Handbook of Research on Active Learning and Student Engagement in Higher Education

Jared Keengwe
University of North Dakota, USA

A volume in the Advances in Higher Education and Professional Development (AHEPD) Book Series

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Table of Contents

Chapter 15
Improvement of Learning Performances With Increased Guidance in Research-Based Learning

Murat Akpinar
JAMK University of Applied Sciences, Finland

ABSTRACT

This chapter examines whether increased guidance during the bachelor's thesis, a research-based learning activity, improves the learning performances of undergraduate students. The quantitative study tests hypotheses on changes in the learning performances at a bachelor's degree program in Finland following intervention in 2015 of the thesis supervision process. The results suggest that increased guidance scheme had a statistically significant positive effect and recommend its adoption in undergraduate programs.

INTRODUCTION

Research-based learning (RBL), also known as inquiry-based or discovery-based learning, is a student-centric pedagogy in which students raise and frame questions, review the literature, collect and analyze data, communicate their results, and discuss them (Maass & Artigue, 2013; Willison & O'Regan, 2007). In doing these tasks, they base their explanations on evidence and connect them to scientific knowledge (National Research Council, 2000). Justice et al. (2009, p. 843) define RBL as "*the set of practices designed to promote the development of higher-order intellectual and academic skills through student-driven and instructor-guided investigations of student-generated research questions*." The tasks of RBL enable students to understand the research process and develop their skills in critical thinking and academic writing (Walkington et al., 2011).

RBL implies a significant change from the historical approach to teaching in that it students are not only consumers but also producers of ideas and knowledge, and teachers become co-learners (Lambert, 2009). RBL emphasizes research processes and problems rather than content, treats students as participants

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rather than the audience, and teaching becomes more student-focused (Healey, 2005). This results in the creation of an inclusive research-based academic community, which benefits all stakeholders (Smith & Rust, 2011). Active engagement of students in projects improves their learning performances (Del Campo et al., 2020). In RBL, This is especially true for low-achieving students (Kogan & Laursen, 2014). Furthermore, it develops science literacy and research skills, increases the number of publications, and establishes long-lasting relationships between teachers and students (Brew & Jewell, 2012; Gormally et al., 2009; Justice et al., 2009). It also makes a more balanced and coherent workload between teaching and research activities, encouraging teaching faculty to become research-active and research faculty to become teaching-active (Smith & Rust, 2011). Overlap between students' research projects and teachers' research interests will create synergies and the motivation of teachers for RBL initiatives (Selje-Assmann et al., 2019). Consequently, both students and teachers will be more engaged in a process of active learning, leading to the establishment of a genuine learning community (Walkington et al., 2011). Finally, a shift from traditional teaching with ready-made answers to pre-determined questions towards RBL will teach better how to manage ambiguity and complexity and prepare undergraduate students better for uncertain work environments of the future (Brew & Jewell, 2012).

Despite these advantages, there can also be resistance from some teachers due to their limited understanding of RBL and accompanying fear to succeed with a different approach (Justice et al., 2009). There can also be resistance from some students RBL demands from them more cognitive efforts as well as more patience and tolerance towards frustration (Gormally et al., 2009). Since the development of research skills is slow, it is important to have continuous practice starting from the first year of the degree program (Knight & Yorke, 2004). These issues challenge the successful implementation of RBL initiatives.

Lazonder and Harmsen (2016) argue that teachers' guidance throughout the RBL process has facilitative effects on the learning performances of students. In broad terms, guidance can be defined as "*any form of assistance offered before and/or during the inquiry learning process that aims to simplify, provide a view on, elicit, supplant, or prescribe the scientific reasoning skills involved*" (Lazonder & Harmsen, 2016, p. 687). Proper guidance is of high relevance especially when teachers implement RBL with first-year students in large class settings (Oliver, 2007). In doing that, whereas an open inquiry learning approach seems to be more suitable for strengthening links between research and teaching, structured and guided forms of inquiry are also needed in developing students' particular methodological skills (Spronken-Smith & Walker, 2010). Yet, it is still to be answered what type of guidance is adequate, and for whom (Lazonder & Harmsen, 2016). Furthermore, there is a need for more attention on the process of implementation in order to close the gap between theory and practice (Burkhardt & Schoenfeld, 2003; Maass & Artigue, 2013). More specifically, there is room for increasing systematic knowledge in higher education about types of RBL tasks, variations in employing RBL, and intended learning outcomes from RBL activities (Aditomo et al., 2013, p. 1240). This is especially true in the context of undergraduate programs because in higher education RBL is associated more with doctoral education (Brew et al., 2017; Roberts, 2018). Some universities tend to undervalue undergraduate research and even exclude it from their curriculums (Brew & Jewell, 2012). As Lambert (2009, p. 299) claims, "*undergraduate students are rarely encouraged to participate in core intellectual activities such as seminars and conferences*".

This chapter recognizes the above challenges and aims to increase understanding of the impact of increased guidance on students' learning performances. In order to achieve this objective, it compares the learning performances of students before and after the introduction of an increased guidance scheme to the thesis process at the bachelor's degree program in international business at JAMK University of

Applied Sciences in Finland. The results of this chapter will contribute to the literature in the context of higher education that aims to understand the impact of guidance in RBL initiatives (Lazonder & Harmsen, 2016; Spronken-Smith & Walker, 2010).

The bachelor's degree program in international business received international accreditation from the European Foundation for Management Development (EFMD) in 2012. In response to demands from EFMD to increase the intellectual contributions of the faculty in their teaching, the program adopted a research-based curriculum in 2015. This implied two major changes from the earlier traditional curriculum. The first change is that the number of research methods courses was increased, starting from the first year of studies. The second change is that the thesis and the accompanying supervision process shifted from the last to the second year of studies, resulting in the provision of more guidance to students by faculty. Comparison of data collected from 157 students, who studied with the new research-based curriculum, with data collected from 143 students, who studied with the traditional curriculum, suggests that increased guidance in the thesis process had a statistically significant positive effect on students' learning performances.

The structure of the rest of the chapter is as follows. The background section, which continues after this introduction, reviews the relevant literature and develops the hypotheses. The chapter proceeds then with a detailed description of the intervention in 2015 and the presentation of the methodology applied in the empirical study. Thereafter, the chapter presents results and discusses them in terms of contributions to literature, practical implications, limitations, and directions for future research. Finally, the chapter ends with a conclusion.

BACKGROUND

Learning refers to a reflective and interactive process, whereby the learner acquires or constructs new knowledge and as a result, changes behavior and/or improves her performance (Driscoll & Burner, 2021). There are different pedagogical approaches to learning. RBL belongs to the integrative learning pedagogy, according to which, students learn by reflecting between theory and practice through their involvement in solving real-world problems (Tynjälä & Gijbels, 2012). This occurs in a socio-cultural context, in which students interact with their teachers, peer students, and sometimes representatives from the industry (Tynjälä & Gijbels, 2012). The literature review by Spronken-Smith and Walker (2010) suggests that there are five principles of RBL, as commonly agreed among scholars of the field. The first one is that real-world problems and inquiry to solve them triggers learning. The second principle claims that learning occurs through a process of constructing new knowledge. The third principle suggests that RBL takes an active approach to learning, and the fourth one argues that it is a student-centric approach, where the teacher acts as a facilitator of students' activities. Finally, the fifth principle is that students take responsibility for their learning.

According to Healey and Jenkins (2009), there are four approaches to engaging students with research. In the research-led approach, students learn about current research through literature review, and in the research-oriented approach, they learn about research methods. In both approaches, students are passive. In the research-tutored approach, students discuss current research, and finally, in the research-based approach, students perform research. Whereas the research-led and the research-tutored approaches emphasize research content, the research-oriented and the research-based approaches focus on research processes and problems (Healey & Jenkins, 2009). RBL falls into the research-based approach, where

research is the means for solving real-world problems. In RBL, the scale of inquiry can vary from being part of a specific lecture in a course to being a core element of the degree program (Spronken-Smith et al., 2007). Similarly, the nature of research tasks will also vary based on the focus of the research project and its orientation towards application (Aditomo et al., 2013).

Pedaste et al. (2015) identify five consecutive phases in the process of RBL. These phases from start to end are orientation, conceptualization, investigation, conclusion, and discussion. In the orientation phase, students address a specific problem statement, and during the conceptualization phase, they develop theory-based questions or hypotheses. The investigation phase is about collecting and analyzing data for answering research questions or testing hypotheses. The conclusion phase aims to draw conclusions from the data, and in the discussion phase, students present their findings and reflect upon them. Selje-Assmann et al. (2019) also argue that the process of RBL is sequential. According to their sequence, students first review the relevant literature to understand the theoretical background, and then they develop their research questions and propose a suitable research design for the empirical study. Following that, they practice the methodology by collecting and analyzing the data. Finally, they discuss their findings and present them to the public. In a more robust manner, Levy and Petrulis (2012) divide the research process into two: the learning paradigm and the discovery paradigm. The learning paradigm is about exploring existing knowledge through literature review, and the discovery paradigm is about building new knowledge following an empirical study. Both of these typologies fit very well to the context of the bachelor's thesis at the bachelor's degree program in international business at JAMK University of Applied Sciences. In their bachelor's theses, students review the relevant literature first in order to define their research questions and identify their theoretical frameworks. This is the learning paradigm, covering the orientation and conceptualization phases. After that, they design and conduct their empirical studies, whereby they collect and analyze the data in order to answer their research questions or test their hypotheses. Finally, they present their results and discuss them. This is the discovery paradigm, covering the phases of investigation, conclusion, and discussion.

RBL can be rewarding for students in many ways. Whereas traditional courses mainly exercise knowledge acquisition and limit learning to the surface, RBL actively engages students in the learning process and promotes deep learning (Trigwell et al., 1999). Literature suggests that students will develop their skills in communication, time management, solving problems, decision-making, investigation, self-efficacy, leadership, project management, and analytical thinking (Fernandes, 2014; Frank et al., 2003). After engaging in RBL experiences, students will also increase their self-confidence, develop a deeper understanding of science and learn how to think and work as researchers and improve their skills in applying knowledge for solving real-world problems (Hunter et al., 2006). RBL is more likely to prepare students for their professional life after graduation, where they will need to deal with ambiguity and complexity in rapidly changing, uncertain environments (Brew & Jewell, 2012). Employers look for features among new graduates such as the ability to analyze issues and solve problems, critical thinking, and effective communication, all of which are exercised through RBL initiatives (Justice et al., 2009). In developing these skills, RBL employs a transdisciplinary learning approach, in which students from diverse backgrounds analyze issues from multiple perspectives (Kamrozzaman et al., 2019).

Integrating research and teaching under RBL initiatives is also beneficial for teachers. They can balance their workload between teaching and research, and at the same time, they can test their research ideas in the classroom with students (Smith & Rust, 2011). Contributing to both students and teachers, RBL indirectly contributes to higher education institutions because, in addition to increasing the qual-

ity of learning and the number of publications, it also develops the commitment of some undergraduate students to graduate and postgraduate studies (Lopatto, 2007).

The implementation of RBL, however, is challenging. One challenge is that the development of research skills takes time (Hughes, 2019; Knight & Yorke, 2004). The initial phases are the most challenging especially in the research for the thesis. This is because students are not provided with research questions in advance, but rather they are expected to find or create them following a thorough literature review. Second, academic reading and writing are not familiar to most undergraduate students. Making in-text citations appropriately and preparing a matching list of references according to certain accepted standards is an issue. As a result, they require additional guidance in writing their theses in an academically professional manner. Such support is part of the studies, offered by the language department. Third, the student-centric RBL process is less structured and less formal, and that requires more work, time, and patience from both students and thesis supervisors (Gormally et al., 2009; Vasilienė-Vasiliauskienė et al., 2016). Fourth, when there is a commissioner of the research from the industry, as is the case in some theses, there may be unrealistic expectations, and bridging students' learning with industry expectations can be challenging (Danford, 2006). Finally, significant amounts of time and money expenditures, which are scarce, may be required from the higher education institution in implementing RBL (Selje-Assmann et al., 2019).

RBL tasks can be structured, guided, or open (Spronken-Smith et al., 2007). In structured tasks, teachers provide both the research questions and the procedures for answering the questions (Spronken-Smith et al., 2007). While the focus of learning is information-oriented, the independence of students is restricted (Spronken-Smith & Walker, 2010). In guided tasks, the role of the teacher shifts to providing direction and guidance (Spronken-Smith et al., 2007). The focus of learning has a balanced distribution between information orientation and discovery orientation, and as a result, students are more independent (Spronken-Smith & Walker, 2010). Finally, in open tasks, students build their own research questions and conduct appropriate research on their own in order to answer their research questions (Spronken-Smith et al., 2007). In this type of RBL task, the focus of learning is discovery-oriented, and the independence of students is the highest (Spronken-Smith & Walker, 2010).

Lazonder and Harmsen (2016) provide a typology of RBL guidance. Their six types of RBL guidance are process constraints, status overviews, prompts, heuristics, scaffolds, and explanations. Process constraints organize the research into a series of manageable sub-tasks, and status overviews summarize the progress in learning in terms of achievements over time (Lazonder & Harmsen, 2016). Whereas prompts remind learners of the next steps to be done, heuristics not only remind the next steps, but also point out ways for accomplishing the steps (Lazonder & Harmsen, 2016). Finally, scaffolds and explanations are the most specific types of guidance. They are for learners who require more guidance than average, and they aim to structure and simplify the tasks of learners (Lazonder & Harmsen, 2016).

In order to manage the challenges of RBL, there is a need for clarity and guided instruction from supervisors and support from peer students (Archer-Kuhn et al., 2020). Unguided or minimally guided learning in RBL is like throwing a non-swimmer out of a boat in the middle of a deep lake (Kirschner et al., 2006). Kirschner et al. (2006) justify their analogy by arguing that in RBL students should develop both content knowledge, i.e. knowledge of the topic that they are researching, and pedagogical knowledge, i.e. knowledge on how to do research, and it is not possible especially to learn about science by doing science. Therefore, teaching about doing science and increasing students' pedagogical knowledge should be the responsibility of teachers (Kirschner et al., 2006). Merrill (2002) suggests five elements for guided instruction in RBL, which are a real-world problem to solve, activation of prior experience,

demonstration of skills, application of skills in practice, and integration of skills into real-world problems in a planned manner. Providing guidance with these five elements is more likely to improve student's learning than unguided or minimally guided learning experiences (Merrill, 2002). The teacher's role as facilitator and guide covers the tasks of orienting students towards research problems, making constructive use of students' prior knowledge, managing group discussions and encouraging alternative views, and helping students in connecting their ideas to concepts and theories (Maass & Artigue, 2013, p. 782). Guidance is especially relevant when applying RBL with first-year students (Oliver, 2007). Selje-Assmann et al. (2019) argue that the tedious and difficult research process requires time, and guidance should be available starting from the early stages. However, as Lazonder and Harmsen (2016) warn, levels of guidance should match the needs of different students. Too much guidance or highly specific guidance can challenge the nature of the research process (Lazonder & Harmsen, 2016). Finally, Edelson et al. (1999) call for the support of technology and curriculum design in overcoming the challenges of implementing RBL.

The above arguments lead to the formulation of the following hypotheses.

Hypothesis One: Performances of all cohorts will be lower in the thesis (RBL activity) than in regular courses.

The first hypothesis tests the claim that RBL activities are challenging for students because these they demand the active production of new knowledge instead of passive consumption of existing knowledge (Lambert, 2009). This demands more cognitive efforts, and the tedious and less structured research process can be frustrating at times, requiring perseverance (Gormally et al., 2009; Vasilienė-Vasiliauskienė et al., 2016).

Hypothesis Two: Cohorts that receive more guidance will perform better in the thesis (RBL activity) than those which receive less guidance.

The second hypothesis tests the main argument of this chapter whether increased guidance in the bachelor's thesis process contributes to students' learning performances in this RBL activity, following arguments by for example Kirschner et al. (2006), Merrill (2002), Archer-Kuhn et al. (2020), Knight and Yorke (2004), Lazonder and Harmsen (2016), Spronken-Smith and Walker (2010), and Oliver (2007).

Hypothesis Three: There will not be any significant differences among the performances of cohorts, which receive less guidance in the thesis process.

Hypothesis Four: There will not be any significant differences among the performances of cohorts, which receive more guidance in the thesis process.

Hypothesis Five: There will not be any significant differences among performances of all cohorts in their regular courses.

The third, fourth, and fifth hypotheses aim to validate whether a possible improvement in students' learning performances in the thesis is due to the intervention of the increased guidance scheme introduced in 2015 at the bachelor's degree program in international business, or whether there are other factors to explain differences in learning performances.

RESEARCH CONTEXT AND THE INTERVENTION

JAMK University of Applied Sciences is a higher education institution located in Jyväskylä, Finland. Higher education in Finland, administered by the Ministry of Education and Culture, consists of 13 universities and 23 universities of applied sciences. Universities of applied sciences were established in

Finland during the 1990s in order to establish stronger links between academia and regional industries. They offer both bachelor's degrees and master's degrees, which are equivalents to corresponding degrees from universities. Whereas universities specialize in basic research, universities of applied sciences focus on applied research in collaboration with local industries with the objective of contributing to regional development. Universities of applied sciences do not offer doctoral degrees. Graduates from their master's degree programs, however, are eligible to apply for doctoral programs at universities.

Jyväskylä is located in Central Finland, about 270 km north of Helsinki, the country's capital, and it has a population of nearly 140 000 inhabitants. It has a reputation of being a student city, hosting the University of Jyväskylä, which has about 15 000 students, and JAMK University of Applied Sciences, which has nearly 8 500 students. The city also has a historical reputation in the field of education, being home to the first Finnish-language teacher education college of Finland, called Jyväskylä Teacher Seminary, established in 1863.

JAMK University of Applied Sciences is owned by the City of Jyväskylä (90% of shares), the City of Jämsä (5% of shares), and the Vocational Education Institute of Northern Central Finland (5% of shares). According to key indicators in its annual report, the institution had a turnover of 59.8 million Euros and a staff of 743 people in 2019, and its main sources of funding were the Ministry of Education and Culture funding (73%), research and development income (12%), income from education services (7%), subsidies and financial support (3%), and other income (4%) (JAMK University of Applied Sciences, 2021a). Sources of external funding for research and development income in 2019 were European Union funds (56%), public funds in Finland (35%), private funds in Finland (6%), municipalities (2%), and Business Finland and Academy of Finland (1%) (JAMK University of Applied Sciences, 2021a). The institution has four schools, namely the School of Technology, the School of Business, the School of Health and Social Studies, and the School of Professional Teacher Education. In its strategy for 2020-2030, JAMK University of Applied Sciences has a vision of being an internationally acclaimed institution for reinventing education and developing competitiveness based on the values of responsibility, trust, and creativity (JAMK University of Applied Sciences, 2021b). Its core areas of focus are bioeconomy, multi-disciplinary rehabilitation, and applied cybersecurity, while there is growing expertise in its emerging fields of innovative learning, tourism, and automation and robotics (JAMK University of Applied Sciences, 2021b).

The School of Business at JAMK University of Applied Sciences has 2 450 students and a staff of 125 people (JAMK University of Applied Sciences, 2021c). It offers six bachelor's degree programs, of which three are in Finnish, and three are in English. The English bachelor's degree programs are in international business, tourism management, and business information technology: game production. It also offers four master's degree programs, of which two are in Finnish, and two are in English. The English master's degree programs are in international business management and sports business management. The School of Business has the vision of being a leading school of business in Finland until 2025 by fulfilling its goals of delivering practice-oriented education and student-centered learning, having regional and global impacts, and contributing to ethics, responsibility, and sustainability (JAMK University of Applied Sciences, 2021d).

The bachelor's degree program in international business is the program understudy for this chapter. It is a 210 ECTS program, which demands 3.5 years of full-time study. For many years in a row, it has been the most attractive bachelor's degree program in international business among Finnish universities of applied sciences. It has an annual intake of 50 students, and nearly half of the program's degree students are from outside of Finland. The faculty of the program is also highly international. The curriculum of

the program was quite traditional before the intervention. The first year aimed to introduce students to the fundamentals of business and develop their transferrable skills. Then the second year continued with intermediate and advanced studies in business. An important feature of the program is that it has been obligatory for all students to go for at least a semester to international student exchange at one of the School of Business's partner universities during the third year. Students also made their specialization studies during this year, and finally, they finished their studies by completing their practical training and bachelor's thesis. There was a problem with this setup in that a good number of the program's students decided to stay abroad after their exchange, or they received job offers following their practical training. These situations required the completion of the bachelor's thesis under remote supervision. As a result, there were challenges regarding students' motivation and commitment to the thesis process, which hindered the delivery of high-quality theses.

The program received its first international accreditation from EFMD in 2012. One of the development areas of the program, as identified by the peer review team during the accreditation process, was to increase the intellectual contributions of the faculty in their teaching. This required more involvement in research activities, for which the faculty did not have adequate time. Merging this need with the challenge of the thesis process, the program director and the faculty jointly decided to change the curriculum of the program starting with the cohort of 2015. The new curriculum adopted the pedagogy of RBL. It was innovative in that it shifted the thesis process from the fourth year to the second year, and it introduced additional research methods courses to the first year of the program. These courses aimed to develop students' research skills to prepare them for their research activities in the second year. The second year was the "academic year", where research became the key activity. The learning outcomes of the second year aimed to develop students' critical thinking and analytical understanding skills, applied business skills, communication skills, intercultural collaboration skills, ethical conduct, and personal development. According to the new curriculum introduced in 2015, students would select two academic tracks at the end of their first year. There were initially six academic tracks. These tracks in alphabetical order were cross-cultural management, economics of internationalization and competitiveness, finance and corporate governance, innovation management, marketing management, and technology business and future foresight. During the autumn semester of the second year, they would participate in their selected tracks as well as in applied research projects related to their selected tracks. During the autumn semester, students would decide in which of the two tracks they would remain to make their bachelor's theses. They would work with teachers of their selected tracks, who would become their career tutors and thesis supervisors, to develop research plans for their theses until the Christmas break. This relationship would continue in the spring semester of the second year with thesis supervision.

This change aimed to improve the quality of the thesis supervision process with an increased guidance scheme, to focus the faculty on their research activities, and to integrate students into the faculty's research initiatives and develop their research skills. By completing their theses during the second year, students would be more flexible with their choices after their international exchange and practical training. They could live and work where they would like to after the second year and the thesis would not be an issue hindering them from graduation, as it used to be. From the faculty perspective, the change would allow them more resources for their research initiatives together with students' contributions, and this would increase the number of publications and intellectual contributions. Thanks to these benefits, the quality of the program would improve, making it better prepared until the next reaccreditation.

Both the faculty and students welcomed the intervention despite some concerns about whether the second year was too early to do the thesis. There were also some adaptations in the implementation over

time based on feedback from both the faculty and students. The major adaptation was the shift from a two-track system to a single-track system after three years of implementation. This change was motivated by the fact that when students decided which track they would write their theses in, the commitments of some students to their second tracks diminished significantly. Their lack of motivation also affected the motivations of other students in the track negatively. In addition to this, teachers had restrictions in organizing applied research projects for their students in the two-track system. Since every student participated in two tracks, there happened overlaps between research activities of their tracks. Another adaptation occurred in 2021 with the addition of sports marketing as the seventh track. Students interested in sports marketing had a chance to do their theses in the earlier years only after participating in the specialization of sports marketing during their third year.

The international business program was reaccredited by EFMD in 2015, 2018, and 2021, the last reaccreditation being for five years until 2026. The academic track system will run for the sixth time since its adoption during the 2021-2022 academic year. According to feedback from the faculty, the academic track system delivered some positive results. Working in research projects in small groups of about 10 students in the academic tracks allowed both the faculty and students a unique opportunity of RBL during the second year. Furthermore, there has been an increase in the number of publications of the program's faculty after the intervention. Students and the faculty have co-authored conference papers and journal articles, developed from students' theses and applied track projects. Two such papers have received best paper awards in international conferences. The academic track system has also contributed to the development of students in the learning outcomes of the program, as revealed by students' self-assessments in the academic tracks. Students self-assess themselves twice in every academic track in terms of the intended learning outcomes of the program. The first self-assessment occurs at the beginning of the academic track. It assesses students' perceptions of their levels in the learning outcomes before starting the track and their target achievement levels after completing the track. The second self-assessment occurs when students complete their academic tracks. This time students assess their achievements in the learning outcomes. As shared in a preliminary study by Saleem and Akpinar (2021), results from these self-assessments indicate improvements in the learning outcomes of the program. These results, however, are only indicative. They do not allow making statistically significant conclusions on the impact of the intervention. The research in this chapter aims to accomplish this with the testing of the five hypotheses.

The outbreak of the Covid-19 pandemic in early 2020 set new challenges for the academic track system with the moving of the whole guidance process to the online learning platform of the institution. The percentage of students, who were able to complete their theses by the end of the spring semester, was not very high even before the pandemic, and Covid-19 worsened this statistic.

METHODOLOGY

Data were collected from the registers of JAMK University of Applied Sciences following the acquisition of the research permit from the institution's administration, agreeing to comply with the ethical principles of the institution and the Finnish legislation on conducting responsible research. Data included the thesis grades and course grade point averages (GPAs) of 300 students, representing seven cohorts with starting years from 2012 to 2018 (see the descriptive statistics by cohorts in Table 1).

The grading system applied at JAMK University of Applied Sciences follows the Finnish practice at higher education institutions. Course grades and the thesis grade are both ordinal measures, taking the

values from 0 to 5. 0 means fail, 1 is sufficient, 2 is satisfactory, 3 is good, 4 is very good, and 5 is excellent. GPA represents the weighted average of grades from all courses in the student's transcript. As such, it is a continuous variable between 1 and 5, expressed in two decimal points. As the intervention started with the cohort of 2015, cohorts from 2012 to 2014 represent students who were not provided with the increased guidance scheme in the thesis process, and cohorts from 2015 to 2018 represent students who were subject to the increased guidance scheme. Cohort 2018 is the last starting cohort in the empirical study because there is not yet enough corresponding data from later cohorts.

Data were analyzed using IBM's SPSS statistics software version 27. Following the analysis of descriptive statistics, Hypothesis One was tested using the Wilcoxon signed ranks test on all cohorts with a sample of 300 students. The reason for using this non-parametric test is that it allows comparing means of two measures within the same sample reliably when one of the measures is ordinal. Hypothesis Two was tested with the non-parametric Mann-Whitney U test. A non-parametric test was applied due to the same reason as in Hypothesis One that the dependent variable, which is the thesis grade, is ordinal. Mann-Whitney U test was utilized this time because different than in Hypothesis One, Hypothesis Two compares the means of two different samples, namely the sample of cohorts from 2012 to 2014 and the sample of cohorts from 2015 to 2018. The numbers of samples to be compared in Hypothesis Three and Hypothesis Four are three (cohorts 2012, 2013, and 2014) and four (cohorts 2015, 2016, 2017, and 2018) respectively. As the numbers of the samples are more than two and the thesis grade, the dependent variable, is ordinal, the non-parametric Kruskal-Wallis H test was applied in testing both hypotheses. Finally, Hypothesis Five was tested with one-way between-subjects ANOVA because GPA, the dependent variable, is a continuous measure, and the number of groups is more than two. Test results were interpreted following discussions with the director, the faculty, and students of the program.

RESULTS

Descriptive statistics

Table 1. Descriptive statistics by cohorts

Cohort Starting Year	Sample Size (N)	Course GPA Mean	Course GPA Standard Deviation	Thesis Mean	Thesis Standard Deviation
2012	51	3.69	0.45	3.29	1.08
2013	34	3.64	0.61	3.41	1.10
2014	58	3.94	0.50	3.52	1.03
2015	57	3.98	0.54	3.51	1.05
2016	38	4.14	0.50	3.89	0.98
2017	31	4.12	0.55	4.00	0.89
2018	31	4.12	0.45	3.77	1.18
2012-2014	143	3.78	0.52	3.41	1.06
2015-2018	157	4.07	0.52	3.75	1.04
2012-2018	300	3.93	0.54	3.59	1.06

Descriptive statistics in Table 1 provide some preliminary results. Regarding Hypothesis One, it seems from the sample of 300 students in cohorts from 2012 to 2018 that students perform on average better in courses than in the thesis. The mean GPA from the courses is 3.93, which is 9.5% higher than the mean thesis grade of 3.59. A related observation is that students' performances vary more in the thesis, with a mean standard deviation of 1.06 than in the courses, where the mean standard deviation is only 0.54.

Regarding Hypothesis Two, the sample of cohorts from 2015 to 2018, which has a mean thesis grade of 3.75, performs on average 10.0% better in the thesis than the sample of cohorts from 2012 to 2014, which has a mean thesis grade of 3.41. This statistic hints that maybe the intervention had a positive effect on students' learning performances.

Concerning Hypothesis Three, there is an increase of 7.0% in the mean thesis grade from the cohort of 2012 (mean 3.29) to the cohort of 2014 (mean 3.52). This questions whether there was an improvement in students' learning performances in the thesis already before the intervention. Regarding Hypothesis Four, there is a 10.8% improvement in the mean thesis grade from the cohort of 2015 (mean 3.51) to the cohort of 2016 (mean 3.89) and a further 2.8% improvement to the cohort of 2017 (mean 4.00). However, the mean thesis grade drops by 5.8% to 3.77 in the cohort of 2018. Among all cohorts, the cohort of 2018 is the only one that was subject to the negative consequences of the Covid-19 pandemic. During their second year, the thesis process needed to shift to fully online mode when the pandemic broke out in Finland in March 2020. This may be a reason behind the drop in learning performances in the thesis for the cohort of 2018. However, it is also interesting to note that there is hardly any decline in the mean course GPA of cohort 2018 vs. cohort 2017. This statistic further suggests that increased guidance in the classroom, including also support from peer students, is more important for students' performances in RBL activities such as the thesis than for regular courses.

Finally, regarding Hypothesis Five, there is an overall increase of 11.7% in students' course GPAs over the years from the cohort of 2012 (mean 3.69) to the cohort of 2018 (mean 4.12). The increase, however, is not homogenous over the years. The jump occurs mainly in the cohort of 2014 with a mean of 3.94, which is 8.2% higher than that of the cohort of 2013. A second significant increase occurs in the mean GPA of the cohort of 2016. Having a mean of 4.14, it is 4.0% higher than that of the cohort of 2015.

Testing of the Hypotheses

The Wilcoxon signed ranks test comparing thesis grades with course GPAs for all cohorts from 2012 to 2018 (N=300) confirms that the mean of thesis grades is significantly lower than the mean of course GPAs, where Z=-6.21 and p=0.00. As a result, *Hypothesis One is accepted*.

The Mann-Whitney U test indicates that cohorts from 2015 to 2018 (N=157), which received increased guidance in the thesis process, performed on average better in the thesis than cohorts from 2012 to 2014 (N=143), which received less guidance. The corresponding statistics of this test are U=9214.50, Z=-2.79, p=0.01, and r=0.16. These statistics suggest that increased guidance in the thesis process has a statistically significant, though small impact on students' performances. Hence, *Hypothesis Two is also accepted*.

The comparison of the mean thesis grades of cohorts 2012 (N=51), 2013 (N=34) and 2014 (N=58) using the Kruskal-Wallis H test shows that there are no statistically significant differences between the three cohorts, where H(2)=1.36, p=0.51, and the mean ranks for the three cohorts are 67.36, 71.74 and 76.23 respectively. Therefore, *Hypothesis Three is accepted, too*.

The comparison of the mean thesis grades of cohorts 2015 (N=57), 2016 (N=38), 2017 (N=31), and 2018 (N=31), using again the Kruskal-Wallis H test, suggests that there are no statistically significant differences between these four cohorts. In this test H(3)=5.53, p=0.14, and the mean ranks for the four cohorts are 68.45, 84.58, 88.18 and 82.39 respectively. As a result, *Hypothesis Four is accepted as well*.

Finally, the comparison of the course GPAs using one-way between-subjects ANOVA for all cohorts from 2012 to 2018 (N=300) suggests that there are significant differences between the cohorts, where F(6, 293)=6.24 and p=0.00. Hence, *Hypothesis Five is rejected*. The rejection of Hypothesis Five requires further inquiry to understand in which cohorts the differences are. This is because course GPAs and thesis grades are correlated, as indicated by a correlation coefficient of 0.63. This brings to question whether the improvement in mean thesis grades is because of having better students, as reflected by their performances in courses. As a result, Hypothesis Five is further tested separately for the cohorts from 2012 to 2014 and the cohorts from 2015 to 2018. The test for the cohorts from 2015 to 2018 (N=157) shows that there are no statistically significant differences in these cohorts' mean course GPAs, where F(3, 153)=0.97, and p=0.41. The test for the cohorts from 2012 to 2014 (N=143), on the other hand, suggests that there is a statistically significant difference, where F (2, 140)=4.79, and p=0.01. Checking the post-hoc Tukey statistics for these three cohorts suggests that the mean GPA of cohort 2014 differs significantly from those of 2012 and 2013. To conclude, the testing of Hypothesis Five reveals that the significant increase in mean course GPAs occurred with the cohort starting in 2014. As discussed with faculty and the program director, this can be attributed to the acquisition of the international accreditation in 2012, which contributed to the program's attraction of better-performing students during the following years. The significant increase in mean thesis grades, however, occurred with the cohort starting in 2016. If this increase was due to having better students, then the expectation would be to see the increase in mean thesis grades already with the cohorts starting in 2014 and 2015, but that is not the case. As a result, it is possible to argue that the increased guidance scheme for the thesis process, introduced with the cohort of 2015, had a significant positive impact on students' learning performances in their theses. However, the improvement occurred starting with the cohort of 2016, suggesting that the pilot year with the cohort of 2015 was not very successful. There was probably a learning curve for both the faculty and students in adapting the new initiative. Finally, the results from the one-way between-subjects ANOVA test for the cohorts from 2015 to 2018 indicate that the decline in thesis grade of the cohort of 2018 is not statistically significant in comparison to earlier cohorts from 2015 to 2017. Discussions with students, however, revealed that moving the thesis process online with the outbreak of the Covid-19 pandemic in the spring of 2020 diluted the nature of the new guidance scheme. Perhaps there is a need for collecting more data in the coming years to assess the impact of the Covid-19 pandemic more precisely.

DISCUSSION

Results indicate that RBL is challenging for undergraduate students. This derives from students' lower performances on average in the bachelor's thesis, the main RBL activity at the bachelor's degree program in international business at JAMK University of Applied Sciences, than in their regular courses. Results also show that increased guidance during thesis supervision improves students' learning performances in this RBL activity. The calculated effect size of increased guidance on students' learning performances is small at 0.16. There are three factors, which may have diminished the effect size. First, the experimental cohorts from starting years 2015 to 2018 underwent the thesis process during their second year

when they were less mature compared to the control cohorts from starting years 2012 to 2014. Second, the cohort of 2018 was subject to the negative consequences of the Covid-19 pandemic. Third, the new guidance scheme did not deliver its intended effect in its pilot year with the cohort of 2015. This observation suggests that it may take more than a year before achieving intended improvements in learning performances in RBL initiatives.

Results of this chapter contribute in three ways to RBL literature in the context of higher education. First, since more of RBL literature in higher education focuses on doctoral-level studies (Brew et al., 2017; Roberts, 2018), providing empirical evidence on successful implementation of an RBL initiative at the undergraduate level is encouraging. Second, it supports earlier findings by Gormally et al. (2009), Hughes (2019), and Vasilienė-Vasiliauskienė et al. (2016) that RBL is challenging for most students. The thesis differs from regular courses in the degree program in that students are expected to be active producers of knowledge (Lambert, 2009). At the start of the thesis process students need to identify the research problem and delineate it with focused research questions, which is something they are not familiar with from their regular courses. Furthermore, writing the literature review chapter by synthesizing from the relevant literature requires intellectual capability. It takes a while before students understand what the theoretical framework means and how it should be utilized to answer the research question. Moreover, academic reading and academic writing are challenging as well. Undergraduate students are not much familiar at the beginning of studies with ethical issues of plagiarism in academic writing such as making proper citations and preparing the list of references. These and other ethical matters need to be taught at the early stages of the thesis process. Additionally, applying an appropriate methodology rigorously in data collection and data analysis is another challenge for most students, even though they have been exposed to it in research methods courses. These challenges explain why perform worse in the thesis than in their regular courses. The difference between mean grades from courses and theses, however, has been decreasing after the introduction of the new guidance scheme in the thesis process from an average 9.8% in the cohorts from 2012 to 2014 to even 2.9% in the cohort of 2017. This observation suggests that a process of increased guidance by supervisors is vital for improving students' learning performances in RBL (Archer-Kuhn et al., 2020). The third contribution of this chapter is about competencies developed by RBL, as identified in earlier literature (e.g., Fernandes, 2014; Frank et al., 2003). Based on the case of the studied bachelor's degree program, ethical conduct and personal development can also be added to the existing list in the literature. Students develop their ethical conduct through complying with ethical matters during the whole research process, e.g., proper use of citations and avoidance of plagiarism. The thesis process also contributes to students' personal development when thesis supervisors act as career tutors, guiding students in their choices for personal development.

The main practical implication based on findings from this chapter is the suggestion to increase the guidance provided to students in a structured manner in the thesis process. Close interaction with supervisors and peer students for at least an academic year is ideal. While a one-year period is sufficient for most good students to write their thesis, other students may require more time. It is important to continue the support for such students. Acquainting students with research methods as well as academic reading and academic writing already during their first year of studies will also contribute to learning performances since it takes time to develop research skills (Hughes, 2019; Knight & Yorke, 2004). It is acknowledged that regular courses do not prepare students for the thesis. This is because the thesis demands students to be producers rather than pure consumers of knowledge (Lambert, 2009). Leaving students alone at the end of their studies with this challenging task, as was the case before the intervention, will result in lower learning performances. In the bachelor's degree program of this study, the thesis process was

moved to the second year because students went in the third year to their international exchange, and some of them lost physical contact with their supervisors afterward. For programs, which do not demand international student exchange, it could be better to conduct the recommended thesis process during the last year of studies. Students would then be more mature for it.

The empirical study is subject to the limitation that data was collected from one bachelor's degree program at one institution. Higher education institutions, which apply RBL initiatives in their bachelor's degree programs, can conduct similar tests in future research. Conducting similar tests at other institutions will contribute to the generalizability of findings. It is especially important to replicate the study in other countries because earlier research shows that cultural differences in students' perceptions towards collaboration may affect their learning performances (Akpinar et al., 2015). There can also be differences in the assessment of learning outcomes due to cultural differences, which future research should also take into consideration (Del Campo et al., 2020). A second avenue for future research is to study the impact of the new guidance scheme separately on the learning performances of high-achieving and low-achieving students. This would test the finding by Kogan and Laursen (2014) that RBL has a higher and long-lasting positive impact on the learning performances of low-achieving students. A third avenue for future research is to study the impact of the new guidance scheme on the development of students' competencies. That would be useful since RBL offers the promise to develop a variety of skills (see Fernandes, 2014; Frank et al., 2003) and to prepare students better for future work environments (Brew & Jewell, 2012). In-depth longitudinal case studies could be suitable for this purpose. Finally, there was not adequate data to understand the impact of the Covid-19 pandemic on students' learning performances more thoroughly. It remains a task for future research to collect similar data from students for the cohorts of starting years 2019 and 2020 and retest the hypotheses.

CONCLUSION

This chapter aimed to find out whether increased guidance in the thesis supervision process, an RBL activity, contributes to the learning performances of students, measured by their thesis grades. Five hypotheses were formulated and tested using data from a total of 300 students belonging to cohorts of starting years from 2012 to 2018 at the bachelor's degree program in international business at JAMK University of Applied Sciences, School of Business in Finland. The results indicate that RBL is challenging for students. Students performed on average worse in the thesis, the main RBL activity in the bachelor's degree program in international business, than in courses. The results also suggest that increasing the level of guidance in this RBL activity has a statistically significant positive impact on the learning performances of students. However, it can take some time before achieving desired outcomes. It took one year in the implementation at JAMK University of Applied Sciences for both the faculty and students to adopt the new guidance scheme successfully in the thesis supervision process. Therefore, it is important to remain patient and continuously assess and develop the implementation of the new guidance scheme, as was the case in the bachelor's degree program in international business. The results contribute to the literature on RBL in the context of undergraduate programs and encourage undertaking similar initiatives in the supervision process of the bachelor's thesis.

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KEY TERMS AND DEFINITIONS

Academic Track: A 5-ECTS course in the bachelor's degree program in international business at JAMK University of Applied Sciences. It takes place in the autumn semester of the second year. Following this course, students continue with their bachelor's thesis under the supervision of their academic track teachers.

Applied Track Project: A 5-ECTS research project that students conduct in their academic tracks in the autumn semester of the second year in the bachelor's degree program in international business at JAMK University of Applied Sciences.

Bachelor's Thesis: A 15-ECTS research project that students conduct usually during the final year of their bachelor's degree, guided by their bachelor's thesis supervisors.

Guidance: Support and direction provided by teachers or thesis supervisors to students to improve their learning. In the context of this chapter, it aims to help students in overcoming challenges related to the research in their thesis.

Higher Education: University-level tertiary education.

Learning Performance: Performance of students in the intended learning outcomes of the program. The thesis grade and the grade point average from course grades are used in the study for measuring learning performances in the bachelor's thesis and courses respectively.

Research-Based Learning: Learning through conducting a research project. Also known as inquiry-based learning.

Undergraduate Program: A bachelor's degree program.

University of Applied Sciences: The Finnish higher education system has a dual structure, comprising universities and universities of applied sciences. Universities of applied sciences offer only bachelor's degrees and master's degrees, not doctoral degrees. Whereas universities specialize in basic research, universities of applied sciences focus on applied research that aims to contribute to local industries and regional development.