesis grade. Thirdly, the present study aimed to investigate individual variation within the approaches to learning and how this variation is related to the experiences of the thesis as a TLE, self-efficacy, and the thesis grade.

5.1 Key findings in the light of previous literature

The results indicate that the thesis writing process in our context seemed to evoke quite high levels of the deep approach. However, this is not surprising, given the complexity and level of demand of the master's thesis (de Kleijn et al., 2012; Wisker, 2019; Ylijoki, 2003). The deep approach to thesis writing was positively related to the organized approach, similar to earlier findings concerning the positive association between the deep and organized approaches from the SAL framework (Herrmann et al., 2017; Hyytinen et al., 2018). However, the deep approach and unreflective approach to thesis writing did not have a significant (negative association) in our data, which is distinct from some of the earlier SAL findings (Asikainen et al., 2020; Diseth & Martinsen, 2003). Furthermore, our study revealed that writers can combine these approaches to writing in individual ways, similar to the earlier reported mixed approach by Biggs (1988a), which can also explain why the deep approach and unreflective approach did not have a significant negative association in our data. To summarize, the results from the thesis context of the present study

bear strong similarities to earlier results from the approaches to learning framework (SAL), giving contextualized and present day support to Biggs's (1988a) view of the close parallel between these two frameworks.

The ways in which the experiences of the thesis as a TLE associate with the approaches to thesis writing as well as with each other reveal further insights into the elements of a supporting learning environment for a master's thesis. The positive association between approaches to thesis writing and perceptions of the thesis as a TLE was also quite similar to that of earlier SAL findings (Parpala et al., 2010; Richardson, 2005; Salmisto et al., 2017) as well as to findings from writing research (Ellis et al., 2007), although peer support had a significant relationship only with the deep approach, similar to earlier findings by Coertjens et al., (2016) and Entwistle (2003). Out of all the TLE scales, interest and relevance correlated the strongest with self-efficacy, and then with experiences of feedback and supervision. However, self-efficacy for thesis writing only correlated weakly with experiences of feedback and supervision.

These findings suggest that a thesis writer's own level of interest in the research topic in question bears important weight in the ways thesis writing is experienced. The findings could also mean that engaging supervision goes hand in hand with higher levels of interest and relevance (de Kleijn et al., 2012; Wagener, 2018). It is worth mentioning that interest and relevance also correlate, albeit weakly, with peer support. Thus, it seems that higher levels of interest and relevance are connected to opportunities to engage in discussions on the research topic with supervisors and peers. The findings also suggest that peer support is not exploited to its full potential in the thesis writing process in our context, giving support for earlier suggestions on the need to implement more peer support for master's thesis processes (de Kleijn et al., 2012; Vehviläinen, 2009; Vehviläinen & Löfström, 2014). Since in our data peer support had significant (but weak) correlations with the thesis grade, deep approach to thesis writing, self-efficacy, and interest and relevance, it would be fair to suggest that more peer support could enhance the process. Thus, peer and supervisor support together could contribute to creating a supporting TLE for the thesis, which can evoke higher levels of interest and relevance as well as further enhance learning (Entwistle et al., 2002; Renninger & Hidi, 2006).

Because the thesis grade serves as an independent measure (i.e., not based on self-report), and because the grading process is based on rigorous criteria and involves the decision of a committee, it is important to consider the findings of our study in relation to the thesis grade. The thesis grade should reflect the kinds of writing approaches and elements of the thesis as a TLE that are related to the highest academic competencies. In our study, the thesis grade correlated the strongest with interest and relevance. A similar association between the thesis grade and interest on the research subject was found earlier by Wagener (2018). The thesis grade also

correlated moderately with self-efficacy for thesis writing, a finding which is not surprising given the strong evidence of the importance of self-efficacy on learning outcomes (Bandura, 1982; Linnenbrink & Pintrich, 2003) and on writing outcomes (Bruning et al., 2013; Hetthong & Teo, 2013). The thesis grade also had significant (but weaker) positive correlation with the deep and organized approaches to thesis writing, and a negative correlation with the unreflective approach to thesis writing, which implies that the master's thesis as a learning task in this context and its grading reflect high quality learning processes (Asikainen et al., 2013). Finally, the relationships between the thesis grade and experiences of feedback and supervision as well as with peer support were significant but small. This could be because the master's thesis in the Finnish context is often emphasized as an independent project. For instance, the grading criteria for the master's thesis in the present context include a mention of the thesis as an independent project, emphasizing that the contributions from the supervisor should be minor for meritorious theses. However, it is possible that thesis supervisors may understand the concept of "minor support" differently. Furthermore, not all students at our context participate in thesis seminars where they could network with other thesis writers. These reasons could explain why peer support or feedback and supervision did not have such a strong relation with the thesis grade while the student's own interest toward the thesis topic as well as self-efficacy correlated more strongly with the thesis grade.

Through a person-oriented approach, this study identified three groups of master's thesis writers based on their individual combinations of their approaches to thesis writing: 1) students applying a dissonant approach to thesis writing; 2) students applying a deep and organized approach to thesis writing; and 3) students applying an unorganized approach to thesis writing. These individual combinations differ from several earlier studies that have investigated approaches to learning through a person-centered approach (Asikainen et al., 2020; Parpala et al., 2010; Salmisto et al., 2017). In our study, the unreflective approach profile was not present as such, a finding similar to that of Parpala et al (2021). As has been discussed, the unreflective approach in the traditional sense of the former surface approach, relying on memorization, is not as common in university studies today (Lindblom-Ylänne et al., 2018). Such an approach based on memorization or intention of fact listing in writing seems then quite unlikely for a demanding task such as thesis. Therefore, measuring the unreflective approach in thesis writing may make more sense through the items measuring the result, i.e., the experience of fragmented knowledge base. Nevertheless, the nature of the unreflective approach to writing should be further investigated.

In our study, the students applying the deep and organized approach experienced the TLE the most positively with higher levels of interest and relevance as well as feedback and supervision. They also received significantly higher grades

on the thesis and scored higher on self-efficacy for thesis writing. Thus, our findings indicate the importance of approaching the master's thesis through a combination of the deep and organized approach. This supports the earlier findings concerning the association between the deep approach and master's thesis grade (Petri , 2007; Tuononen & Parpala, 2021) and complements them by adding that the deep approach and organized approaches to thesis writing together lead to better success on the thesis.

The students applying the dissonant approach to thesis writing scored high in both the deep and unreflective approaches, similar to the mixed approach to writing (Biggs, 1988b, 1988a) and to the dissonant approach to learning (Lindblom-Ylänne & Lonka, 1999). The students applying the dissonant approach to thesis writing perhaps represented the portion of students who may have used the unreflective approach earlier in their studies and who now in the thesis both aim to create a coherent whole but struggle with a sense of disconnected pieces of information. Based on our findings, the kinds of students who may struggle more in the master's thesis process are the students applying the dissonant approach to thesis writing and the students applying the unorganized approach. This finding is similar to that of Parpala et al. (2021) on the learning profiles that struggle the most in their studies. These two thesis writing groups (Group 1 dissonant and Group 3 unorganized) might represent students who are (still) in the process of developing their approaches to thesis writing, i.e., learning to create new and more functional processes for research writing (Lindblom-Ylänne et al., 2018). This gives support for the notion of the thesis as a potential challenge since some students are still in the process of learning the important skill of doing research and reporting about it, while needing to demonstrate such a skill at the same time (de Kleijn et al., 2012). In sum, the way that the deep approach to thesis writing combines with the other two approaches (i.e., unreflective and organized approaches) seems to be an important factor relating to how the thesis is experienced as a TLE and to the writing outcome, i.e., the thesis grade.

5.2 Practical implications

Based on our findings, we present some practical implications for master's thesis writing support. First, since the master's thesis writers' own levels of interest and relevance toward the thesis topic area have associations both with the thesis grade, approaches to thesis writing and the ways the thesis is experienced as a TLE, it is important to consider how levels of interest and relevance could be supported in the thesis process. One perspective is to consider how much autonomy and freedom master's thesis writers have on the choice of the thesis topic and its direction. As was explained in 3.2, in our context, most thesis writers apply for the thesis topic as an internship in an outside company or in a professor's project. This initial application may serve as useful way to both survey and spark the writers' own

interest and motivation toward the topic at the outset. For all kinds of thesis writers, we encourage thesis supervisors to scope the students' own levels of interest and relevance also during the thesis writing process, aiming to promote the thesis writer's own autonomy and help the writer see the relevance of the thesis through a broader lens. Since the contexts for thesis writing vary greatly, as some writers deal with real-world problems from companies and others investigate research problems within the university, it seems that such contexts and their connection to thesis writing approaches, self-efficacy, and experiences of the thesis as a TLE could provide an interesting focus for further studies.

Second, as a part of the thesis supervision process, supervisors may consider exploring the student's level of self-efficacy and the nature of students' approaches to thesis writing, which could reveal something additional about how the thesis writer is doing that is not detectable in the text itself. In cases of noticing low self-efficacy for thesis writing, it may be fruitful to have a deeper discussion of what factors could be at play behind these lower self-efficacy beliefs to design more tailored support. If a student seems to have trouble creating a coherent whole of the topic area (i.e., dissonant approach or unreflective approach), the supervisor could try to move the discussion towards understanding the bigger picture, for instance by guiding the planning of thesis organization (table of contents, outlining, chapter headings) which could help the writer see the forest for the trees or promote opportunities to ask specific questions. Since a successful thesis needs to be approached both through the deep and organized approach, support for how students could develop both approaches may be necessary. Some students may not be aware of what kind of organization a large research project such as a thesis may entail. Supervisors are encouraged to provide milestones during the process, which would break the process into smaller steps and help the students engage in the organized approach. This can be especially important for thesis writing contexts where the length of the project is fixed (i.e., 6 months is the ideal in the present context). This may also need more organized affiliation from the side of the supervisor, which requires appropriate resource planning for supervisors.

Lastly, our findings indicate that opportunities for discussion either within supervision or with peers are connected with higher levels of interest and relevance; yet peer support was not fully exploited by the thesis writer's in the present study. If the point of the master's thesis is to help the students build their expertise, develop as scholars, and possibly produce new knowledge in the field, it is important to remember that even the most experienced scholars do not usually work in a vacuum. In the context of the present study, enhancing the thesis process with opportunities to discuss the thesis more frequently with other thesis writers could be a venue to promote levels of interest and relevance. Since thesis writing contexts can vary from one writer to another, perhaps such peer networking

opportunities could better serve those who are working on the thesis more independently.

Helping the students develop a deep and organized approach to academic writing is something that preferably would also be introduced and emphasized in earlier studies prior to commencing the thesis and in an iterative fashion (Mendoza et al., 2022). Courses on academic writing and courses involving academic writing assignments should therefore strongly emphasize the process approach to writing and allow more time for exploring and understanding the research area in question, aiming to help the writers develop their understanding of the content as well as their ability to write about it (Smith et al., 1999). Such a process should preferably entail various drafts and feedback as well as include both teacher and peer feedback, enhancing the opportunity to develop the students' approach to writing toward deeper and more organized directions.

5.3 Limitations

This study has several limitations. First, although the survey items are based on a robust survey (HowULearn), the items were rewritten and contextualized for the thesis writing context. Therefore, the present study is the first to report how the survey, with satisfactory reliability and construct validity, functioned in the thesis writing context. However, survey items are subject to interpretation and nuances, which means the survey should be further tested in extended contexts and developed as needed. Second, more development is needed concerning some items in the survey. For instance, the unreflective approach to writing contained items to measure the fragmented knowledge base, which is more like a result of the unreflective approach, so perhaps the multidimensional quality of the unreflective approach to writing would require further investigation and testing. The items measuring thesis objectives and requirements (constructive alignment) did not properly work in this survey and require further development as well. A third limitation is that the survey responses (excluding the thesis grade data) are based on self-report. The self-reported measures could always be subject to overestimation or underestimation and can be affected by an inability to reflect. Fourth, the sample size is relatively small. Lastly, since only about 40% of the thesis writers who were approached volunteered to participate in this study, it could mean that those who participated had more positive or more negative experiences than the entire thesis writer population. Thus, our findings may not be generalizable to the entire thesis writer population in our context or in other contexts.

5.4 Conclusion

The present study set out to examine the relations between the approaches to thesis writing, student experiences of the thesis as a teaching and learning environment, self-efficacy for thesis writing, and thesis grade. The instrument

utilized in this study was based on the HowULearn questionnaire (Parpala et al., 2010) with modified survey items to fit into the thesis writing environment, thus creating a bridge between the vast research framework in student approaches to learning (SAL), the thesis writing context, and the earlier work on writing approaches by Biggs (1988a). Thesis grade had a positive association with interest and relevance, self-efficacy for thesis writing, and deep and organized approaches. Individual variation was identified in how thesis writers combine the approaches to thesis writing, and this variation was connected to the thesis grade and to the ways in which the thesis is experienced as a TLE. Further research could focus on exploring the structural relationship between the thesis writing approaches, thesis as TLE, self-efficacy, and thesis grade in extended contexts. Furthermore, more empirical research could explore what kind of elements and pedagogical choices in the thesis as a TLE support the development of a deep and organized approach, promote self-efficacy for thesis writing, and evoke higher levels of interest and relevance. Finally, the nature of the unreflective approach to writing could be further explored through qualitative methods.

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Appendix A: Scales, Items, Cronbach's alphas, item factor loadings (EFA)

Scales	Items	Item factor loadings	Cronbach's alpha
Approaches to thesis writing			
Deep approach to thesis writing	5. While doing my thesis, I often contemplated the ideas from multiple perspectives.	.576	.69
	6. I carefully looked for evidence to reach my own conclusions while doing my thesis.	.756	
	10. While writing my thesis, I tried to make use of different viewpoints on the subject matter as much as possible.	.499	
	11. In my thesis, I tried to form a coherent whole of its contents.	.402	
	2. I put a lot of effort into my thesis.	.572	
Unreflective approach to thesis writing	1. I had trouble forming a coherent whole of my thesis.	.700	.62
	3. Many themes related to the contents of my thesis remained disconnected from each other.	.614	
	7. The contents of my thesis were so complicated that I often had trouble understanding them.	.566	
Organized approach to thesis writing	4. On the whole, I worked on my thesis in an organized way.	.741	.73
	8. I organized the time reserved for my thesis carefully to make the best use of it.	.527	
	9. I made a schedule so that I could complete my thesis as planned.	.775	
Self-efficacy for thesis writing			
Self-efficacy for thesis writing	12. I believed that I would do well in my thesis.	.730	.69
	13. I was certain that I can understand even the most difficult contents related to my thesis.	.700	
	14. I was confident I can understand the concepts related to my thesis.	.702	
	15. I believed I would finish the thesis in due time.	.612	
	16. I was certain I can achieve the set requirements for the thesis well.	.776	

Thesis as a teaching and learning environment			
Feedback & supervision	28. I received enough feedback about my thesis from my supervisor.	.962	.91
	30. The feedback given on my work helped me to improve my thesis.	.862	
	31. The supervision I have received helped me to improve my thesis.	.812	
	32. The feedback given by my supervisor helped to clarify things I hadn't fully understood before.	.790	
	21. The supervision of my thesis supported the achievement of the set requirements.	.711	
Thesis objectives and requirements (removed from analysis because only two items remained)	20. It was clear to me what objectives have been set for the thesis in my school.	.756	.81
	29. The requirements set for the thesis in my school were clear to me.	.904	
Interest and relevance	22. Doing the thesis was meaningful for me.	.818	.85
	24. I found it very interesting to do my thesis.	.732	
	26. I enjoyed doing my thesis.	.910	
Peer support	23. I got support from other students for my thesis when needed.	.774	.84
	25. Talking with other students helped me to develop my understanding of the concepts related to my thesis.	.826	
	27. I worked comfortably with other students while working on my thesis.	.815	