How the didactic and instructional design in a blended research-based learning environment supports learning - the total mediation effect of intrinsic motivation

A DISSERTATION

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List of Abbreviations

American Educational Research Association (AERA)

American Psychological Association (APA)

Assessment of Higher Education Learning Outcomes (AHELO)

Complex learning environment (CLE).

European Commission (EC)

European Union (EU)

Extended Technology Acceptance Model (TAM2)

Exploratory factor analysis (EFA)

German Federal Assistants Conference *Bundesassistentenkonferenz* (BAK)

Information and communication technologies (ICT)

International Association of Universities (IAU)

Kaiser-Meyer-Olkin measure of sampling adequacy (KMO)

Knowledge and skills (K&S)

Kolmogorov-Smirnov test (K-S)

Learning Management Systems (LMS)

Lower limit confidence interval (LLCI)

Massive open online courses (MOOC)

National Council on Measurements in Education (NCME)

One-way analysis of variance (ANOVA)

Ordinary least squares (OLS)

Organization for Economic Co-operation (OECD)

Problem-based learning (PBL)

Research-based learning (RBL)

Scholarship of Teaching and Learning (SoTL)

Self-Determination Theory (SDT)

Summer Semester (SS)

Technology Acceptance Model (TAM)

The Association to Advance Collegiate Schools of Business (AACSB)

Unified Theory of Acceptance and Use of Technology (UTAUT)

United States Medical Licensing Examination (USMLE)

Unweighted Least Squares Factoring (ULS)

Variance inflation factor (VIF)

Vocational Education and Training (VET)

Standardized predicted values (*ZPRED)

Standardized residuals (*ZRESID)

Science, technology, engineering, and mathematics (STEM)

Upper limit confidence interval (ULCI)

Vocational and Business Education (Berufs- und Wirtschaftspädagogik) (BWP)

German Society for Educational Science (Deutsche Gesellschaft für Erziehungwissenschaft) (DGfE)

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1 Introduction to Researching Blended Research-Based Learning in Business Higher Education

1.1 General Context for Innovative Blended Research-Based Learning Offers in Higher Education During Pandemic Times

In 2016, The World Bank Digital Dividends report stated that Internet access and digital adoption should be complemented by adapting workers' skills to the new economy. Some of these skills are embedded in three categories: cognitive skills, which include problem-solving skills; social behavioral skills, which account for mindset along with decision-making, and technical skills, which include methods and specific occupation skills (The World Bank, 2016, p. 33). The skills required for this new economy set new challenges for educational institutions in various areas, such as using available technology for learning processes in a supplemental and practical way and providing relevant curricula development materials. As this report observes, "while technology will not replace teachers, teachers who use technology will replace those who do not" (The World Bank, 2016, p. 147). This implies that the World Bank is urging us as scholars and teachers to include technology in curricula and learning processes development.

Both the increase in productivity rates and integration with international markets require competent workers. These workers must understand and reflect the dynamic international economy, and at the same time boost the capacities of the organizations so that they can be more competitive in a globalized and digital economy framework. In this sense, the World Management Survey argues that improving management practices in organizations has a positive impact on the productivity indices of nations (Bloom et al., 2012). The essence of this argument is that a more educated human capital tends to produce better economic results for organizations and in doing so for the whole national economy.

The previous panorama highlights the need to boost organizational productivity and innovation by seeking quality and sustainability in organizational management practices. Management practices can be understood as a decision-making process that involves problem-solving skills (Eilon, 2018). These skills are addressed in business education, which must respond not only to the challenge of developing qualified human capital through innovative education (UNESCO, 2014), but also to the challenge of supporting students in their personal development and enabling them to participate in social life (Euler, 2005, p. 253). Therefore, at universities, business scholars

are conducting research on the production of relevant knowledge and sustainable practices related to organizations, students, and higher education institutions (The World Bank, 2002, p. xx).

Concerning pertinent current topics in higher education for the advance of research on online learning, international organizations such as the European Union (EU) have made several recommendations. In Horizon 2020, the largest EU research and innovation program, the European Commission defined relevant projects for research grants. Some of these projects come under the category of "Science for and with Society" and have a strong emphasis on research teaching. Specifically, the project "Enhancing Responsible Research and Innovation through Curricula in Higher Education (EnRRICH)" is intended to stimulate improvement in this area (European Union, 2015, 2017). The courses from these projects will be primarily based on problem-based learning methodology (PBL) and supported by multimedia materials with further implementation in several EU countries. Their results and final products will then be uploaded on open access. An internationalization plan will guarantee their future use in Europe and globally (European Union, 2017). Basically, the EU is arguing that responsible research promotes innovation, and this can be achieved by implementing educational programs with PBL methodologies.

The previous context reveals the importance of implementing and evaluating didactic and instructional innovations using available technology for teaching research methods in higher education with PBL methodologies. Based on the principles of PBL, the didactic concept of research-based learning (RBL) unifies research and teaching, especially research and "real" research problems (Schlicht & Slepcevic-Zach, 2016). This didactic approach gained greater relevance in Europe after the Bologna Reform Process[1] as it brings research into the focus of university teaching (Dörpinghaus, 2014; Huber et al., 2009; Schlicht & Slepcevic-Zach, 2016). RBL is the didactic concept used for designing the course on research methods evaluated in this study and is a central subject for the development of this project which will be discussed in more detail later.

Additionally, since 2020, the COVID-19 pandemic has disrupted different spheres and fields worldwide, causing increased digitalization in higher education (OECD, 2022). A literature review by Pinto and Leite (2020) from 2012 till 2017 showed a pattern of technologies reflecting the teacher's choice for learning methods combining face-to-face and distance learning. Moreover, the overall impact of technology usage in students learning process and outcomes proved to be positive when used with the intention to promote students' active engagement and participation in the learning process inside and outside the classroom (Pinto & Leite, 2020). However, since 2020, the lockdowns, social distancing, and COVID safe hygiene practices have reduced the usual face-to-face course

[1] The Bologna Reform Process made the introduction of bachelor's and master's degrees (Schlicht & Klauser, 2014, p. 1017).

delivery options for many higher education institutions worldwide. A forced transition to online and blended learning has been the only viable option for preventing the wholesale closure of many institutions. This forced education systems worldwide to adapt to new conditions and restrictions of face-to-face teaching and learning. This adaptation opened more possibilities for innovative responses in didactic including blended learning offers. As stated by the OECD it is key to gaining insights from this adaptation to the crisis (OECD, 2021).

Some studies showed that switching classroom teaching by remote teaching was the solution to this crisis adopted in higher education worldwide in 2020. According to the survey implemented by the International Association of Universities (IAU) when social distancing measures were implemented, most higher education institutions were faced with a sudden and unprepared shift to online teaching to continue teaching and learning activities, and to engage and motivate students. Several interconnected dimensions determined the feasibility and quality of distance learning, including the technical infrastructure and accessibility, distance learning competences and pedagogies, and the study subject (Marinoni et al., 2020). By April 2020, 85 % of higher education institutions in Europe switched to online teaching, while 12 % were still developing solutions (European Commission. Directorate General for Education, Youth, Sport and Culture & PPMI Group; Marinoni et al., 2020). According to the European Commission, these trends were broadly reflected at the global level. The IAU survey data showed that 75% of higher education institutions worldwide replaced classroom teaching with remote teaching by April 2020 (European Commission. Directorate General for Education, Youth, Sport and Culture & PPMI Group).

In summary, business education scholars and universities worldwide need to bring more relevant business practices and practitioner's problems into the classroom with innovative delivery formats. These profession problems should be addressed using an academic approach and should not be simplified by those in academia (Arbaugh & Hwang, 2015). This effort of approaching such problems with an academic mindset particularly affects the research components, composition, pedagogy, didactics, and focus of the teaching staff, as well as the delivery processes of student training and learning especially during crisis times. These delivery processes should be framed, designed, and adapted in a reflection on the context in which management action is carried out to be authentic; otherwise, there will be no learning motivation (Hmelo-Silver, 2012). Since 2020, business higher education has also been challenged to respond to a changing environment in pandemic times and attempting to imitate or improve what would have been the face-to-face way of proceeding while using online or blended learning formats (European Commission. Directorate General for Education, Youth, Sport and Culture & PPMI Group; Marinoni et al., 2020; Turnbull et al., 2021). This situation supports research on understanding the blended learning process in a more detailed manner.

1.2 Blended Research-Based Learning Background at Leipzig University

Undergraduate business students will deal with real research problems[2] (Schlicht & Slepcevic-Zach, 2016) at organizations during their internships, thesis writing, and at the beginning of their professional work life (Schlicht & Klauser, 2017, p. 97; Sugiarto, 2014). To face these challenges, they need business knowledge and an academic mindset that can be understood as the ability and motivation to work and argue on a scientific/academic basis (Dörpinghaus, 2014, p. 543). Both should be acquired during the teaching and learning process, which is strongly linked with research and its relevance in professional practice (Elton, 2001; J. Schlicht & Slepcevic-Zach, 2016; Williamson & Bow, 2002).

The teaching and learning process entails identifying and learning how to understand and solve these real research problems. Students must learn how to formulate accurate research questions about the problems, how to find the right information to answer these questions, how to analyze and interpret the obtained information, how to report it, and how to make knowledge-based recommendations for organizations to take action (Schlicht, 2013, p. 165). This teaching and learning process includes, but is not limited to, knowledge and digital skills acquisition, technical issues, and an academic mindset that covers sustainable growth in the long run. As the World Bank advises, it also involves socioemotional skills and the motivation for responsible, sustainable organizations in the new economy (The World Bank, 2016, p. 33).

Since 2012, the business education institutes at Leipzig University and the Technical University of Dresden have developed an innovative complex (constructivist) online teaching-learning environment[3] (KLLA in German language). A teaching-learning environment is defined as complex when it comprises a multidimensional design of learning contents and goals with complex procedures and methods that generate an effective knowledge acquisition (Achtenhagen & John, 1992). This complex teaching-learning learning environment was designed in collaboration with master's students in both universities. During the initial years, several prototypes were designed, tested, and improved according to evaluation results (Schlicht et al., 2017, p. 46). These very good

[2] "Research is finding out something not previously known. Hence the problems suggested must pertain to the unknown" (Reid, 1948, p. 515). As stated by Schlicht and Klauser, the real problem situations serve on the one hand as a cognitive and motivational stimulus for the learning process of the students and on the other hand act as a connecting element between scientific theory and the students' operational and future professional practice. (Schlicht & Klauser, 2017, p. 97).

[3] Achtenhagen states complex teaching-learning environments were developed for the vocational and occupational education and training during the 90s in Germany. Germany has a dual education system of apprenticeship that had to adapt to the megatrends of that moment. Some of these megatrends were the increasing complexity of entrepreneurial processes, changes in population levels, changes in migration, internationalization of economies, international mergers and acquisitions, information explosion including increased availability of research results, and increased use of new information and advanced communication technologies. As a result of these megatrends work tasks were more complex demanding therefore the development of individual employee competencies and personalities (Achtenhagen, 2000, pp. 159–161).

results were the starting point and motivation for the longitudinal study on motivation, acceptance, and knowledge acquisition presented in this dissertation. As the authors stated, further research was needed for a better understanding of the learning process with the complex online teaching-learning environment (Schlicht et al., 2017, p. 48).

The most recent prototype of this complex teaching-learning environment was tested from 2017 to 2021[4] in a blended RBL course on research methods for bachelor's students during their second semester at Leipzig University. This blended RBL course aimed to systematically bring students to academic thinking and to prepare them to face real and challenging business questions (Schlicht et al., 2017, p. 43).

The project in this study was aligned with the EU recommendations. The course was blended, developed according to PBL with a RBL didactic, and its main goal was to support responsible academic research to solve complex, real problems and overcome disadvantages regarding the acquisition of research abilities after the Bologna shift in the German higher education context (Schlicht & Slepcevic-Zach, 2016). As Arbaugh claimed:

> The expansion of business schools beyond North America and Western Europe calls for the study and development of educational models and curricula that generalize to these new settings (Eisenberg, Hartel, & Stahl, 2013; Lamb & Currie, 2011). As advancements in instructional technology affect both how and where we deliver education, we need contributions from BME[5] scholars to determine optimal combinations of content and presentation (Wankel, 2009; Whitaker, New, & Ireland, 2015). (Arbaugh et al., 2016, p. 655)

Countries such as the United States and Germany are more advanced in curricula and instructional technology. One of the reasons for this is because they include research findings regarding online delivery of business education; other reasons might be the solutions they find to cope with the challenges faculty face when attempting to integrate information and communications technology (ICT) tools in their teaching (Whitaker et al., 2016). This study offered research findings in the field of German business education in order to improve blended RBL knowledge and its implementation at Leipzig University.

[4] In 2018 it was not possible to test it because the chair head of the department passed away and in 2020 due to the COVID-19 pandemic start.

[5] Business Management Education.

1.3 Problems in Researching Blended Learning in Business Higher Education

1.3.1 Research Gaps in Online and Blended Learning for Business Higher Education

Universities have been implementing a range of didactic approaches to achieve the requirements for management practices. To improve knowledge learning, problem-solving skills, as well as other abilities acquisition, and increasing student motivation, teaching, and learning strategies of business schools have evolved. This evolution serves to accommodate a learning process that—without conflict with academic rigor—brings students closer to business practice and organizational reality. In this sense, business education has gradually adapted practices to the students' training process, which are used by other professions such as law or medicine (Garvin & Datar, 2009). Specifically, the use of case methodology, experiential learning, and problem-based learning seek to develop problem-solving skills, hard skills (technical), and soft skills (social and interpersonal skills in a general sense) (Savery, 2015).

All these didactic approaches have contributed to the learning process as it has moved away from the traditional classroom setting to online settings. Recently, with the dissemination of ICT, e-learning has been included more in teaching practices, and mobile and blended learning has grown. And to some extent this dissemination of ICT could be another way to improve coverage and inclusion of students from different backgrounds. The World Bank states:

> Teachers now must instruct students in how to find information and apply it in a new and unexpected context. This requires changes in teacher training. There are many examples of how digital technologies can assist teachers and students—by allowing group work among classrooms connected online, apps that stimulate creativity and problem solving, and games designed for education ("gamification"). (World Bank, 2016, pp. 33–34)

Hence, cognitive skills in problem-solving, social skills in decision-making, and technical skills from the relevant field are crucial for the educational process. These skills include how to find information in a new digital context and apply it, but it is also important to understand to what extent and how in-depth the information should be used. This starts with how to define the right information to search for, how to choose reliable sources, and how to design creative and innovative ways of action, and continues with obtaining relevant data, analyzing, interpreting, and making conclusions and recommendations for decision-making. Some of these tasks naturally have to be conducted using available technology (Reilly, 2017). All the above skills should not be simplified nor neglected in this learning process.

Studies have indicated the kind of skills that are needed to teach; however, it is not clear how to best teach in the online learning context. There is general agreement about what kind of cognitive, social, behavioral, and technical skills we need to teach to our students and what kind of skills cannot be automated or undertaken by technology (The World Bank, 2016, p. 33). Nevertheless, there is no consensus about how to optimally integrate ICT into the learning process in business education. More research is encouraged to find better ways to combine content from different subjects in business education with presentation and instructional technology (Arbaugh et al., 2016, p. 655; Whitaker et al., 2016).

Moreover, when it comes to the topic of online and blended learning in business education, there is an ongoing international debate on whether ICT has transformed business higher education or not. On the one hand, the supporters of online learning report that these formats, including massive open online courses (MOOCs), have allowed more students to be reached over the past two decades. On the other hand, skeptics argue that it is difficult to replicate the physical graduate school experience online (Whitaker et al., 2016).

Redpath, a supporter of online education, made a call to scholars to research online learning in the business higher education context (Redpath, 2012). In doing so, the bias was left behind that such research is not relevant in academia, and recently the Academy of Management Learning and Education reinforced this call, inviting submissions on online learning in business education (Foster, 2020). It is highly important for business academics to understand how new technologies are evolving and how ICT can be better integrated into the curricula. They must innovate the curricula and focus on the online learning experience, including blended learning, as a productive experience that responds to real business problems, and allows students to build their own knowledge in this process. In doing so, they must also inform scholars about their concerns and perceptions for future improvement (Whitaker et al., 2016). In this regard, there is also a need for studies that replicate and validate constructs in order to create a better foundation in the business higher education field (Arbaugh & Hwang, 2013, p. 246). This dissertation accepted this call and aimed to bring more knowledge in blended RBL in business higher education in Germany, thus contributing to the international discussion.

Furthermore, it is essential to find the best way to teach each of the different business disciplines in online learning along with blended learning formats. Many scholars view blended learning as being a good balance between pure online and pure classroom-based experiences. Scholars point out the fact that blended learning is increasingly common in business schools and universities (Allen et al., 2007; Picciano & Dziuban, 2007), and for this reason, questions regarding

theoretical perspectives and the most beneficial blends for each discipline and topic will become more important (Arbaugh et al., 2009; Chao Cao et al., 2008; Foster, 2020).

According to Reinmann (2011), research on blended learning for teacher education is also an area of debate. This discussion is closely related to the question of which competencies teachers must acquire in their education or which conception of professionalism should be central in their education (Zlatkin-Troitschanskaia et al., 2009). For Reinmann (2011), especially the didactic design of teacher education or individual learning offers in teacher education must be thought of from the goals, this also applies to blended learning in teacher education. Accordingly, she states that it is important to ask how blended learning can help prospective teachers to apply theoretical knowledge in practice by supporting their instructional designs and to reflect theoretically on their practical experience, and thus to achieve the needed reflective practice. She also pointed out the relevance for prospective teachers of the following question: in which way blended learning can be a role model and impulse for one's own teaching activities and expand the learning experiences and strategies of prospective teachers? Therefore, it is also important from the teacher's point of view to research the specific way blended learning supports the learning process in business education.

1.3.2 Research Gap in Blended RBL for Business Higher Education

The section Vocational and Business Education (BWP) of the German Society for Educational Science (DGfE) accepted the approach of RBL and comprised the area of vocational and business education research and teaching, including its didactic components as a relevant field of activity in its basic curriculum for the degree programs in vocational and business education (Sektion Berufs- und Wirtschaftspädagogik der Deutschen Gesellschaft für Erziehungswissenschaft., 2014, p. 7). During the implementation of higher education didactics, the question arises of how teaching and learning processes are to be operationalized and designed to promote, for example, selected and profile-defining specializations, problems and current challenges (including heterogeneity, inclusion, interculturality, and entrepreneurship), and a research-distanced attitude among prospective teachers as well as their abilities to use research results (Holtsch & Riebenbauer, 2019; Schneider & Wildt, 2009; Sektion Berufs- und Wirtschaftspädagogik der Deutschen Gesellschaft für Erziehungswissenschaft., 2014).

To date, little research has examined how research and university teaching and learning processes can be designed based on a RBL approach in business education (Deicke et al., 2014; Holtsch & Riebenbauer, 2019; Schlicht, 2021; Selje-Aßmann, 2020). Schneider and Wildt (2009, p.

54) argue that, although it is not mandatory, it is nevertheless possible and, in many cases, it is indeed the case that RBL also contributes or can contribute to the development of science through the growth of individual knowledge. They also stated that it is possible as a result of their involvement in research processes that students develop at the same time their skills as researchers, so learning takes place through knowledge (Schneider & Wildt, 2009). However, there are hardly any systematically elaborated approaches or empirical findings on how research process, university teaching, and learning processes can be designed and linked with each other. This design should explicitly include curriculum and didactic methods to generate both individual and scientific progress in knowledge (Schlicht, 2013, p. 165). The essence of Schlicht's argument is that more research is required in RBL in business education.

Moreover, there is a particular need for research on the intended effects on students' individual knowledge growth, and their further development in research methods still needs to be empirically proven (Schlicht, 2012a). Regarding this need, recently, four studies presented findings on the effects of RBL in social sciences, two of them specifically investigated business education students. The first study by Deicke, Gess, and Rueß (2014) who conducted impact analyses on the effects that participation in RBL has on the students' general interest in doing research, on self-efficacy regarding research activities, on interest in their academic subject, and on the epistemological beliefs of learners in students' interest on research. According to their findings, RBL does not, per se, contribute to an increase in students' interest in research, depending on which research activity the students carried out, their research interest increased. Working with literature, developing a research design and empirical work proved to be effective, whereas developing a research question or scientific writing promoted the students' interest less (Deicke et al., 2014). It is important to note that these results included students from different disciplines in social sciences at Humboldt University. The second study by Holtsch and Riebenbauer (2019) presented a RBL setting specifically designed for business education students. The university course was evaluated in orientations, interest, and self-perceived knowledge concerning aspects of content knowledge and research activities. Their results showed that while students' orientations remained relatively stable, their knowledge was more thorough at the end of the study by the course than at the beginning (Holtsch & Riebenbauer, 2019). The third study by Wulf, Thiem and Gess (2020) was a quasi-experiment with a control group of freshmen from education and pedagogy. They investigated the effects of RBL on cognitive research skills and motivation. For cognitive research skills, they found significant improvements in both samples. Since the content focus of both modules was strongly on cognitive research skills, this finding was not surprising. Although the effect of change in the RBL sample was slightly higher than in the control group, they did not detect a different development of the two samples by variance analysis. Thus, a

stronger promotion of cognitive research skills and competence by the format of RBL was not detected. Concerning motivation, their results were not as expected. Both groups showed a lower level of motivation at the end than at the beginning of the semester, whereby this decrease was only significant for the control group (Wulf et al., 2020). The fourth study with freshmen and master students in business education by Schlicht (2021) aimed to systematically introduce students of vocational and business education to the thinking and working methods of academics and experts from professional practice, to involve them in sustainability research, to effectively support learning about, for and through research (RBL), and to integrate digital media into the research, teaching and learning process. The study reported that this didactic approach had an effect with large increases in knowledge and skills, which could be achieved with relatively stable motivation (Schlicht, 2021).

According to the previous results, there was an opportunity to advance research in blended RBL in business education. It seems that motivation levels remain stable in face-to-face settings despite RBL approach and learning success understood as self-perceived knowledge and skills increased. Moreover, no empirical finding seems to show how the relationships between acceptance, cognitive, and emotional facets work. To understand the effects of RBL in a blended setting, it is necessary to start designing appropriate didactic RBL concepts. In the conceptualization of RBL, the learning cycle of the students should be synchronous with the research cycle in that they can distance themselves from their everyday experiences, develop new concepts through the reflection of contradictions and problems, and test them in practical action (Wildt, 2009). Therefore, university didactics are challenged to provide students with suitable learning spaces or didactic arrangements, which should simulate real business conditions for the acquisition of their research skills (Schlicht, 2021). With research on innovative blended arrangements in RBL, new knowledge can be reported for academic discussion. In the absence of more empirical longitudinal studies in the field of blended RBL in business education, a concept of blended RBL was implemented in business education at Leipzig University. Its origin and longitudinal evaluation are presented in the next section.

1.3.3 Evaluating a Blended RBL Course at Leipzig University

The starting point for this dissertation project was a previous study on RBL in a face-to-face classroom setting at Leipzig University´s Business Education and Management Training Institute. This study was conducted between 2012 and 2013, and it was sponsored by the Joachim Herz Foundation. Students in bachelor's and master's degree programs were involved in research in such a way that, on the one hand, the individual learning and study processes were influenced, enriched, and changed by the methods, processes, and procedures used in academic work. On the other hand,

academically founded contributions to the solution of complex (practical) problems were generated (Schlicht, 2013, pp. 165–166). Schlicht's point is that students created research questions, hypotheses, and instruments and with these, they collected data and analyzed it. By reflecting on data results, they were able to state solutions to the practical business problems faced in the course.

This first RBL project in Leipzig University was focused on solving deficits in RBL empirical research and finding innovative didactic solutions for its implementation in an offline setting. The students evaluated the course (and project) by completing a self-reported standardized questionnaire (Schlicht & Klauser, 2014, p. 1018). The results of this study showed that acceptance of higher education is largely associated with student motivation, learning success, and the instructional design of RBL. In addition, results supported the hypothesis that RBL improves student motivation and from the students' points of view, all four structural didactic elements of the pedagogical approach to RBL (marketplace, workshop, laboratory, and studio) promoted their learning success (Schlicht, 2021; Schlicht & Klauser, 2014, p. 1028). This innovative RBL didactic approach was empirically shown to achieve good results in traditional classroom settings.

The next step was transforming the face-to-face RBL course into a blended pedagogical design by developing and evaluating various prototypes. The blended learning design is a complex teaching-learning environment that combines an online environment with face-to-face teaching on a regular basis during the semester. This blended RBL course aims to bring students in a systematic way to academic thinking and prepare them to face real and challenging business questions (Schlicht et al., 2017, p. 43). The project was cyclical and had different prototypes that were improved according to the evaluations and feedback from the learning experience (Schlicht, 2021). The most recent and complete prototype of this complex teaching-learning environment has been tested since 2017 in a blended RBL course on research methods. The learning evaluations in 2017 showed good results, and in the end, the authors insisted that future research should be conducted for further development of the complex teaching-learning environment (Schlicht et al., 2017; Schlicht, 2021).

Consequently, this course was further tested at Leipzig University in 2017, 2019, and 2021 with business education bachelor's students in the second semester. The Institute aimed to understand how this course worked by evaluating and obtaining insights into the learning process, the changes in motivation, the acceptance of the didactic design, and the perception of knowledge acquisition from the students' point of view. The student responses were analyzed to find the most important factors influencing their learning process and how it functions. In this way, theoretical knowledge was advanced, and the faculty was supported with recommendations for future improvement.

1.4 Purpose of the Study

This work was intended to advance the knowledge about blended learning in business education in a German context by using a RBL approach, which as a complex problem-oriented learning didactic, should be investigated with an experimental approach (Funke, 2013). Explicitly, evaluations from the blended RBL course on research methods (Klauser, 1998; Schlicht et al., 2017; Schlicht, 2021) were analyzed in the business education bachelor's program at Leipzig University. The years under review were 2017, 2019, and 2021. The main aim was to analyze and identify the key factors determining students' self-perceived learning, how they interacted, and advance the pedagogical knowledge on blended RBL. Gaining insights and understanding from the blended RBL course was the main purpose.

Another objective was to generate hypotheses and recommendations for future implementation. Achieving a balance between theoretical knowledge in motivation, empirical data, and practical course design requirements (e.g., acceptance of students) is essential to prepare and improve a class type and therefore influence teaching in the long term (Reinmann & Vohle, 2003, p. 50). By generating these hypotheses and recommendations, new studies could be carried out to test the hypotheses in the short term.

1.5 Significance of the Study

Worldwide, it is important to improve the business pedagogical offer by rising research strictness and integrity in the knowledge generation and problem-solving skills. With this background, an innovative blended RBL course is relevant, one which integrates research methods content and business complex or wicked[6] problems within a PBL approach for business higher education. According to the European Commission (EC), this is pertinent for different geographies (European Union, 2017) and the German context as well.

Looking at other geographies, it is worth noting that there are three main barriers for business educational research, particularly in the United States. According to Arbaugh et al. (2016), one of the largest barriers to expanding knowledge in the United States in the business education field has been "a lack of exposure to educational research in doctoral programs, a lack of perceived prestige

[6] Wicked problems refer to problems that involve an intricate combination of changing relationships between their various components (Hmelo-Silver, 2004, p. 235).

associated with conducting educational research in business schools, and a general lack of incentives for such research in business school accreditation requirements" (p. 656). In the past, these barriers have contributed to an overall negative climate in educational research on American business schools and universities. This negative climate is reflected by the publishing decisions made by scholars, as they would rather publish blended and online business education research in discipline-related journals rather than in online teaching and learning ones (Arbaugh et al., 2009, p. 81). Fortunately, for the American context, this was expected to move in a positive direction over the next decades (Arbaugh et al., 2009, p. 82). Another influencing factor in general for higher education is the Scholarship of Teaching and Learning (Huber et al., 2018; Huber, 2018). Scholarship of Teaching and Learning (SoTL) can be understood as the scholarly engagement of university faculty in the disciplines with their own teaching and/or student learning in their own institutional settings through inquiry and systematic reflection with the intention of making the findings and results known to the interested public and thus available for exchange of experience and discussion (Huber, 2018, p. 21). The SoTL concept was first explicitly developed in the United States, and subsequently, in other countries, especially Great Britain, Australia, and Scandinavia, a whole movement with international networking has emerged. Compared to this rich picture, in 2011, when the concept was again revised in Germany, the German higher education system appeared to be backward in this respect (Huber, 2018). Currently, SoTL is attracting increasing interest from among those committed to the development of teaching and learning in higher education. According to Huber et al (2018), this is because the concept offers the prospect and starting point for understanding the profession of university teaching more comprehensively and for effectively complementing general university didactics through their own contributions to university-related subject didactics. The strength of this movement can be seen, among other things, in the fact that there are several journals with this scope. For example, in 2014, the American Psychological Association (APA) established a journal called Scholarship of Teaching and Learning in Psychology. Furthermore, for business higher education, since 2013, the accreditation requirements of the Association to Advance Collegiate Schools of Business have included teaching and learning scholarship as a required area for development and therefore fosters opportunities for universities, faculties, and business schools to advance new understandings, insights, and teaching methods that impact positive learning outcomes[7] in these institutions. (AACSB International, 2017, 2021).

[77] Learning outcomes in Germany are understood as competences in a holistic manner, involving not only cognitive but also non-cognitive aspects, this concept is a central idea in educational and training context (Hensen & Hippach-Schneider, 2016). A well accepted definition is that competencies are the cognitive abilities and skills that are available to or can be learned by individuals to solve specific problems, as well as the associated motivational, volitional, and social readiness and skills to apply the problem solutions successfully and responsibly in different situations (Weinert, 2001, p. 27).

Meanwhile, German-speaking countries have a strong research tradition in the field of higher education in general, as well as in business education and management training. This tradition is framed under Humboldt's philosophy and his principle of research and teaching unity (Schlicht, 2013, p. 165). For Humboldt, research and teaching unity is a special feature of higher education where learners are not just learners but are treated as researchers and guided by researchers and professors in their research (Humboldt, 1993, p. 169). This principle is also relevant for the selection of a RBL didactic design in this study.

In Germany, the business education and management training tradition in higher education started more than 100 years ago. In 1898, the first commercial college was opened at Leipzig University, the second oldest university in Germany (Schlicht & Moschner, 2018, p. XIII), and some years later, in 1923, the first business education and management training chair in Germany was also established at Leipzig University (Krause, 2003, p. 486), responding to the teaching, research, and scholarship needs in this field (Pätzold et al., 2010).

Despite this long German tradition, research in blended delivery of RBL is still scarce. Since the Bologna Reform Process, student's research knowledge and skills acquisition in higher education programs has only taken place in a rudimentary form. Even in the master's programs, students are only conditionally qualified to research and apply academic knowledge to complex practical problems (Schlicht & Slepcevic-Zach, 2016). As a result, universities are under pressure to develop and implement didactic innovations and strategies that are suitable to counteract the separation of research and teaching (Hippler, 2015, p. 14, as cited in Schlicht & Slepcevic-Zach, 2016). With these new strategies, research, and teaching, as Humboldt's unity is expected to improve in the long-term. To assess improvement in this area, it is mandatory to continue research on how these didactic innovations foster the learning process of research methods among students. Since 2021, this is also pertinent for the Faculty of Economics and Management Science at Leipzig University to fulfill international accreditation requirements as a member of The Association to Advance Collegiate Schools of Business (AACSB).

1.6 Research Questions

The main question is whether the blended RBL course supported learning among business education students and, if so, in which way? This was addressed through the evaluation of a higher education course in Germany in the field of business education and handled by means of a self-report. Following research recommendations regarding blended RBL in business education, a survey with two

measurement points was conducted over one semester. Different constructs, such as the acceptance of the blended RBL course, students' self-assessed knowledge and skills in research methods for the social sciences, as well as their motivation, were investigated. Here, the analysis of the acquisition of basic research methods knowledge and skills in the higher education sector was intended. The central research question can be specified as follows:

How do freshmen of business education learn through the blended RBL course on research methods?

The overarching guiding question is examined by analyzing the theoretical framework and current constructs' discussion for hypotheses generation. These hypotheses were pursued and tested through an empirical data collection and statistical descriptive and inferential analysis.

To gain understanding of this process, it is necessary to further specify the outlined overarching objective and to derive research questions concerning the different areas on which this dissertation is oriented., the following questions were answered:

- **RQ1. How was the self-perceived level of knowledge and skills at the beginning (t1) and how it developed at the end of the semester (t2)?**
- **RQ2. How was the self-perceived level of motivation at the beginning (t1) and how it developed at the end of the semester (t2)?**
- **RQ3. How was the acceptance level of the blended RBL course at the end of the semester (t2)?**
- **RQ4 Which factors influenced the learning process from the students' point of view?**
- **RQ5 Which relationship exists between the acceptance of the blended RBL course and the changes in motivation?**
- **RQ6. Which relationship exists between the acceptance and the changes in knowledge and skills?**

1.7 Organization of the Study

This dissertation is organized into five chapters, a bibliography, and appendixes in the following manner. It starts with the introduction to the topic in Chapter 1. Chapter 2 presents a review of the related literature, constructs, and concepts dealing with the learning process in blended RBL

in higher education and the proposed model to understand the relationship among the main constructs in this study, namely, motivation, acquisition of knowledge and skills, and acceptance of the blended RBL course. Chapter 3 delineates the research design and methodology of the study. The instrument used to gather the data, its validity and reliability, also the procedures followed, and the determination of the sample selected for the study are described. An analysis of the data and an interpretation of the findings are presented in Chapter 4. Chapter 5 contains the summary, discussion, limitations, conclusions, and recommendations of the study. The study concludes with a bibliography and appendixes.

Chapter 1 presented the general context in blended and RBL, and outlined the objective and research questions for this study. It was described the relevance of research on blended RBL in business higher education particularly during pandemic times. The main problems and research gaps were described particularly for the research at Leipzig University. Research questions were stated regarding the development of students' motivation, knowledge and skills acquisition, and acceptance of the blended RBL course on research methods were mentioned.

Chapter 2 summarizes the relevant concepts, and the current state of research, are summarized. In the first section of this chapter, the learning concept is described and its implications in PBL and RBL. Then, the blended learning concept, its different approaches, and pedagogical aspects, including those relevant to higher education and the concept of internet-based complex teaching-learning environments was discussed. Following, PBL and its connection with RBL is clarified. In the subsequent section, the teaching dimensions, the way RBL promotes academic thinking, and the blended delivery aspect were presented. Then, the evaluation aspects for RBL in higher education including the standards for educational and psychological testing and the criteria for determining good teaching in higher education were considered. After that, the cognitive and motivation facets in blended RBL processes for higher education context were discussed in depth. This is followed by a discussion of the acceptance concept and technology acceptance models relevant to the evaluation of blended learning in higher education. The last section of the second chapter deals with the proposed conceptual model for the relationship between acceptance, motivation, and cognitive facets in blended RBL.

Chapter 3 covers the research design of this dissertation. In this section, the empirical investigation is presented. To answer the six research questions, one longitudinal study was conducted. In the first section, the settings, and a brief description of the evaluated blended RBL course on research methods are presented. In the second part, the research design, sample, validity, and reliability of the instrument are displayed. To ensure the greatest possible comparability of the findings, an instrument based on previous studies was used for the blended

RBL course evaluation (Schlicht et al., 2017; Schlicht, 2021). This chapter ends with the presentation of the data collection procedures and analysis.

In Chapter 4 the results and findings are described. In the first several sections it is shown with descriptive statistics the development of self-perceived knowledge and skills acquisition, motivation, and the acceptance of the blended RBL course. In the next sections, the relationships among the constructs and the evidence of associations between motivation, knowledge and skills acquisition, and acceptance are investigated with inferential statistics and regression analysis. In the last section, the total mediation effect of intrinsic motivation between acceptance of the course and the knowledge and skills was presented by using the model from Hayes (2013). The interpretation of the model parameters can be also found in this section.

Finally, Chapter 5 contains a concluding discussion of the findings of the empirical study, which answers the research questions and positions them to prior researchers' findings. Here, the most important results are summarized, limitations and possible implications for business higher education were presented. Recommendations for action for the practical use of the blended RBL course and reflections for possible subsequent studies concluded the chapter.

2 Model Generation for the Influence of the Acceptance on the Learning Process for Blended Research-Based Learning

2.1 Understanding the Learning Concept and its Implications for PBL and RBL Environments

Learning has been defined in different ways by educators, pedagogical researchers, and theorists over the past few decades. Since the 1970s and 1980s, pedagogical research has primarily focused on different kinds of learning, such as the acquisition of skills (Anderson, 1982; National Research Council, 2000, p. 4), learning with understanding (Anderson et al., 1984; National Research Council, pp. 8–9), and as the emergence of new ideas through the interaction with other people and the surrounding culture (Carey, 2000; Wooster & Papert, 1982). Learning theorists explored different settings for learning, for example, experimental laboratory, classroom, and workplace (Bransford et al., 2006, p. 209). Classroom settings have been the focus of learning and motivation research on the individual in context for the last four decades. In this research, the most common epistemological perspectives are behavioral and cognitive (Schraw, 2006, pp. 245–246). For this reason, the two most frequently cited definitions in the field of learning come from these two research areas.

On one hand, behaviorists are interested in how the environment influences behavior. Their research focuses on ideas about conditioning, incentives, and motives to better understand learning. According to the Reinforcement Theory, which derives from the Law of Effect (Thorndike, 1913, as cited in Perry et al., 2006, p. 329), reinforcement is the mechanism for establishing and maintaining behavior and punishment is the mechanism for extinguishing it. As a result, learning refers to the behavioral change of an organism with respect to any given situation, in accordance with previous experiences with the same situation (Bower & Hilgard, 1981).

On the other hand, cognitivists are more concerned with individual perception and information processing, emphasizing the consideration of choices and anticipated outcomes within rational processes that lead to courses of action (Anderson, 2004; Mook, 1996). From this perspective, learning relates more to human organisms and knowledge acquisition and is an individual process based on personal beliefs, needs, and goals.

More recently, other scholars have claimed that learning can also be defined as the acquisition and creation of knowledge. According to Schraw, there are three different epistemological

perspectives of knowledge: positivist, postpositivist, and postmodern (2006). Positivists believe that learning occurs through sensory experience and that knowledge is viewed as stable and transmittable to others (Phillips & Burbules, 2000). Knowledge is objective and it is not open to personal interpretation, which can be imparted to others through books, lectures, and other media (Schraw, 2006, p. 245). Behaviorists and connectionists such as B.F. Skinner, rely on this epistemological perspective, and claim that experience is what facilitates knowledge acquisition, representation, and reorganization (Schraw, 2006, p. 245).

In postpositivist theories, learning is described as a process of understanding based on experiences with others within real-world contexts and is consensual (Peters & Burbules, 2004). In this perspective, knowledge is changeable and must be interpreted within the context (Schraw, 2006, p. 246). Schraw (2006) presents laws and constitutions as examples of this negotiation and consensus of knowledge, they are not an objective ideal but an approximation to an ideal (p. 246). Knowledge is viewed as complex processes with an overarched structure, this view is based on Descartes and Kant's rationalism, they claimed that knowledge validity and testing can be achieved by means of rational thought (Prawat, 1996, p. 216; Schraw, 2006, p. 246). Jean Piaget is cataloged as structural postpositivist who proposed a structural model of development, while Freud was viewed as a modernist postpositivist (Schraw, 2006, p. 246).

In postmodern approaches to learning, an individual learns through personal experience where knowledge is subjective and is not transmitted or transacted on with others (Schraw, 2006). Postmodernists questioned three main assumptions of modernists, knowledge as an individual property, science as the solution for the mental and physical version of the mind-world problem, and knowledge as the foolproof product of an inferential system (Prawat, 1996, p. 217). This perspective assumes that knowledge is self-constructed to create personal meaning for the individual (Schraw, 2006). Under this constructivist point of view, learning is basically understood as an active knowledge construction by the subject that learns (Piaget & Aebli, 1974). Wittrock and others have defined learning as a collection of processes that makes change possible through experience. Learning is understood as "the process of acquiring relatively permanent change in understanding, attitude, knowledge, information, ability and skill through experience." (Wittrock, 1977, p. IX). Here, the subject interprets the stimuli in all its facets and constructs its own interpretation of them, generating in an active manner and new knowledge for them, and changing their own understanding, attitude, ability, and skill during the process. At this point, knowledge, attitude, information, ability, and skill depend on each subject's previous knowledge, attitude, information, ability, and skill. The experience is subjective and personal for each subject. Specifically, these scholars focus on the interplay among affection, motivation, and cognition arguing that individuals are self-regulated (Carver & Scheier,

2012; Wells & Matthews, 1999). Furthermore, they argue that individuals compare their actual and desired states to learn and, accordingly, to these states align themselves toward the ideal self-state by engaging in an activity (Matthews et al., 2006).

Klauser (1998) defined learning in a business education context with modern didactic and instructional approaches, such as PBL or RBL, as a constructive process. According to him, the constructive process emerges through the interpretation of perceptual experiences depending on prior knowledge, the respective context of action, and on the current emotional and volitive state of mind (pp. 276–277). More explicitly, learning is conceived as an active, socially mediated, and situated process of individual construction of knowledge and skills, willingness and feeling. Learning is characterized as a process where learners construct their knowledge by interpreting perceptually conditioned experiences, depending primarily on their prior knowledge, on the respective context of action, and on their current emotional and volitive state. In this process, knowledge and skills are generated internally by the individual cognitive performance of each individual, they are dynamic, and subject to constant reconstruction (Jungmann et al., 2002).

Consequently, for the purposes of this study, the postmodern constructivist perspective is applied. This perspective guided the design of the blended RBL course and is the epistemological view shared by the instructors as well. In the evaluation, this perspective is the basis for analyzing and interpreting the results, according to this understanding of learning which includes non-cognitive and cognitive aspects such as motivation and knowledge and skills, in the discussion and recommendations they were reflected. Although the concept of learning per se is vast and covers many multifaceted theories and definitions, the most appropriate definition for this study is based on a constructivist approach in which the learning process goes beyond cognitive aspects. This will be discussed in depth in section 2.7.

2.2 Blended Learning More Than a Sort of Online Learning

E-learning, online learning, and blended learning are concepts derived from distance learning, which itself can be understood as ‘‘institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors’’ (Schlosser et al., 2009, p. 1). E-learning or electronic learning has been defined as “learning via electronic sources, such as television, computer, videodisk, teletext, videotext.” (White, 1983, p. 13). Online learning is a further concept related to e-learning and can be defined as learning that takes place partially or entirely over the internet making information or knowledge available to

users irrespective of time restrictions or geographic proximity (Sun et al., 2008, p. 1184). In this definition, blended learning is also included as it takes place partially face-to-face and over the internet (Stecyk, 2018).

The last two decades have witnessed different definitions for the blended learning concept evidencing that this term is not as simple as a mixture of face-to-face and pure online learning. Horton (2000) defines blended learning as "combining some strong and advantageous aspects of online learning and the learning in classroom" (p.15), and Morgan (2002) explains that blended learning is conducted to blend the best aspects of online learning and face-to-face learning. These two definitions stressed the importance of taking the best aspects of two delivery formats, however, these aspects and how to combine them properly are not clear. Blended learning was also defined as integrating face-to-face learning and electronic learning or distance learning, using different learning theories, methodologies, and techniques in the same place and supporting the learning process with various online technologies in the classroom (Singh, 2003). Throne (2003) goes beyond and defines the blended learning as "an education model which can integrate e-learning which has improved in parallel with new and technologic developments with traditional learning which provides the interaction in classroom" (p. 10). The Handbook of Blended Learning discusses different definitions ranging from the combination of instruction methods to media, and states that "*Blended learning systems* combine face-to-face instruction with computer-mediated instruction" (Graham, 2006, p. 5) whereas the U.S. Department of Education defined blended online courses "as a combination of online and in-class instruction with **reduced in-class seat time** for students" (Parsad & Lewis, 2008, p. 1). Bersin (2004) states that blended learning is a learning approach formed with the combination of the different learning environments and activity types for a certain group with the addition of electronic sources to face-to-face learning. He also portrays blended learning in business and management education as the natural evolution of e-learning by integrating diverse media types into a program that is aimed to solve a business problem in an optimal manner (Bersin, 2004). This definition points out solving business problems as a general objective for business education, which is more specific for the present dissertation, and is plausible according to Reinmann (2011) and her view of the importance of specific instructional design according to teaching-learning objectives.

More recently, blended learning was defined as "a mode of instruction in which some of the information is provided via digital or online media, either inside or outside of the traditional classroom, with students having some level of ownership over the time, pace, and place of instruction" (Morgan & Spies, 2020, p. 44). This definition shows the different aspects of media, instruction, and students' engagement at which blended learning has been understood in recent years. As a form of online learning, different variants of learning with new media are important for blended

learning. This ranges from self-organized learning, with online and offline information, through guided learning interaction with technical systems, to social and real problem-based learning in virtual groups or communities. (Reinmann & Vohle, 2003).

The most suitable definition for this dissertation is from Schulmeister et al. (2008), who developed the Hamburg Reference Framework for Quality Assurance of eLearning Offerings funded by the German Federal Ministry of Education and Research (BMBF). In this framework, they take the degree of virtuality as an important parameter to differentiate other e-learning scenarios from blended learning. Thus, for a blended learning scenario, the seminar is held face-to-face, while some sessions or supervised workgroups take place online. The students submit the results of their research, their presentations, and their homework into a platform. This work takes place asynchronously, independent of dates. The working groups occasionally meet online on specific dates and then discuss their tasks and topics synchronously, which will then be looked at again in the seminar (Schulmeister et al., 2008). This definition applies to the blended RBL course on research methods. In addition, students meet also offline and present their results either in the face-to-face seminar or online, depending on the current state's health restrictions.

It can be inferred that the main difference among these concepts is an evolution of the method of the delivery method for the learning experience. However, other changes must be noted, as didactics are also evolving, and synergy is aimed. As Garrison and Vaughan (2008) stated, a blended learning design should represent significantly more than just adding on to its face-to-face and online components. The key factor is the didactic approach employed to design the instruction and learning experience. The challenge is to arrange an appropriate blend among limitless design options, learning activity arrangements, and delivery channels by gaining an understanding of strategies. This brings into consideration a range of options that require revisiting how students learn in a deep and meaningful way. The need to provide more engaged learning experiences is the core interest of blended learning (Garrison & Vaughan, 2008).

One advantage in this regard is that blended learning responds to a wide variety of learning styles and needs through flexibility, high adaptability, and economy of space and time, taking benefit of both cognitive and human resources (Garrison & Vaughan, 2008). According to Garrison and Vaughan (2008), blended learning is an approach to educational redesign that can enhance and extend learning and offer designs that efficiently manage large classes. This point is important to support coverage objectives at higher education institutions, but it is not a limitation for the approach. It represents a distinct design methodology that transcends the conventional classroom paradigm. The proportion of face-to-face and online learning activities may vary considerably, but blended learning

is distinguishable by way of the integration of face-to-face and online learning that is multiplicative, not additive. (Garrison & Vaughan, 2008). Reinmann (2011) defines blended learning briefly as a call to use the teaching-learning potential of (always new and evolving) digital media in a didactically meaningful way and what is didactically meaningful depends on the goals, content, and educational contexts. She also points out that blended learning must be carefully planned didactically by determining teaching-learning objectives, selecting, and sequencing appropriate teaching-learning materials, and, if necessary, preparing them. Also, the desired processes have to be organized, for example, by designing tasks, contexts, and their arrangement (Reinmann, 2011). To illustrate how this arrangement can be designed, Schulmeister et al. (2008) used a blended learning course for journalism. For this course, the instructor has a wealth of historical and current material on the press, radio, television, the music industry, and other media markets, which he develops and updates in a data bank and feeds into an available platform. The didactic forms of use and activities are varied: in exercises on editorial practice and in projects with media companies, the students develop the content themselves and are also responsible for presenting the results. There may be assignments and questions about it, on which the students work and can communicate in the seminar, as well as in forums (Schulmeister et al., 2008). This example suggests how diverse collections of teaching materials can be used in the classroom and online, and the complexity involved in designing and preparing them for a specific context and arrangement.

Regarding the effectiveness of blended learning, as numerous studies suggest that blended learning courses allowed students the same, if not improved, learning outcomes when diverse types of knowledge were assessed (Cavanagh, 2011; Means et al., 2010; Saichaie, 2020; So & Brush, 2008). Moreover, researchers report positive student satisfaction with blended learning among different types of students, including undergraduate and graduate students, also in international contexts when compared to face-to-face courses (Dziuban et al., 2018; So & Brush, 2008).

Furthermore, findings from the systematic review of meta-analyses by Schneider and Preckel (2017) indicate that for online and classroom instruction that they are most effective when they are combined into blended learning arrangements. Online learning was about as effective as classroom learning, but blended learning was more effective than classroom instruction alone ($d = 0.33$). They also support further research in finding the best combinations of the different forms of blended learning and further meta-analyses with more detailed moderator analyses.

2.2.1 Three Approaches to Blended Learning Models

Blended learning, in the sense of a combination of virtual and presence phases, linked with different teaching-learning methods, can take various forms. When planning study programs, modules, or courses, a first possible approach is to answer the question of combination in terms of time, i.e., with regard to the sequence of virtual and presence phases (Reinmann, 2011; Schulmeister et al., 2008). A second approach combines terms of time and volume and the role of online instructional delivery (Woo et al., 2009). The third approach categorizes the degree of control that students have over their learning and the volume of online instructional delivery among other dimensions (Graham et al., 2013; Picciano et al., 2013; Staker, 2011; Stecyk, 2018). Without claiming to be exhaustive, the previously mentioned approaches are presented.

Within the first approach numerous variants such as the preparation variant, the follow-up variant, the framing and alternating variant, the practice-accompanying variant, and the work-integrated variant can be defined. The preparation variant is a common combination of preparing a face-to-face session or a face-to-face period through teaching offers in virtual rooms. Individual preparation through self-learning offerings such as computer- and web-based training is just as conceivable as the preparation with social interaction via e-mail, forums, chats, and audio, or video conferences. This can be largely self-organized or accompanied by teachers or tutors/facilitators (Reinmann, 2011; Schulmeister et al., 2008).

The follow-up variant is following up on face-to-face sessions or periods in virtual settings. Blended learning in this sense focuses on the goal of promoting the transfer of what has been learned through suitable application tasks or providing opportunities to consolidate what has been learned through practice. Accordingly, communication and cooperation tools can be used for digital follow-up, but also software applications that serve for practice or reflection (Reinmann, 2011).

With the framing and alternating variant, it is possible to virtually prepare and follow up a classroom session or a classroom period. This can be achieved by using digital media to combine the outlined goals of preparation and follow-up. In this case, virtual phases "frame" the attendance phase. Moreover, if several attendance phases follow, a post-processing online phase can simultaneously be the preparation for the next attendance phase. This is viewed as the alternation between online and attendance phases. These forms of blended learning rhythmisize the teaching-learning process in a special way and support longer teaching-learning phases (Reinmann, 2011; Schulmeister et al., 2008).

The practice-accompanying variant is mainly used for learning processes in places outside of institutionalized training situations, such as the university, to support or accompany learners during

their practice experiences. Such practical support can be structured in different ways: Through synchronous or asynchronous communication with teachers or tutors, through peer coaching, through accompanying assignments and subsequent feedback, and through supervised e-portfolio work. In this variant, teaching activities run exclusively virtually, while learners are at physical learning sites such as companies, and can thus learn in both real and virtual spaces (Reinmann, 2011; Schulmeister et al., 2008).

The work-integrated variant refers to the possibility of using mobile devices at any time. Thanks to the increasing advancement of mobile technology, it is no longer necessary to sit in front of landline computers in every case if one wants to work on digital content, communicate electronically or practice other media activities: With networked notebooks, netbooks, tablets, and smartphones, virtual elements can be brought into every presence situation. As a result, physical and virtual activities no longer must be carried out in separate rooms and separate phases, but can run in parallel or be combined with each other (Reinmann, 2011; Schulmeister et al., 2008).

Following this first approach, this dissertation examined a blended learning environment which combined the preparation and the work integrated variants to achieve learning goals by using ILIAS as a Learning Management System (LMS). As media-based preparations can have the goal of homogenizing or activating prior knowledge, provoking questions, or demanding initial results via tasks for the research project that are brought into the classroom session. As a rule, this blended learning variant attempts to make more intensive use of the available attendance time. Furthermore, the work integrated variant made it possible to achieve goals such as, using different sources of information at any time and researching, recording, and preparing work results digitally on ILIAS (Reinmann, 2011; Schulmeister et al., 2008).

The second approach by Woo et al. (2009) considers whether the online and offline phases are divided by session or by topic, and which one of them accounts for the highest instructional delivery, and the supportive role. Thus, they categorized blended learning into a mixed mode and an adjunct mode. The mixed mode refers to classes that comprise online and offline sessions which are further divided into vertical and horizontal types. Usually, the vertical type divides online and offline classes based on class topics without a combination of online and offline activities within a session. In the horizontal type of mixed mode, every class is divided into online and offline phases combining them according to the instructional needs. Furthermore, the adjunct mode of blended learning is subdivided into either online or offline supplementary types. As expected in the online supplementary type, offline classes account for the main portion of teaching and learning activities, and online classes offer support. In the offline supplementary type, the main instructional delivery takes place online,

and offline classes are sessions used to reduce the disadvantages of pure online learning such as access to tutors and group discussions (Im, 2021; Woo et al., 2009). In this dissertation, the blended RBL course was designed with an adjunct mode approach where offline sessions were a way to supplement the online ones by assigning additional time to the tutor's guidance, content discussion, teamwork, and practice while operating the regular class online.

The third approach categorizes the degree of control that students have over their learning, teacher roles, scheduling, physical space, instructional delivery method, and the volume of online instructional delivery. Several models of blended learning have been defined, such as face-to-face driver model, rotation model, online lab model, A La Carte model, enriched virtual model, and flex model. The programs that fit in the face-to-face-driver mostly all retain teachers to deliver most of their curricula face-to-face. Teachers employ online learning on a case-by-case basis to supplement or remediate the learning process (Staker, 2011).

The rotation model allows students to rotate through stations on a fixed schedule, where at least one of the stations is an online learning station. In other words, in this form of blended learning, students rotate between different online and offline stations on a fixed schedule (Graham et al., 2013; Picciano et al., 2013; Staker, 2011; Stecyk, 2018). Several types of rotation models are stations, where the station refers to online, face-to-face, or collaborative activities. The lab type uses a dedicated computer lab for the online phases. In individual types, the rotation is individually scheduled by a teacher or an algorithm. The flipped classroom is a type where learning occurs at home via online coursework and lectures; face-to-face class time is used for teacher-guided practice or projects (Graham et al., 2013; Staker, 2011; Stecyk, 2018).

The online lab relies on an online platform to deliver the entire course in a lab environment. Generally, these programs provide online teachers which supervise, but offer little content expertise (Staker, 2011). Self-blended or A La Carte model is an educational framework in which students take one or more courses entirely online (at home or at the campus) with a remote teacher. It gives students the opportunity to supplement their learning experiences by taking courses beyond what is already offered at their university. Online learning is always remote, which distinguishes it from the online-lab model, while the traditional learning is in a brick-and-mortar institution (Graham et al., 2013; Staker, 2011; Stecyk, 2018). The enriched virtual model is an alternative to full-time online courses that allows students to complete most of the coursework online, but attend university for required face-to-face learning sessions with a tutor (Stecyk, 2018).

Finally, the flex model includes an online platform that delivers most of the curricula. Teachers act as tutors and provide on-site support on a flexible and adaptive as-needed basis through

face-to-face tutoring sessions and small group sessions (Staker, 2011). The blended learning model used for this dissertation is a flex model. It was selected because the flex blended learning model gives students a higher control degree over their learning and heavily relies on online instructional delivery. As Stecyk states, in the flex model, online learning is the backbone of student learning where students can move through the content at their own pace. Tutors have time for individual work and group discussions with students because they are generally no longer delivering knowledge in front of a class, while face-to-face time is used for further discussion and specific questions (Graham et al., 2013; Stecyk, 2018).

2.2.2 Pedagogical Aspects of Designing Blended Learning for Higher Education

From the perspective of educators who are responsible for higher education, including business education and teacher training, it seems particularly pertinent to take up the possibilities offered by digital media for organizing the teaching process as blended learning. Some consensus has emerged around the concept that a blended course integrates online learning with traditional face-to-face class activities in an intentional pedagogically reflected and effective style (Arbaugh et al., 2010; Garrison & Kanuka, 2004; Reinmann, 2011). For some authors, this manner can be quantified regarding the course content and activities online; specifically, to be blended, this figure should represent between 30% and 79% of the course (Allen et al., 2007; Arbaugh et al., 2010; Garrison & Kanuka, 2004). However, as Reinmann (2011) affirms, the specificities in blended learning regarding the type of media used, the intensity and quality of media use in the teaching-learning situation, the exploitation of existing teaching-learning potentials, or didactic challenges and decisions are not defined. This situation can be viewed as a challenge and a possibility for educators who should answer the previous questions according to the didactic approach selected for the instruction. It is the selected didactic approach that should guide the design of teaching material and instruction delivery, and digital media should expand the didactic scope of blended learning scenarios and thus, it requires particularly high didactic skills and correspondingly careful and deliberate design processes (Reinmann, 2011; Schulmeister, 2006). For the blended course investigated in this dissertation, the didactic approach selected was research-based learning (RBL), and this aspect will be discussed in the following sections.

Nonetheless, some aspects regarding teaching activities for blended learning have been considered for clarification. For teaching activities, digital media can be used to design content and material as well as tasks and contexts in advance, (designing teaching activities) and/or to communicate, instruct, and collaborate with learners (interactive teaching activities) (Reinmann,

2011). Designing teaching activities for blended learning refers mainly to a lecturer's capacity to develop their own teaching materials, expand existing ones, or link them in new ways, including all delivery media and, especially, digitally generated elements. Currently, it is relatively simple to write, publish, distribute texts, and integrate images, as well as to produce audio or video recordings, and web-based learning objects and to use them as teaching and learning material. Some tools supporting this include blogs, wikis, Flickr, YouTube, Podcast, social bookmarking, e-portfolio, digital storytelling, e-books, video lectures, RSS feeds, NetVibes, and Google Reader (Pinto & Leite, 2020).

Results in higher education show that the use of video technologies, especially lecture captures, were reflected on students' more positive engagement and in-class participation (Garrison & Vaughan, 2008; Pinto & Leite, 2020). For example, to illustrate the effectiveness of these teaching materials, the use of video tools to produce digital storytelling has been studied, and results showed that they support for reflective and critical engagement in learning (Pinto & Leite, 2020). There are also technical tools for designing exercises and tests, such as electronic marking, clickers, audio feedback, computer note-taking, etc. that can be learned and used quickly (Garrison & Vaughan, 2008; Pinto & Leite, 2020). Even complex tasks that enable problem-, case- or project-oriented learning can be made more informative and/or motivating by using digital media and Learning Management Systems (LMS) such as Blackboard, Moodle, WebCT, and ILIAS (Garrison & Vaughan, 2008; Pinto & Leite, 2020).

All these activities usually take place before the start of a course or a teaching phase. They have a design character and materialize the didactic scenario that one wants to implement. The planning of processes (e.g., group processes, task timings, feedback loops, project phases, etc.) also falls under the category of design teaching activities, in which technical systems and tools are often used and can turn the planned didactic scenario into a blended learning scenario (Garrison & Vaughan, 2008; Reinmann, 2011; Saichaie, 2020). The studies by Saichaie (2020) and Garrison & Vaughan (2008) give some detailed considerations for settings configuration in this regard.

Furthermore, digital media support teaching activities after the design phase during the actual teaching and learning process in an interactive manner. For instance, when a course begins, the teaching material prepared is made available, learning objectives are presented, tasks are set, and their completion is supervised, instruction is given, communication is carried out, and feedback is given (Reinmann, 2011). At this point after the design phase, the nature of teaching activities is interactive. Here, the faculty have a different priority in using digital media in the process of teaching during the implementation. The priority is to establish fluid communication with students to guide and support them so that they gain a clear understanding regarding learning objectives, expectations, and

assignments (Garrison & Vaughan, 2008; Reinmann, 2011). Fortunately, an LMS can facilitate this communication by allowing instructors and students to send group e-mails to the class, post information, and establish asynchronous and synchronous dialog through the use of wikis and forums (Garrison & Vaughan, 2008).

Saichaie (2020) presents different components that should be reflected while designing a blended learning experience. Some of these components include student readiness, learning goals, percentages of time online and in the classroom, learning activities, interaction, the role of technology, assessment of learning, and assistance. He also recommends educators to reflect on the Technological Pedagogical Content Knowledge (TPCK) model (MISHRA & KOEHLER, 2006) which is based on Shulman's (1986) construct of Pedagogical Content Knowledge (PCK) model. With the TPCK model, it is possible to conceptualize a proper interaction between the components to teach in settings like blended learning models (Herring et al., 2016; Linder, 2017). Instructors can define where to allocate time for their courses by reflecting and gauging the desired learning outcomes and the functions of pedagogies, content, and technologies to achieve them (Saichaie, 2020). This contemplation guided the development of the blended RBL course evaluated for this dissertation. In correspondence to this reflection, online and face-to-face time allocation, and the various teaching activities and materials were defined. The result was a complex teaching-learning environment on research methods for business higher education.

2.2.3 Complex Teaching-Learning Environments in Business Higher Education

According to German business education scholars, Achtenhagen & John (1992), a complex teaching-learning environment is a multidimensional design of teaching contents and goals with complex procedures and methods. This type of learning environment generates effective knowledge acquisition (Achtenhagen & John, 1992). The learning environment concept has been developed to find constructive answers to the problems of teaching and training arising from developments in the political-economic field, the new media open possibilities for the development and use of complex learning environments that go far beyond those of print (Achtenhagen, 2006, pp. 322-323). They usually offer multimedia formats (diagrams, graphics, animations, sound, and video). Its use requires careful planning and implementation because the teacher must design or find a suitable real-world problem that addresses the content and objectives (Dubs, 1996; Morge et al., 2019, p. 619).

More specifically, Jungmann et al. (2002) stated that complex teaching-learning environments should be designed in such a way, that learners are confronted with objectively and subjectively

meaningful problems from their professional and everyday world, which enable challenge and motivate independent learning. They affirm that learners should be able to bring their previous knowledge and experience, their interests, and their skills into the problem-solving process and that new authentic experiences arise because of the learning action. Additionally, the tasks should be introduced in a situationally embedded way and a change of contexts and perspectives in the processing of tasks and problems is possible and supported. This means, tasks are real-life problems that can be examined from different points of view and are suitable for the development of structured knowledge and open transfer possibilities (Dubs, 2009, p. 28). Likewise, social cooperation, individualization, and differentiation are to be promoted through combined individual, partner, and group work. Moreover, specific help and opportunities for error correction should be offered and metacognitive processes, reflecting on learning, the learning path, and the results must be promoted. Finally, in the sense of a necessary link between casuistry and systematics, the elaboration of general rules and conclusions is aimed (Jungmann et al., 2002, pp. 9–10).

With the development of structures, style sheets, and templates for the presentation of content in learning management systems, a framework for the construction of learning offers is available, which guarantees a uniform and learner-appropriate layout designed according to media-didactic findings (Jungmann et al., 2002). Thus, a high technical and pedagogical level can be realized, which sustainably secures the pedagogical intentions within the construction process as well as, during the presentation in the LMS. This can also be transferred to other projects pursuing the same or similar teaching-learning philosophy.

Nevertheless, Jungmann et al. (2002) pointed out that these structures, tools, and methodologies are no substitute for the necessary pedagogical expertise in the creation of multi-media learning offers, and that the provision of learning content in an LMS cannot be a substitute for a pedagogically prepared and designed learning situation and systematic pedagogical action. The creation of multimedia, net-based learning environments is a process in which technical and pedagogical tasks can only be solved in an integrative manner. The construction of multimedia Internet-based learning environments first requires a theoretical conception, which is implemented uniformly on different levels throughout the learning offer. The technical architecture must enable and support the implementation of the conception. In this respect, there is a close interrelationship between information technology and pedagogical tasks. This is also in agreement with Reinmann (2011).

In terms of research, it is about insights in different aspects, such as how the knowledge and skills of experts differ from the knowledge and skills of novices, and how teaching-learning processes

with new media can be systematically aligned regarding expert action in study, professional, and everyday situations (Jungmann et al., 2002). In essence, it is about linking the goals and contents of the learning offer, as well as the learning processes in a specific way. The sequencing principles concrete-abstract-re-concrete (Klauser, 2000), increasing complexity, increasing diversity, and global before local skills (Collins et al., 2016) serve as a frame of reference for some instructional approaches, such as PBL, which have proven to be particularly suitable for the implementation of such sequencing approaches in research (Jungmann et al., 2002). Some authors describe these environments as PBL, which in digital spaces defined as students working in online teams with the focus being on a problem or scenario-based learning. Students are expected to work collaboratively to solve or manage the problem and may work in real-time or asynchronously. Facilitation is made through tutors having access to the ongoing discussion, and sometimes with their participation (Savin-Baden & Bhakta, 2019, pp. 646–647). PBL and RBL instructional approaches are discussed in sections 2.3 and 2.4 respectively.

2.3 Problem-Based Learning in Connection to Research-Based Learning

Problem-based learning (PBL) is defined as "an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem." (Savery, 2015, p. 5). It was developed in Canada in the mid-1960s for education in the medical sciences, and from 1970s to 1980s, PBL was widely adopted by medical schools in the USA, UK, and Europe. It was implemented worldwide afterwards in different disciplines including science, engineering, humanities, and social sciences undergraduate courses (Allen et al., 2011; Hendry et al., 1999; Savery, 2015).

PBL development was indirectly influenced by Dewey's work on education, commonly known as "learning by doing". Dewey was interested in learning in communities where the learner participates in social practice and acquires knowledge and skills (Reinmann, 2009). He explained learning as an experiential process triggered by a "problem" for which the learner should use his or her knowledge to seek out a solution (Servant-Miklos et al., 2019, pp. 12–13)[8]. Popper's conjectures regarding science and nonscience, as well as influenced PBL in that problem solvers develop theories and hypotheses by activating their previous knowledge (Servant-Miklos et al., 2019, pp. 13–14). PBL

[8] In this study the concept of learning is not limited to knowledge acquisition, however, the knowledge acquisition facet also follows a cognitivist approach. In this sense, the learning definition by Steiner (2001) in terms of knowledge acquisition is preferred, he defines it "as the construction and continuous modification of knowledge representations" (p. 164). In the 2.5 section of this thesis, learning and knowledge and skills acquisition will be discussed in depth.

was initially designed to cope with the difficulties of the bucket theory by presenting authentic complex cases of patients in which the medical students had to integrate and apply their knowledge to diagnose the patient accurately (Allen et al., 2011). Students from problem-based programs are not expected to have previously assimilated all the knowledge but are expected to be able to manage knowledge (Savin-Baden, 2001). In business education, an analogy can be made by seeing the organization as the patient with different symptoms, and students must identify the problem, diagnose it, and offer the appropriate solution or treatment, as in the blended RBL course used for this dissertation.

PBL is modeled by the instructor with a situated constructivist approach (Hendry et al., 1999; Klauser, 1998; Reinmann & Mandl, 2010) around a complex problem situation with not a single correct solution (Hmelo-Silver, 2004, p. 235). Funke (2006) goes further and states five defining characteristics of a complex problem: complexity, interactivity, dynamics, lack of clarity, and multipurpose. The complexity refers to the number of variables involved. Interactivity implies the fact that there are multiple relations between the variables implicated. Dynamics denotes the changes over time to the original problem situation, which will transform it. Lack of clarity and multipurpose relate respectively to the unavailability of some of the information needed to solve the problem, and to the need for more than one criterium for the optimization of the solution (Funke, 2013).

In PBL, the learning process occurs during the generation of new knowledge and its application by learners in the way they perceive a thing (Hendry et al., 1999). For the resolution of complex problems, different approaches or models can be used. One of them is the idealized process model by Dörner (1989), which encompasses six different stages, namely: goal definition, model construction and information gathering, extrapolation and forecast, actions planning, decision making and actions' implementation, and effects or results monitoring with reflection on implemented strategies. After feedback, the process can go backwards to previous phases, and students can change goals or collect more and new information (Dörner, 1989) These stages guided the implementation of the blended RBL course on research methods at Leipzig University. Here, learners were confronted with a complex problem and worked in collaborative groups to answer the different questions around it. In this way, learners were responsible for their own learning process and were involved in research. They used theories and experience to develop sound solutions and applied them to the problem situation. In the end, an analysis of the learning process was made, along with a self-assessment of the student´s achievement. From the model foundation point of view, a perspective including emotional, affective, and cognitive variables is the most appropriate for understanding and assessing complex problem-solving processes according to Funke (2006).

For the successful implementation of PBL, it is crucial to have in mind the different aspects of instructional design in a structured way starting with a problem and process design, followed by the design for facilitation and scaffolding, effective group process, self-directed learning, assessment, and technology support (Moallem et al., 2019, pp. 245–247). An important difference among other instructional methods is that in PBL, the instructor's role is not to provide answers, but to support, stimulate, advise, and guide with questions and coaching (Savery, 2015, p. 5). According to Allen, et al. (2011), instead of lecturing PBL instructors must find or create good problems based on clear learning goals. They also explain that PBL problems may intentionally pose cognitive challenges by not providing all the information needed, thereby motivating a self-directed search for explanations. Instructors often allow students considerable latitude to make false starts and wrong turns. They must also encourage good team communication strategies (Allen et al., 2011). Some studies indicate that incorporating writing tasks into PBL problems could enhance student engagement and motivation (Allen et al., 2011; Butler et al., 2001). Consequently, the RBL course on research methods included the writing of an academic research report, which was part of the summative evaluation.

According to Hendry et al. (1999), the optimal teaching environment for a PBL instructional approach includes realistic problems, tutor facilitation that supports reflection and cooperation, sufficient scheduled time for independent study, and formative and summative assessment that is aligned with learning issues, problem packages, and other integrated, interactive teaching sessions. This mix of key course features provides the necessary structure to allow students the freedom to construct levels of competence in less time than if they were simply immersed in the haphazard flux of everyday experience.

PBL continues to be a favored method in higher education for different disciplines. However, apparently, there is no conclusive evidence that suggests a better effect on student learning than traditional methods. Several meta-analyses of the data from the United States Medical Licensing Examination (USMLE) Step 1 suggested that PBL has modest or no beneficial effect on student learning of content (Albanese & Mitchell, 1993; Hendry et al., 1999; Nandi et al., 2000). Other authors reported a robust positive effect from PBL on the skills of students, noting that, students in PBL tend to remember more acquired knowledge compared with their traditional counterparts (Allen et al., 2011). From a different approach with positive results for PBL, Allen et al. (2011) stated that the underlying richness of PBL is not captured simply by looking at the student achievement on content recall exams. This is also an aspect to consider for the learning definition of this present dissertation, where not only cognitive but emotional aspects are important and included. According to some authors, if scores on the USMLE Step 2 (knowledge of clinical practice) or ability to apply knowledge in the clinic after graduation are considered, medical school students with PBL experience

frequently outperform their traditional counterparts (Albanese & Mitchell, 1993; Koh et al., 2008). These results are complemented by Kaufman and Mann (1996) in medical education. They found a high level of enthusiasm among PBL students and teachers. PBL students were more likely to find their learning environment more democratic than students receiving conventional teaching. PBL allows students to identify their own learning issues and thereby, substantially guide the tutorial process. These results additionally showed that students using the PBL had a greater intrinsic interest in learning by solving problems, although this format may initially reduce the amount that students learn, later retention is increased (Kaufman & Mann, 1996). Finally, Hedry et al. (1999) states that the value of PBL may be that it promotes the development of metacognitive skills in students.

PBL, RBL, and situated learning are understood as related concepts (Reinmann, 2009; Selje-Aßmann, 2020). Several authors have attempted to define RBL with different emphasis. For some, the learner autonomy is paramount for the concept, while for others the choice of context and research question is key (Selje-Aßmann, 2020). RBL is also understood as the most developed learning method based on PBL and active learning by Wildt (2011). Wildt (2011) states that when including the definition or selection by the student of different aspects in a learning environment, a higher level is achieved. For example, when the context and the question are given, and the students define the methods and results, the PBL is achieved. From a PBL model if the students additionally define the question, then the project-based learning level is achieved. Finally, if after this, the context is defined by students as well, then we have what constitutes RBL (Wildt, 2011). At this point, the definition of the context includes researching and selecting appropriate theory and sound empirics. According to the previous description, learner autonomy[9] is increased going from a low level in conventional teaching up to RBL, where learner autonomy is at a higher level, reaching self-instruction and self-evaluation. This can also be understood as metacognitive skills development or self-regulation, defined as a person's process of planning, monitoring, and evaluating their own learning (Ertmer et al., 1996; Ertmer & Newby, 1996).

2.4 Research-Based Learning Fosters Academic Thinking by Using the Three Basic Dimensions of Teaching that Promote Learning

The German Federal Assistants Conference (BAK) established a catalog for RBL and defined some characteristics which should be considered essential to RBL: Among them is the independent choice

[9] The aspect of independence is central for RBL. Due to the independence in research, the main responsibility lies with the students. But the teachers have a shared responsibility, they have to ensure the quality of research as stated by Fichten (2012).

of the topic by the student, regardless of whether he or she has the problem through their own work, consultation, discussion, or observation. The independent strategy is also a characteristic of RBL, especially in the choice of possible methods, experimental arrangements, research, etc. They (BAK) also stated the importance of unlimited risk of mistakes and detours, the opportunity for chance findings, fruitful moments, and unexpected side results that are possible with RBL. Finally, the task of presenting the results in such a way that their meaning is clear, and the path to obtaining them is verifiable (Bundesassistentenkonferenz, 1970, p. 14). This catalog contains quality criteria relevant above all for academic work but also indicates opportunities and risks associated with the acquisition of knowledge (Fichten, 2012).

Despite its beginnings in the 70s and its continuous development, in the literature, there seems to be no general definition of RBL. In broad terms, it can be defined as a type of learning in which the learning process is incorporated into actual research practices (Fichten, 2017, pp. 30–38) It is supposed to improve not only students' research skills but also their academic writing (Rueß et al., 2016, p. 24). In Healey and Jenkins's (2009) framework model description, RBL is characterized by the active design by students, as well as the focus on the research process. This is also in agreement with Huber (2014) who distinguishes between three different types, research-oriented teaching, researching learning, and RBL. He states that research-oriented teaching aims to provide the foundations which would enable students to conduct their own research. While in research-oriented teaching, the focus is on the initial questions. In researching learning, it is mainly about the selection, execution, and reflection of methods, whereas in RBL, the entire research process is carried out independently by the students (Healey & Jenkins, 2009; Huber et al., 2009; Wulf, Haberstroh, & Petersen, 2020, pp. IX–XI). Reinmann (2016) also described similar types as learning about research, learning for research, and learning through research.

Regarding the content focus and activity level of students in RBL, there are defined categories based on the two approaches of Healey and Jenkins (2009), as well as Huber (2014). The learning focus can be on 1. the research process, 2. the research methods, or 3. the research results. The activity level of the students can be differentiated according to whether students 1. act receptively, 2. apply acquired knowledge, or 3. conduct research themselves (Rueß et al., 2016; Wulf, Haberstroh, & Petersen, 2020). By combining these categories, Rueß et al. (2016) created a classification matrix with nine groups of research-based teaching, which they differentiated into a total of twelve forms based on concrete examples in teaching. Also, in this model, the term RBL is used when students actively engage in researching (Rueß et al., 2016).

Thus, depending on the content focus associated with research-related learning offerings and the level of activity, students are enabled to engage in different goals, and structural requirements are aimed and needed. In the blended RBL course evaluated in this dissertation, the goals were to enable students to achieve research results and conduct research by themselves. Here, the group used under the classification by Rueß et al. (2016) was the process-researching group or group nine. The special characteristic of this group is that students here go through the entire research process, i.e., from developing the research question to planning and conducting the investigation to processing the results.

From the educational point of view, RBL is created by combining research and learning through a didactic transformation into research learning (Huber et al., 2009, p. 54). According to Behrman (2019), its techniques originated from empirical social science approaches to acquire objective information. Though, RBL is not expected to be an extensive or full academic research process, as RBL does not engage in obtaining knowledge and insights generalizable across comparable situations. The process of RBL, however, primarily should generate knowledge and insights that are of interest to the student (Behrman, 2019, p. 434).

Specifically, in business education, RBL brings academic work, especially research[10] and real research problems, into the focus of higher education (Schlicht et al., 2017, p. 43). It is primarily about providing opportunities for students to trace the path of how a question becomes a research question, and to reflect on the difference between social problems and scientific or academic problem definition, between everyday knowledge (including their own) and academic knowledge (Huber, 2014, p. 24). Thus, RBL should enable students to understand the way academics think and work, and thus, to understand and evaluate research processes, and to conceptualize themselves under guidance. This means RBL should support research competence acquisition. Subsequently, a transfer to other application contexts, such as economic or business, should take place (Schlicht, 2013).

This does not make the common discussion about formats of RBL in practice, in the theoretical-didactical foundation, and in their suitability for different learning goals and learning types any easier. Therefore, it is important to agree in the discussion on some specificities and how the design is intended. The format design envisioned in this present study is then characterized by learners' (co-)design, experience, and reflection on the process of a research project aimed at gaining

[10] According to Fichten (2012) research is an ambiguous term with numerous types and variants because of discipline-specific differences in methodology, forms of work, modes of presentation, etc. In general, research can be seen as a systematic, rule-governed scientific or academic practice of gaining knowledge. Some of the characteristics of research are activities that have always been part of the study program, such as searching for information and evaluating sources. However, research primarily involves planning and conducting empirical investigations achieving this requires research methodological knowledge. This must be taught during study to enable students conducting small research projects themselves (p. 7).

knowledge from the development of questions and hypotheses to the choice and execution of methods to the examination and presentation of results in learning groups for active collaboration in an overarching project in the context of a situated managerial problem (Huber, 2009, p. 11; Klauser, 1998; Sembill, 1992).

Regarding the design of an RBL environment, numerous factors call for didactic decisions to support learning. Reinmann (2016) proposed a model and classified these factors inductively into three dimensions of teaching: procurement, activation, and accompaniment. These dimensions are not entirely independent of each other but at their core they each point in a different direction. She defined procurement as a facilitation of knowledge where teachers guide students through lectures (which can also be digital supported), the relevant existing scientific knowledge in the field in a situated way. Students here are primarily receptive; they ideally construct personal knowledge, but do not produce visible pieces (p. 234).

The activation dimension refers to teachers inducing students to deal with academic knowledge in a questioning way by creating appropriate circumstances in the form of tasks that encourage students to understand what they have read, heard, or observed, and inspire them to apply this knowledge in designing or implementing something. For activation in this sense, students can be aroused to solve problems, do projects, and do their own research (Reinmann, 2016).

The third dimension, accompaniment occurs while teachers support students when they are learning receptively or practicing by providing specific help, giving feedback, and advising or by modifying and adapting activation when needed. As previously discussed, the autonomy level within RBL is high and this should shape the relationship between self-organization, external organization, how much guidance and support are offered, and in what form (Reinmann, 2016). Hence, for RBL, the tutoring concept to support self-learning phases in terms of content, motivation and/or technology was followed (Reinmann, 2011).

According to Reinmann (2016) these three dimensions are intentionally performed by teachers when they instruct. At different points of their lectures, teachers could separate these dimensions, utilize only one of them, or enhance some dimensions over the others. Teachers decide this intentionally and based on the learning goals that they aim for. The design of different learning spaces is therefore characterized by accentuations, and by the fact that one dimension is primary in each case, and the others are (or can be) added with different weighting. Thus, the design of information spaces focuses on procurement, the design of exploration spaces on accompaniment, and the design of testing spaces on activation. Consequently, the learning goals and the three pedagogical dimensions guided the design of the blended RBL course on research methods (Schlicht, 2021;

Schlicht et al., 2022). A different dimension was enhanced during the different phases of the research project by explicitly designed RBL activities according to the respective phase (Huber, 2014, p. 23; Bundesassistentenkonferenz, 1970). Thus, students were moving from information to an exploration space, and to an activation space enhancing their learning experience.

2.4.1 Research-Based Learning at the Beginning of Studies

Research in RBL is currently blossoming (Lehmann & Mieg, 2018). Numerous studies are reporting RBL experiences in different disciplines (Huber et al., 2009; Huber, 2009; Reinmann, 2019a; Rueß et al., 2016; Selje-Aßmann, 2020; Wulf, Haberstroh, & Petersen, 2020), some of them in the first years of undergraduate studies (Reinmann et al., 2019). According to Huber et al. (2009), during the first years after the Bologna Reform Process there was confusion regarding the definition of RBL experiences and most of the publications came from the teacher education field. More recently, more studies from teacher education, psychology, medicine, biology, and sports among other disciplines have been published (Wulf, Thiem, & Gess, 2020).

During the past decade, few contributions aimed to answer structural and curricular questions, among them the curricular anchoring of RBL. Huber (2020) presented various possibilities for the curricular embedding of RBL formats and discusses their suitability regarding the course of study, the subject-specific characteristics, and the general requirements for teachers and students. For example, RBL could be anchored through elective courses and projects outside degree programs or in conjunction with courses within a degree program. He differentiates the type of anchoring according to whether RBL is in the study program once, repeatedly, or in a sequential structure. For example, with a sequence of modules that are all oriented towards RBL, but in which not every module provides for the entire cycle of research, then in which different elements or phases are particularly accentuated. Huber states that in German universities, RBL is often (only) placed in the final phase of studies and linked to the preparation for an examination paper or its implementation. Examination papers and diploma theses have traditionally been understood here as being based on the student's own research (pp.3-10).

Also, more recently, RBL sequencing has been increasingly discussed. Engler and Gerstenberg (2020) appealed for a sequencing of the research process analogous to a value chain in the RBL industry. They argued that in each sequence of RBL, an increase in competence on the part of the students takes place. Selje-Aßmann (2020) developed a multidimensional model for teaching practice with RBL that explicitly considered not only the learner’s perspective, but also the teacher’s

perspective. This model is intended to help in the planning of study programs to determine the forms of increasing independence of the learners and the supportive offers.

Regarding the study entry phase, the compilation by Reinmann et al. (2019) gives a broad picture of RBL concepts used in Germany in the recent years. The study entry phase involves very special circumstances, not only for the beginning of a new qualification phase but in the best-case scenario, also for a self-start and thus, for education. Students are often overwhelmed by the demand for independence at the beginning of their studies (Selje-Aßmann, 2020). Results of learning research suggest that inexperienced learners need precise guidance in new learning situations, or that learning growth is higher when they are intensively supervised (Kirschner et al., 2006; Mayer, 2004). According to Selje-Aßmann (2020) the guidance that is appropriate to learners' abilities and needs is essential, especially in RBL, to avoid overwhelm and frustration. For her, the intensity of supervision should be gradually reduced in order not to overtax students at the beginning, but to promote the development of an independent research personality. The goal is again to increase independence and the development of the ability to collaborate in a research team (Selje-Aßmann, 2020).

Regarding the goals of RBL projects, Lübcke and Heudorfer (2019) indicated that the goals behind such projects are highly complex, both in terms of content and in terms of their level of abstraction and function. For example, motivating students and awakening their scientific interests, helping them to build up a research attitude and initial research competencies, identifying candidates for scientific advancement, or orienting studies toward research from the outset can be the goal of RBL in the introductory phase of studies (Lübcke & Heudorfer, 2019). Often, several goals are pursued at the same time, but not all of them prove to be free of contradictions, and complex connections between different levels of goals and assumptions become clear (Reinmann et al., 2019).

RBL in the introductory phase of studies does not belong to the bulk of current formats at the beginning of studies, but on closer inspection. It enjoys a growing, if still comparatively restrained, popularity (Reinmann, 2019b). However, from the point of view of motivational psychology, it does indeed seem worthwhile to integrate RBL into the study program from the very beginning (Reinmann et al., 2019). There are good arguments in favor of RBL promoting epistemic curiosity and student’s success at the beginning of their studies, even if it has not yet been possible to empirically prove this along with all the associated mechanisms of action, which ultimately also points to the limits of traditional empirical research that can be practiced in the context of university teaching (Barnat & Jänsch, 2019; Reinmann, 2019b).

Lübcke et al. (2019) developed an instrument based on the model introduced by Brew (2013). Brew’s wheel model places students at the center and integrates decisions regarding RBL at the

micro- and macro-levels. These decisions include, among others, the nature, number, and type of students, learning outcomes, skills to be developed, and the tasks to be completed as well as their proper assessment (Brew, 2013). Lübcke et al. (2019) further developed this into a double-wheel model, which places students at the center of one wheel and teachers at the center of the other. This model is suitable for both the design and the analysis of RBL and makes transparent how multifaceted teaching offers can guide and support students in gaining their own research experiences (Reinmann, 2019b). Based on the double wheel model, Reinmann (2019b) states that RBL in the introductory phase of studies, in addition to particularities in its objectives and presumably also particular challenges in its practical implementation also poses requirements that apply quite generally to teaching for the promotion of RBL in studies. She focuses on the perspective of the individual teacher and his or her design possibilities in concrete university contexts and proposes a number of statistics that also take into account the study entry phase (Reinmann et al., 2019).

Reinmann (2019c) discussed the variety of goals, motives, conditions, and dimensions for implementing RBL in the introductory phases of studies at the university. For her, some special motives, such as emotional, motivational, cognitive, and social come into play. RBL should enable students already at the beginning of their studies to experience the difference in the way of learning, thinking, and acting between school and university, to recognize the differences between academic and everyday problem solving, and to experience both resistance in the process of research and self-efficacy. These experiences of coping with a new learning situation at the beginning of studies were defined as transitional processes by Martens and Metzger (2017).

Reinmann (2019c) also emphasized that it is best for students to become familiar with a disciplinary culture at an early stage, and to practice academic ways of thinking and working techniques from the very beginning. She considers three conditions to be didactically relevant: (a) the motivational situation of the students, (b) the resulting level of knowledge, and (c) the assumed incentive structure of the teaching offers for the students. She established as dimensions that shape the initial conditions for teaching to promote RBL, the following: (1) the obligatory nature of the course, (2) the type of access to the course, (3) its timing in the course, (4) the amount of time required of students (credit points), and (5) grading (Reinmann, 2019c). The blended RBL course on research methods as a mandatory course at the beginning of the studies with clear credit points and a grading system influenced the three initial conditions that are relevant to the learning process and were investigated. Thus, it is expected that RBL at the beginning of a course of study will boost these learning conditions including motivation and develop students' interests in research (Reinmann, 2019c; Vereijken et al., 2018).

An empirical investigation in higher education seems to be still less advanced for RBL settings (Gess et al., 2017). This is especially true for business education (Müller-Christ, 2018). According to Müller-Christ (2018), one challenge of business administration for implementing RBL is that it permanently increases the stock of knowledge of explicative and technological statements in all its functional areas (procurement, production, marketing, human resource management, etc.), thus making the mountain of knowledge that students are supposed to climb ever steeper. The acquisition of this knowledge then forces the memorization of large bodies of knowledge, resulting in 'bulimic learning' and a passive consumer attitude on the part of the students, who also use the ethos of their own discipline to guide their actions in learning: Efficiently, i.e., with as little effort as possible. This attitude is now met by the offer of RBL in the higher semesters, which must first break up the patterns of knowledge acquisition learned in the first semesters (p. 99).

This pattern could change by implementing RBL courses at the early stages of studies. Müller-Christ (2018) also argued that students are sometimes very disoriented when, instead of given questions with known answers, they come into an RBL environment where neither the question is fixed, nor the answer is known. He stated that in the same environment, teachers must live with the fact that the learning outcome can no longer be determined concretely and thus cannot be tested in a conventional way. For both parties, RBL is more emotionally, mentally, and temporally demanding (p. 99). In summary, these two aspects make more complex RBL design, and implementation in business education, the degree, and scope of knowledge in different areas and the “efficient” learning patterns established, therefore it is expected to still have limited literature on this area.

Despite some recent studies reporting experiences with RBL in different settings and courses, such as reflecting double-blind peer reviews in industrial engineering for master students at Bremen University (Frischkorn et al., 2018), project management for industrial engineering at the TU Dortmund University (Jungmann et al., 2018), and economic experiments for undergraduate business administration students (Egbert & Mertins, 2018), there is not much knowledge regarding the learning process, the relationships between the relevant variables or effect sizes on these reports.

Barnat and Jänsch (2019) examined the contribution of RBL to academic success for higher education in general terms. They assumed that epistemic curiosity is stimulated by RBL and used a quantitative approach to investigate factors, such as final grade, prior knowledge, self-efficacy, and volitional, and motivational factors that have already proven relevant in research on academic success (Schneider & Preckel, 2017). Their sample included undergraduate students in the third semester from law, economics, social sciences, and engineering (N = 12,628) from four different higher education institutions in Germany (universities and universities of applied sciences). The main

findings included that epistemic curiosity mediates the effect of self-efficacy on subject interest (β = 0.30), but it does not mediate the relationship between self-efficacy and academic success. They stated that the high correlation of epistemic curiosity with autonomy striving also supports the assumption that, especially RBL with a high degree of self-activity, is a teaching-learning scenario that fulfills important affective-motivational functions for learning success. Finally, this study argued that the effects of RBL on emotional and motivational events have not yet been researched very much. Although motivation is considered significant for the implementation of self-regulated learning, its role is not yet clearly defined (Martens & Metzger, 2017).

2.4.2 Research-Based Learning and Blended Delivery

Interest, motivation, and curiosity can often be achieved using digital media, at least when technical systems and tools are used to invite creative work. However, it is surprising that digital media in the introductory phase of studies for promoting RBL has not become widespread (Reinmann, 2019b). There are some concrete examples on how digital media can be linked to the special requirements of the introductory phase of studies and adapted to the potential of RBL. One is the study at Postdam University with four examples of digital support by using apps designed for freshmen. These examples showed how diverse can be the technical and pedagogical functions of different tools can be (some apps were for geolocation and questions regarding university life). They designed two apps relevant to RBL, one for group forming, and one for reflecting research questions (Dehne et al., 2019). Dehne et al. (2019) argued that synergies emerge between the desire to provide students with practical orientation knowledge and the higher goal of shaping researcher identities. In terms of both the introductory phase of studies and for RBL, there are not yet complete solutions for digital support they advocated for working on more accurate models to describe processes that can be digitally supported.

Digital tools for RBL support learning processes that are designed in a constructivist, situated, and connected manner, as well as the self-determined approach and collaborative work of students (Schirmer & Marín, 2020). Some RBL activities can be assigned to the phases of a cyclical research process (Bundesassistentenkonferenz, 1970; Huber, 2009; Schirmer & Marín, 2020). Overarching activities in RBL for which the use of digital tools offers advantages are typically the ones that demand collaboration, storage, and project management capacities (Schirmer & Marín, 2020). These can consist of the availability of communication and information to all participants regardless of location and time and can also be clearly structured and saved for the long term. Project management tools can be used for coordination. Email, messenger, or platforms for group work can be used for

communication in teams. Texts or presentations can be written, commented on, and revised online. The use of such systems meets the above criteria of collaboration and self-determined organization (Schirmer & Marín, 2020).

According to Reinmann (2011) media-supported interactive teaching activities, for example, to accompany learning processes, can follow various didactic concepts: the coaching concept in the sense of trusting one-to-one support to develop concrete competencies; the tutoring concept to support self-learning phases in terms of content, motivation and/or technology, and the concept of e-portfolio. Such interactions can take place completely online or depending on the design of the learning environment partially online, and partially in-person. Synchronous interaction is just as possible as asynchronous interaction; text, audio, and video, depending on the equipment and purpose, are all equally suitable modalities. However, from observations on recent implementations, Reinmann et al. (2019) stated that it should be discussed to what extent RBL, and the simultaneous use of digital media overwhelms students and teachers, and if RBL is primarily viewed from the perspective of teaching and, little from that, of research, thus overlooking the obvious use of digital media for the research process. For them, digital media has great potential in almost all phases of RBL at universities, and this potential should be exploited.

An experimental implementation and learning-targeted evaluation of a didactic concept of blended RBL with a complex teaching-learning environment combining face-to-face sessions with a digital learning environment like the one used for this dissertation was found. Jungmann et al. (2018) wanted to teach the project management topic in a format that is characterized by orientation towards subject-specific and interdisciplinary competencies as learning objectives and provides forms of active learning that are not only limited to the subject itself. They implemented the blended RBL concept in the course Industrial Project Management in engineering studies at TU Dortmund University. The evaluation had a mixed methods approach, however, they only reported qualitative results from interviews and observations. The main results were the merging of theory, the promotion of academic or scientific relevance, and the acquisition of interdisciplinary skills. Without exception, the question about the learning gained by the students was assessed very positively. Sustainability was emphasized: "We learned a lot and retained a lot... I feel more confident now and can well imagine working on projects.". The results also showed the promotion of scientific relevance. Students not only learned how to use sources and citations but also had their first successful contact with the requirements of scientific writing. Students reported the acquisition of interdisciplinary skills with phrases like "We learned across the board: content and presentation... In both aspects we were able to visibly develop personally from phase to phase... Very useful was the accurate personal

feedback that each of us received." or "We really learned something, it was a lot of fun, but it was also a lot of work - too work.".

In addition, they concluded that a blended RBL course appears attractive to students when effort, credits, personal learning experience, and enjoyment of the learning process are in harmony. The concept described deliberately provides a certain complexity in which students structurally integrate the different dimensions in their personal learning project. On one hand, this is appreciated (exciting learning process, high learning success), but on the other hand, it carries the risk of a disproportionately high workload. They insisted that the design of blended RBL must take this into account at all points (Jungmann et al., 2018).

Another experience with blended RBL at the St. Pölten University of Applied Sciences showed positive outcomes. In this project, a flipped classroom format (Stecyk, 2018) was used in different undergraduate courses from physiotherapy and social work over Moodle LMS. For the design, development, and implementation of these courses, more than 45 lecturers and research assistants were involved. Specifically, for the design and production of multimedia didactic elements, students from media technology were included (Freisleben-Teutscher, 2018). Despite no quantitative evaluation being presented, one conclusion from this project was that flipped classroom for RBL means in many respects a didactically very reflective approach, in which also the use of diverse methods is continuously considered. Furthermore, a higher level of dialogue between students and teachers was reported. This dialogue between students and teachers stimulated the incorporation of current knowledge and research results for both actors. Thus, in blended RBL with flipped classrooms, a dialogue orientation must be part of the didactic concept and all chosen methods as well as tools (Freisleben-Teutscher, 2018).

2.5 Evaluation Aspects for Blended Research-Based Learning in Business Higher Education

Evaluation can be understood as “the systematic assessment of the worth of merit of some object” (Bickman, 2005a, p. 141). It is also portrayed as an applied inquiry process that collects evidence and gives conclusions about the value or quality of an object of evaluation or evaluand. The central point here is the judgment of value. This is how it differs from other inquiry or research types (Fournier, 2005, pp. 139–140). Evaluation research is a systematic process for assessing strengths and weaknesses of programs, activities, technologies, courses, etc., identifying ways of improvement, and

determining goal achievement (Bickman, 2005b, p. 141). Evaluation can be descriptive, formative, process, impact, summative, or outcome-oriented, and differs from the program evaluation in that it is more theory-based and initiated by the investigator (Bickman, 2005b, p. 141).

The evaluation utilization occurs when its findings influence the actions or thoughts of stakeholders. The two main types of evaluation usage are instrumental for direct actions and conceptual for changes in thinking (Alkin, 2005b, p. 143). Utilization can also be understood as the crucial difference between evaluation and basic research (Cook et al., 2000, 47f). While basic research orientates itself exclusively on scientific criteria, especially the progress of knowledge as an end in itself, validity, reliability, and generalizability of results, evaluations as a form of applied research should take into account non-scientific interests of knowledge and contexts of exploitation (Thiem & Gess, 2020, p. 190)

Educational evaluation occurs at all levels of education systems and includes a broad range of interests comprising student assessment, measurement, testing, program evaluation, school personnel evaluation, accreditation, and curriculum evaluation. As education aspires to affect every member of society, the public involvement and concerns of stakeholders is more significant than evaluation in other sectors. The educational evaluation field had been evolving due to advances in theory, methodology, and technology (Kellaghan & Stufflebeam, 2003, pp. 1–3).

In German RBL evaluation research, Thim and Giess (2020) refer to the three functions or paradigms of evaluations (Chelimsky, 1997; Komrey, 2005) First, the knowledge-driven evaluations are classified under the research paradigm. This form of evaluation shows a great closeness to social science (basic) research and can be seen as a link between theory and practice (Kromrey, 2005). It is particularly concerned with impact research, for which the question of causality is central. One goal of evidence-based evaluations can be to derive management decisions from the findings (Stockmann, 2016). The second function is the control paradigm. Here, objective criteria of success are used to check whether the defined goals of a program have been achieved, for example, the proper spending of financial resources or acceptance of a learning offer. How and according to which criteria the performance review is carried out depends on the information needs of the implementing and/or funding agency (Komrey, 2005). The third paradigm is the development paradigm, which triggers development and learning processes. The problem definition and the cognitive interest of the evaluation are oriented differently here in comparison to the research and control paradigm. Thus, in this form of evaluation, the focus is on learning. The evaluations are, therefore, usually formative, i.e., program-shaping. The learning and development processes can take place based on best practices, as well as through "flawed" measures (Stockmann, 2016). However, the paradigms cannot always be

sharply demarcated in practice (Thiem & Gess, 2020). The second and third paradigms guided this dissertation as understanding the learning process was the main goal to achieve and find the acceptance of the blended RBL course among students was also intended. Accordingly, under the third paradigm, formative evaluations were conducted.

Regarding evaluation theory, it provides a framework to explain and design the evaluation practice. Some different theories and models formulate a set of principles to explain and perform evaluation, usually with methods borrowed from the social sciences. It is not a simple theory. There are works that describe the four generations of evaluation, the three stages theory, and conceptions of stakeholders and use. All these theories are necessary to build a theory of evaluation, and there are four factors necessary to understand the different principles involved in evaluation. First, the theory of valuing which states the nature of value, how value is assigned, the nature and source of criteria and standards, and the nature of meta-evaluation, including justification, validation, and verification. Second, the theory of practice which describes evaluator roles, the nature of evaluands and evidence, the identification of stakeholders, the nature of normative discourse, and the ways of synthesizing. Third, the theory of prescription which defines amelioration, the logic of prescription, its relation to evaluation, and the nature of recommendations. Fourth, the theory of use which specifies the way evaluation modifies evaluands, what makes evaluation relevant, credible, and just, and the authority of evaluation (Alkin, 2005a, pp. 142–143).

The program theory-driven evaluation is based on program theory, which states that the design and implementation of a program is based on a set of assumptions about the actions required to solve a social problem, and the reasons why the problem should respond to the action. The elements related to the program theory are goals and outcomes, determinants, intervention, or treatment, implementing organizations, program implementers, associate organizations, or partners, and ecological context (Chen, 2005a, pp. 340–341). There are three general types of theory-driven evaluation: theory-driven process evaluation, intervening mechanism evaluation, and moderating mechanism evaluation. A theory-driven process evaluation makes a holistic assessment between the portion of the action model and its implementation in a holistic way. The model of intervening mechanism evaluation focuses on the change model and its components: intervention, determinants, and outcomes. The moderating mechanism evaluation model assesses factors in program implementation that moderate the intervention's effect on outcome (Chen, 2005b, pp. 415–419).

The main point of the intervening mechanism or moderating mechanism evaluations is the clarification of a stakeholder's theory in the change model portion. In this, evaluators take the role of facilitators to synthesize discussions and build consensus. Regarding research methods, quantitative

approaches are the most used in these two models of evaluation (Chen, 2005b, pp. 415–419). These two models of evaluation are used in the present dissertation to assess a blended RBL intervention from students' point of view, its learning outcomes, and moderation effects on outcomes. To achieve this, a formative self-reported assessment was used.

Self-evaluation or "self-assessment", is an evaluation in which participants must review and reconsider their own performance and achievements throughout a course or learning activity. Participants are called to reflect in a critical way on their own performance, and in doing so, become aware of their own criteria, strengths, and weaknesses. This process requires taking responsibility and can be one of the keys to personal improvement and self-initiated learning (Rogers & Freiberg, 1994). According to Ertmer and Newby (1996), not only awareness of effective learning strategies can be improved but also the understanding of how to use them in different learning situations when students reflect and evaluate the results of their own learning efforts (Ertmer et al., 1996; Ertmer & Newby, 1996). For learning situations involving higher autonomy levels, this evaluation means the methodical recording and reasoned assessment of processes, and results for the better understanding and shaping of a practical measure in the field of education through impact control, management, and reflection (Nuissl, 2016). Reflection occurs through an observer or the agent himself (Sloane, 2006, p. 238).

Consistent with the research literature on online and blended learning in management and business education, learning effectiveness has been measured in terms of students' perception of their learning and their evaluation of their classroom experience with constructivist interventions, such as collaborative learning since the 1980s (Alavi, 1994; Arbaugh & Hwang, 2013; Mcdowall & Jackling, 2006). Moreover, findings in RBL showed that it is associated with the initiation of reflective competence (Fiegert & Kunze, 2020, p. 215), which is required for self-assessment. Consequently, the formative evaluation in this dissertation used a self-perceived assessment reported by students through a questionnaire at the beginning and at the end of the semester (Schlicht et al., 2017; Schlicht, 2021). For summative evaluations in RBL, research knowledge and skills can also be assessed through methods of self-reflection. If the focus is on specialized knowledge, content-related, and methodological knowledge, examinations in the form of common scientific formats such as lectures, posters, or thesis are appropriate for the presentation of the research performance and discussion of both the approach and the results (Selje-Aßmann, 2020, p. 190). Accordingly, the summative evaluation in this dissertation followed this approach by using common scientific formats such as, research proposal, presentation, and scholar discussion (Schlicht et al., 2017; Schlicht, 2021).

The recent German evaluations' review by Thiem and Giess (2020) of RBL in higher education stated that RBL has so far only been specifically evaluated at a few universities. In 2015

They started a study together with institutions of higher education, and a total of 14 universities responded, six of which conducted specific evaluations of RBL (Humboldt University of Berlin, Bremen University, Duisburg-Essen University, Hohenheim University, Carl von Ossietzky University of Oldenburg, and University of Applied Sciences Potsdam). They found a high diversity of evaluation designs, most of them done based on quasi-experimental research designs using pre-post measurements (self-assessments by students) in quantitative surveys. Some studies involved qualitative interviews and group discussions on the didactic implementation of RBL, and acceptance studies were also designed and implemented. Considering these studies, it can be inferred that further evaluation designs and instruments should be developed. They argued that the biggest gap was probably in the development of research skills, which is a central goal of RBL. In addition, the acquisition of competencies in RBL was not measured at any university at the time of the survey. This review did not report the specific instruments used in the studies nor blended delivery formats. Finally, they recommend building on previous acceptance studies and conducting them across universities. In this way, different implementation formats and didactic settings could be compared in terms of acceptance.

RBL as other innovative teaching and learning formats tries to give an answer to societal challenges (Favella, 2019). Actors in higher education practice, however, are interested in an answer to the question of whether and, if so, how new approaches to action can succeed and be implemented (Giel, 2016). Favella pointed out that this social process-oriented perspective is important for the evaluation of RBL because, with this approach to the object of evaluation, the components of a measure that contribute to its success or non-success can be reconstructed (more than the effects). Program theory[11]-based evaluations are particularly suitable for this purpose because they can reveal for which target group under which circumstances a program is appropriate (Giel, 2013). In this respect, this evaluation concept is particularly suitable for evaluations that are intended to capture the effects of programs, as well as for those in which the aim is to improve programs (Giel, 2016). Favella (2019) plead for a realistic evaluation compatible with the components of an evaluation anchored on program theory in RBL. Following this, he used existing reflections on programs to show what can be understood as a social mechanism of RBL. He stated that considering the context in a realistic evaluation is important because it is through this context that generalizations can be formulated. Reinmann (2019) argued that a realistic evaluation sounds conceptually appropriate when it is used to show the respective context and theories, and those must always be considered when making statements about the success of RBL in the introductory phase of studies.

[11] The term "program theory" can be defined as an assumption about the way in which a program, activity, course, or offer will bring about change (Bickman 1987).

On the other side, not only the social-process-oriented perspective but also the effects and other measures play a key role in higher education evaluation and should be also considered. According to some authors methodological inferiority and lack of analytical rigor were believed problematic in educational research across disciplines (Arbaugh, 2008; Arbaugh & Hwang, 2013; Henson et al., 2010). However, since 1966, with the first edition of the Standards for Educational and Psychological Testing, for reporting empirical social science research, this situation could be avoided. These standards have been periodically sponsored, developed, and revised by the American Educational Research Association (AERA), the APA, and the National Council on Measurements in Education (NCME). With this approach it was expected to improve research reporting by increasing the transparency of the research process and findings, thus enhancing the acceptance of educational research by the international research community (Arbaugh & Hwang, 2013). These standards seek to give criteria and guidelines for the development and evaluation of tests[12] and test practices, for assessing their validity and providing a framework to ensure that all the relevant aspects are addressed, and the relevant technical information is available (American Educational Research Association et al., 2014). In the latest edition, the chapters "Educational Testing and Assessment" and "Testing in Program Evaluation and Public Policy" were rewritten, and the chapter "Fairness in Testing" was added. According to the context and purpose of this dissertation the relevant standards such as validity, reliability, fairness in testing, test design, scores and scales, test administration, supporting documentation, rights and responsibilities of test takers and users, educational testing, and use of tests for program evaluation were followed to the author's best knowledge for clarity and accountability[13]. For example, regarding test validity, the standard 1.13 for evidence regarding internal structure advocates that if the test score interpretation depends on premises about the relationships among test items, evidence concerning the internal structure should be provided, this was covered in section 3.5.1 in this study. Furthermore, for evidence regarding relationships with criteria, the standard 1.20 encourages that when effect size measures are used to draw inferences beyond describing the sample, indices of the degree of uncertainty associated with these measures should be reported. In this study this standard was also covered by reporting effect size measures with standard errors and confidence intervals as supplements to significance testing in section 4.8.

[12] The term test is used in a broad sense in the standards to cover not only instruments with correct responses but also for scales and inventories, which usually refer to measures of attitudes, interest, and dispositions (American Educational Research Association et al., 2014).

[13] To achieve this, the table Comparison of Review Articles with AERA Reporting Guidelines by Arbaugh and Hwang (2013) on business education was used to assess the reporting guidelines covered in this study. According to these reporting guidelines the relevant descriptive statistics should be presented in tables, the evidence of reliability of measures should be provided, the description and rationale for use of a particular technique should be provided, when hypothesis testing is used, a test statistic and associated significance level should be reported, an index of quantitative relationship between variables (i.e., effect size, regression coefficient) should be reported, a measure that captures the degree of uncertainty of that index of relationship (standard error or confidence interval) also should be reported (p. 234).

2.6 Understanding Good Teaching in Higher Education

As previously stated, the standards for educational and psychological testing are important guidelines for enhancing the clarity of research reporting, thus, standard 1.2 advocates establishing intended uses and interpretations, for defining in advance a rationale for each intended interpretation of test scores with the corresponding theory or evidence for the intended interpretation (American Educational Research Association et al., 2014).

Consequently, the focus of this dissertation should be on reflecting on various aspects that make good teaching and learning. At school level three aspects are widely recognized to be paramount for good teaching: effective class management, generating a supportive teaching environment, and stimulating cognitive activation (Hattie, 2009; Lipowsky & Bleck, 2019). Effective class management can be achieved through different factors such as the ubiquity of the teacher, their capacity to deal with overlapping situations in the class, smoothness, the momentum of the lesson, and the mobilization of the learning group (Kounin, 2006; Lipowsky & Bleck, 2019). Regarding a supportive teaching environment although this is a complex construct, the focus is on the quality of teacher and learner relationships that should support the learning process (Lipowsky & Bleck, 2019). Finally, cognitive activation refers mainly to constructivist learning environments where the lesson is expected to stimulate a deeper examination and understanding of the subject matter by the learner (Lipowsky & Bleck, 2019). Despite the fact these aspects cannot entirely be transferred to higher education, it gives a good basis to reflect the design of an effective course in a higher education context.

In higher education contexts, didactics is an ongoing and rich discussion in Germany. A brief definition of good university teaching was presented by Ulrich and Heckmann (2013, p. 4), who stated that good university teaching comprises the professional imparting of knowledge, skills, competencies, and values, especially in the context of the respective subject. Good university teaching makes use of quality management standards and the latest research results in higher education didactics (Ulrich & Heckmann, 2013). From the educators' point of view, good teaching encompasses various aspects which can influence it positively or negatively. The main aspects of good teaching are the general conditions of universities and subjects. Embedded in these conditions are factors such as infrastructure, teacher's workload, competences, commitment, students' previous knowledge, learning process, and learning outcomes (Ulrich, 2020).

According to Ulrich (2020) some of the aspects previously mentioned are partly easy to influence from the teaching side, whereas others are not. To understand the interrelations of these

aspects, Ulrich suggests using the taxonomy developed for medical care by Donabedian (1966). According to this taxonomy, we can differentiate between processes, structures, and results. The processes of good university teaching are directly influenced by teachers (Donabedian, 1966). They comprise the design of the course, including planning with learning objectives, implementation with student activation, examination, evaluation as well as reflection. The structures (teacher, students, and framework conditions) determine the processes and can only be influenced indirectly. On one hand, they include structural aspects within individuals, such as teaching competencies or the prior knowledge of the students. On the other hand, the structures include the framework conditions, such as the teaching room equipment and the time of the course, which can also only be influenced to a limited extent (Ulrich, 2020). This dissertation focuses on outcomes and processes that teachers can influence.

The results of good university teaching, that is student learning outcomes, can only be influenced indirectly by teachers through teaching processes and are influenced by students' prior knowledge, interests, etc., as well as by the general conditions (Ulrich, 2020). By transferring this taxonomy to higher education teaching with its persons and aspects, Ulrich (2020) proposes the following model of good university teaching: teachers come together with their students in face-to-face and/or virtual teaching. In this setting, teachers bring certain structural characteristics (e.g., teaching competencies), which they use to make teaching or the teaching process qualitatively of high quality. Likewise, students bring certain structural characteristics with them (e.g., prior knowledge). Depending on the quality of the teaching and the prior knowledge of the students, student learning processes or learning activities are triggered by the teaching, which ultimately works towards learning outcomes (p. 22). Hattie (2011) pointed out that, in higher education teaching, what matters the most is the transparency of the course challenges, the teachers search for feedback about the quality of their teaching, and the use of multiple teaching strategies which emphasize problem-solving and content engagement (Hattie, 2011).

To understand research on effective teaching and learning in the tertiary sector, it is important to refer to the synthesis of over 1200 meta-analyses by Hattie (2011, 2015). He maintains that although the Visible Learning research is mostly derived from the K-12 sector, it still includes many from the higher education sector, and the fundamental messages underlying successful innovations are quite similar across the sectors (Hattie, 2011). Hattie (2011, 2015) addressed the issue that it is rare to find studies which show interventions that lead to decreased achievement, this situation could be wrongly understood implying that every intervention works. As an example of this situation and the preponderance of positive effects Hattie describes the study by Tomcho and Foels (2008), in which, from a meta-analysis of 197 studies relating to teaching activities and methods at the tertiary

level, only 10 effects were slightly negative, while everything else showed an achievement gain (Tomcho & Foels, 2008). For Hattie, these results are disconnected from the students' point of view and the diversity in teaching. According to him, everything does not work (Hattie, 2015; Hwang & Arbaugh, 2006). To overcome this problem, effect sizes should be interpreted differently.

Hattie (2011) states that an effect-size less than .2 can be considered small, .4 average, and greater than .6 large, although extra care is needed given that there may be important moderators and mediators of any overall effect-sizes. To avoid teacher's trivial claim that an intervention is having a positive effect on achievement, it is recommended to set the bar of "what works best" in teaching and learning at the tertiary level not at zero but beyond an effect size of d = .40, which is the threshold used to identify the very best strategies from the below average strategies (Hattie, 2011, p.133). Nevertheless, in a study for the higher education sector, it was found that the highest effects on achievement from meta-cognitive study skills (d= .46) were obtained from self-instruction, self-evaluation, and strategies aimed at the forethought phase of learning (Lavery, 2008).

This dissertation aims to find the effects of the blended RBL course in research methods on learning outcomes. This course utilized an RBL pedagogical strategy that combines self-instruction and self-evaluation, among other characteristics, and this will be discussed in the following sections. From the review on blended RBL in different disciplines and at different stages of undergraduate studies, it is assumed that it fosters learning outcomes when implemented with the previously discussed didactic and design aspects. A further understanding of specific cognitive and motivational aspects is relevant for hypotheses generation and answering research questions in this dissertation.

2.7 Knowledge and Skills Acquisition – Cognitive Facets in the Learning Process for Blended Research-Based Learning Environments

In general terms for educational psychology, learning can be understood as a knowledge acquisition process, which is complex and includes other processes such as understanding, saving, and remembering knowledge. All three processes are required to function for the knowledge to be applied. Learning, from this point of view, means the construction and modification of knowledge representations (Steiner, 2001, p. 164). There is general agreement that knowledge is actively constructed. But to what extent the construction of knowledge is an individual or a social process? This issue is widely discussed by two traditional constructivist streams, cognitive and social constructivism, which try to explain the relationship between context and cognitive development (Hoidn, 2007). From a cognitivist perspective, learning is an individual human cognitive process that

must involve a change in long-term memory (Kirschner et al., 2006). Cognitivist educational researchers discussed the situated definition of learning and saw some contradictions with the cognitivist definition. However, more recently, some of them try to find the complementarity between both perspectives (Huber et al., 2009). As previously discussed in section 2.1, under the social constructivist approach learning implies more than cognitive processes. As pointed out by Hoidn (2007) this means "that learning does not take place only in the mind of the learner, but also in the context of their (inter-)active participation in social processes of negotiation using a variety of cultural and media resources" (p. 1). [14]

The situated learning approach by Lave and Wenger (1991) is grounded in apprenticeship learning, and the theory by Vygotskiĭ (1978), who argued that learning cannot be separated from its context, since cognitive and social processes are linked. According to him, "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, *between* people (*interpsychological*), and then *inside* the child (*intrapsychological*)" (Vygotskiĭ, 1978, p. 57). Accordingly, the construction of knowledge occurs at two levels: Through socially situated interaction with other people and cognitive tools and through the integration of the cognitive processes implicit in the interactions and communications into the learner's mental structure (Hoidn, 2007, p.5)[15]. In situated learning, according to Lave and Wegner (1991), the idea of communities of practice is important because individuals change their cognitive structures mostly in constant social exchange. In a community of practice, learning is embedded in the active practice of social communities. It is about informal learning or practice communities that focus on the development of solutions for concrete practice problems (Hoidn, 2007, pp. 8-9). In contrast, learning communities are anchored in formal learning within the framework of educational measures and represent what aim to acquire new knowledge on a topic (Hoidn, 2007). In communities of practice, learners participate, on the one hand, to expand their knowledge and skills, while on the other hand, they contribute their competences to the community of practice (Lave & Wenger, 1991). The common goal of the situated cognition approaches is to enable the learners to develop from novices to experts so that they can apply their knowledge in real-life situations (Hoidn, 2007, p.7).

In higher education the aim is to provide students with advanced knowledge in specific domains and assumes that students are already equipped with academic knowledge and skills (Schneider & Preckel, 2017). Regarding academic achievement, some recent findings suggest that

[14] For a deeper explanation on learning see the contrast between the cognitivist and social perspectives by Hoidn (2007, p. 8). She included the implications for knowledge, learning, motivation, interaction, teaching, and focus.

[15] However, from studies on mathematics education one should be careful with some specific knowledge because maybe not "all knowledge is specific to the situation in which the task is performed, and that more general knowledge cannot and will not transfer to real-world" (Anderson et al.,1996, p.6). For Anderson et al. (1996) there are situations where instruction should be done in complex social context, and this should be further investigated.

variables of social interaction have medium-strong associations. In the systematic review of meta-analyses by Schneider and Preckel (2017), social interaction variables showed the higher effect sizes among all instructional categories. Teachers' encouragement of questions and discussion, small-group learning, teachers' availability, and helpfulness, and teachers' friendliness, concern, and respect for students also showed the higher effect sizes, thus, stressing the importance of social interaction and a comfortable learning environment for academic achievement.

Specifically, in business and management education, the offer-and-use model by Helmke (2014) gives guidance when it comes to study- and learning-related factors that can influence the acquisition of knowledge. Regarding learning activities, active learning time at the university lectures and independent learning time, as self-study, can be distinguished (Helmke, 2014). This distinction is relevant for blended learning environments, which offers students more flexibility, and demands more self-regulated learning. One reason for the popularity of computer- or web-based courses is the flexibility that e-learning brings with it. For example, in virtual learning, neither the time nor the scope of the learning, nor the amount of learning time is fixed or demanded (Artino & Jones, 2012). This flexibility is also achieved with blended learning environments. Students can decide for themselves what content to work on, when, and for how long (Yukselturk & Top, 2013). This individualization allows learners to repeat content as needed, and in doing so, to determine their own learning pace. Similarly, students can determine the location of their own learning and are thus, independent of location (Schulmeister, 2006). Moreover, self-study can be optimized with the appropriate didactic design options, and the presentation of complex topics can be supported with multiple media (Greene et al., 2011).

Blended RBL aims to support learning processes that are designed in a constructivist and situated manner, as well as the self-determined approach and social interaction for collaborative work among students. RBL aims not only at fostering research skills and metacognitive competencies as well as at developing a research mindset (Gess et al., 2017; Huber, 2004), but also at contributing to students' general professional qualification by teaching so-called key competencies such as problem-solving, analytical and communication skills (Huber, 2004; Wissenschaftsrat, 2001, 2006, 2015). For blended delivery, Schirmer and Marín (2020) developed the following criteria for selecting appropriate digital tools for RBL. According to them the self-determination of RBL is made possible when students can co-determine the selection and use of digital tools according to their approach. Thus, digital systems should enable collaboration and communication among students and between students and teachers, thereby, students can make co-decisions about whether their products are publicly, restricted, or private visible. Collaborative and project work should be enabled by digital media that support communication and cooperation among learners. Furthermore, coordinative

functions can allow students to participate in scheduling and deadlines, task distribution, and collaboration, as well as collaborative access to materials and communication. According to the situated learning approach, technologies used in the subject's research or professional practice should be used. Finally, constructivist aspects of learning can be supported by having students present research questions, their approach, results, and newly learned knowledge in writing or visually using digital media. In doing so, they construct their own perspective and build new knowledge and skills according to their own approach to a topic (Schirmer & Marín, 2020, p.287).

Regarding the effectiveness of RBL in the metacognitive and cognitive components of learning, recent studies report good results. The controlled experiment by Wulf et al. (2020) showed some positive findings. They compared traditional instruction with RBL and found that the cognitive research competence improves (independent of the didactic format) in both groups. Thus, the more elaborate format of RBL seems to have a positive effect on the cognitive and affective-motivational facets. For cognitive research skills, they found significant improvements in both samples, with a medium effect size. Since the content focus of both groups was strongly on cognitive research skills, this finding is not surprising. Although the effect in the RBL group was only slightly higher than in the control group, the difference was not significant by variance analysis. Thus, a stronger promotion of cognitive research competence by the format of RBL cannot be suggested. Surprisingly, they report no significant difference regarding research-related self-efficacy. The changes in the mean values during the semester tended towards zero. Thus, neither of the two didactic approaches contributed to the development of research-related self-efficacy. Other studies strongly support that through the concept of RBL, students can reflect on the necessary difference between theoretical and practical knowledge, and to make it applicable in the future professional field (Fiegert & Kunze, 2020, p. 215). According to Selje-Aßmann (2020) research skills can be assessed through methods of self-reflection that assess, for example, the quality of chosen references or suggestions for future research approaches. As previously noted in section 2.5, summative evaluations, or examinations in the form of common scientific formats are appropriate for RBL performance assessment and discussion.

In addition, the study by Schlicht (2021) reported successful results regarding knowledge and skills acquisition. This study compared face-to-face RBL instruction with the first prototypes for the blended RBL course on research methods evaluated in this dissertation. In the first design cycle, the face-to-face RBL intervention only led to medium effects on the knowledge and skills. In the second cycle, blended RBL with the first prototype was successful with significant positive effects in knowledge and skills acquisition, but at the expense of motivation. In the third cycle, along with the second improved prototype of the blended RBL course, the results were positive, achieving again significant effects in knowledge and skills acquisition with a stable level of motivation. The items

designed by Schlicht (2021) to measure the self-perceived level of knowledge and skills are consistent with the items of perceived skill development and self-reported learning scales proposed by Alavi (1994) for online and blended learning in management and business education[16].

In the cognitive facet, this dissertation considered the acquisition of knowledge and skills as knowledge of research methods including knowledge of the methodological background, as well as research process knowledge, i.e., theoretical knowledge of how research should proceed. In addition, it is considered here that the situated learning component and self-efficacy, which contribute to the application of existing knowledge of the cognitive component in a potential academic or professional activity. Consequently, to answer RQ1. How was the self-perceived level of knowledge and skills at the beginning (t1), and how did it develop at the end of the semester (t2)? The following hypothesis is proposed:

H1: The differences in the level of self-perceived knowledge and skills increased significantly over the semester.

2.8 Motivation Facet in the Blended Research-Based Learning Process for Business Higher Education

In broad terms, motivation can be understood as the intention or desire to learn specific content or abilities (Wild et al., 2001, p. 221). As an intrinsically motivated learner is generally spoken of when he or she strives to engage with learning content "for its own sake." On the opposite side, an extrinsically motivated learner, on the other hand, is motivated "from the outside:" the intensity of a serine learning effort depends on the promised incentives (Wild et al., 2001, p. 221).

The findings of earlier motivation research and the motivation theory approaches based on them are of fundamental importance. Deci and Ryan (1985) already created a foundation through the Self-Determination Theory (SDT) of motivation, in which they refer primarily to learning motivation and learning success. The two psychologists distinguish between intrinsic and extrinsic motivation and provide assumptions about various motivational processes and implications for their promotion. Their theory is based on three basic psychological needs of every human being, which are crucial for his motivation. These are the pursuit of autonomy, competence, and social inclusion.

[16] Alavi's (1994) scales included one for perceived skill development consisting of six items such as interrelation of important topics and ideas, critical thinking, ability to critically analyze issues, and ability to synthesize. For self- reported learning she used a scale consisting of three items, namely, understanding basic concepts, learning facts, and identifying central issues. These aspects are relevant for RBL and guided items' design for this study.

Further, Ryan and Deci consider motivation on a scale from "extrinsic" to "intrinsic," where the goal here is to be intrinsically motivated. Ryan and Deci represent the intrinsic motivation as an interest-determined action, “intrinsic motivation is defined as the doing of an activity for its inherent satisfactions rather than for some separable consequence. When intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards” (Ryan & Deci, 2000, p. 56). Intrinsic motivation remains even without consequences from the outside. It is characterized primarily by the person's interest and curiosity in the task. Self-Determination Theory is outlined in terms of social and environmental factors that *facilitate* or *undermine* intrinsic motivation. Here the assumption is that “intrinsic motivation, is catalyzed (rather than *caused)* when individuals are in conditions that conduce toward its expression” (Ryan & Deci, 2000, p. 58).

In contrast, there is the concept of extrinsic motivation. “*Extrinsic motivation* is a construct that pertains whenever an activity is done in order to attain some separable outcome” (Ryan & Deci, 2000, p. 60). Here, motivation is generated from the outside. Motivation is generated by the threat of bad consequences or the expectation of positive consequences. It does not arise spontaneously and is determined by external influences. These external influences could be integrated into their own values as they stated in their SDT when fostering the *internalization and integration* of values and behavioral regulations (Deci & Ryan, 1985). Internalization “is the process of taking in a value or regulation, and integration is the process by which individuals more fully transform the regulation into their own so that it will emanate from their sense of self” (Ryan & Deci, 2000, p. 60).

During the 80’s, most educational activities were not designed to be intrinsically interesting, Ryan and Deci, aware of this problem, pointed out a central question, how to motivate students to value and self-regulate such activities and without external pressure, to carry them out on their own without external pressure. Thus, they and other researchers investigated what task characteristics make an activity interesting and found that intrinsically motivated activities were said to be ones that provided the satisfaction of innate psychological needs. Thus, their approach focused primarily on psychological needs (competence, autonomy, and relatedness) but also the basic need for satisfaction increases in part from engaging in interesting activities. They argued that there is considerable practical utility in focusing on task properties and their potential intrinsic interest, as it leads towards improved task design or selection to enhance motivation. (Ryan & Deci, 2000, p. 57).

Summarizing, the SDT proposed that motivational attitude can be arranged in a spectrum determined by the level of autonomy individuals feel they have on their decision-making process. This motivational spectrum ranges from amotivation through four stages of (semi-)extrinsic

motivations which are defined by the level and type of regulation that include external control factors, up to a state of autonomy, defined as intrinsic motivation. (Pedrotti & Nistor, 2016, p. 473). In this study, the SDT (E. L. Deci & Ryan, 1985) plays a fundamental role and intrinsic and extrinsic motivation are explicitly considered in the operationalization.

From the perspective of self-regulated learning theories, self-regulated learning is a construct that requires motivational, cognitive, and metacognitive skills therefore motivation and learning are interdependent processes, and should be understood together (Zimmerman, 1990). Moreover, self-regulated learners can independently assess which activities are necessary to meet higher education requirements, and achieve self-imposed goals, and they can initiate them (Zimmerman 1990). Although motivation is considered significant for the implementation of self-regulated learning, the role of the same is not yet clearly defined (Martens & Metzger, 2017). According to the ongoing debate about the general role of motivation it can be assumed that a large proportion of motivational regulation is unconscious and cannot be steered by conscious knowledge (Baumeister, 2016; Martens & Metzger, 2017). Although motivational, intentional, and volitional processes and strategies must be fulfilled and implemented by the students themselves, the formation of a learning motivation, a learning intention and the implementation of a learning action can be supported by the learning environment. (Martens & Metzger, 2017).

In higher education it is assumed that students have a better level of intelligence, academic performance, learning strategies, and self-regulation than the general population (Richardson et al., 2012; Sackett et al., 2009; Schneider & Preckel, 2017). According to Schneider and Preckel (2017) these conditions might help students in higher education to profit from any instructional method. They also argued that the research skills of teachers in universities and their competence and expertise in specific subjects could be enough to guarantee the quality of their instruction (Schneider & Preckel, 2017, p. 567).

Furthermore, in their systematic review of meta-analyses, Schneider and Preckel (2017) found that on the microlevel teacher's behaviors, teaching methods, especially the time and effort that teachers invest in planning and organizing the microstructure of their courses, and how they implement them affect students' learning outcomes, therefore they should be improved to influence student achievement in a positive manner. In the motivation category study five of the twelve variables had a medium-large or large effect size including performance self-efficacy, grade goals, achievement motivation, academic goals, and other goals. Intrinsic academic motivation and control expectations had small effects and extrinsic motivation was independent of achievement. Richardson et al. (2012) performed another meta-analysis with students in the UK and in the USA. They

investigated among other aspects the relationship between motivation and GPA understood as performance in higher education. In this study it was found that intrinsic motivation was an important predictor of performance, whereas extrinsic motivation was not systematically associated with performance. Furthermore, in a longitudinal study with Canadian high school students from different school types and cultures, it was found that over a one-year period, intrinsic motivation was the only motivation type that was positively associated with academic achievement (Taylor et al., 2014).

The transition process from school to university is another aspect that influences students' motivation. According to Martens and Metzger (2017), students' patterns of motivational regulation during this transition depend on situational characteristics, personal dispositions, and experiences. For some students, the response to this new situation could be taking responsibility for the new learning process, while for others, the feelings of insecurity and anxiety might increase. This motivational path can change during their studies. Constructs relate differently to learning and performance.

Regarding blended learning and its effects on motivation, various studies reported good results. In a qualitative study with bachelor students of social work in New Zealand, it was stated that self-motivation, self-reliance, and the ability to work independently were essential to their success on the blended learning course. Nevertheless, students who already struggled in the face-to-face delivery, found difficulties adapting to the demands of the blended program (Wivell & Day, 2015). Another study on blended learning for STEM (science, technology, engineering, and mathematics) courses utilized server log on data from students' interactions with the platform and it was found that whilst a blended learning program generally increased students' autonomy and responsibility for their learning, some students did not engage with the online activities or complete the online assignments. Here, the most successful students were those who engaged more frequently with the online materials (Chen & DeBoer, 2015). However, when designing online tasks compulsory, or contributory towards a student's final grade, teachers should be aware that this may increase engagement and submission by offering higher extrinsic motivation (Bowyer & Chambers, 2017) which is not intended.

Nevertheless, little research has been done in blended learning on how motivational aspects and design features are predictors of outcomes in the context of establishing the effectiveness of blended learning (Kintu et al., 2017). One recent study in blended learning with Chinese students of English as a foreign language showed that students' intrinsic learning motivation has a stronger positive impact on learning outcomes compared to extrinsic learning motivation (Peng & Fu, 2021). Motivation is also seen in blended learning as an outcome because in the same manner that cognitive factors, such as course grades, are used in measuring learning outcomes, non-cognitive factors like

intrinsic motivation may also be used to indicate outcomes of learning (Kintu et al., 2017; Kuo et al., 2013). Moreover, learner interest as a motivation factor promotes learner involvement in learning, and this could lead to learning effectiveness in blended learning. (Kintu et al., 2017).

In RBL research, its effects on emotional and motivational variables have not yet been researched very much. Nonetheless, it is assumed that RBL can promote students' motivation and self-direction among other competencies such as problem-solving, teamwork, or communication skills (Huber et al., 2009; Wulf, Thiem, & Gess, 2020). Regarding motivational aspects, there are findings that RBL can promote intrinsic motivation, and develop scientific reasoning among undergraduate students (Seymour et al., 2004). Other findings also indicate that the impact of RBL is influenced by motivational aspects, and that there is a relationship between intrinsic motivation and growth in research interest in social sciences (Wessels et al., 2018).

However, some studies show contradictory findings that over the course of the semester, students' motivation decreases in face-to-face and RBL environments. The controlled experiment by Wulf et al. (2020) with 92 bachelor students in education and pedagogy programs showed no significant changes in motivation at the end of the semester in either group. Motivation for undergraduate research decreases even in the RBL group. Both groups presented a lower autonomous motivation at the end of the semester than at the beginning of the semester, whereby this decrease was only significant for the control group. In addition, for the promotion of value-related interest in research, no significant difference was detected in the two groups over the course of the semester. On the descriptive level, a slight - but not significant - decrease in value-related interest in research can even be observed for the research-based learning group. Similarly, in the study by Schlicht (2021) the RBL approach did not demonstrate a positive effect on motivation during the semester. These findings suggest that RBL does not contribute to an increase in motivation under all circumstances. One possible explanation is that the uncertainty and tentativeness inherent to academic work might cause feelings of frustration and worry when students try to find meaning and structure within the information available at the different phases of the research process (Wessels et al., 2018). Another possible explanation is offered by Reinmann et al. (2019), they suggest that RBL can also generate resistance because research work differs from learning behavior from high school or defies considerations of usefulness. The empirical results also suggest that interest in research increases when the participants consider the course to be useful for their later professional life and/or when the teachers are interested in the results of the research processes (Wessels et al., 2018).

In summary, the effects of blended RBL on emotional and motivational aspects have not yet been researched in depth. Although there are indications that blended RBL can strengthen research

motivation, there are no empirical results on the question of whether blended RBL strengthens the motivation facet of learning. Therefore, to answer RQ2. How was the self-perceived level of motivation at the beginning (t1), and how did it develop at the end of the semester (t2)? The following hypotheses were derived:

H2a: The differences in the level of self-perceived intrinsic motivation increased significantly over the semester.

H2b: The differences in the level of self-perceived extrinsic motivation decreased significantly over the semester.

2.9 Acceptance of Blended Learning Offers in Higher Education

During the 1970s, the acceptance concept was used to discuss the use of innovative office technologies. This discussion was primarily concerned with business management issues. These included, the understanding of sales markets, the assessment of economic risks, or potential analyses to prevent bad investments (Degenhardt, 1986). It was not until the beginning of the 1980s that research turned to social acceptance issues in addition to economic ones. As a result of the assumption of a hostile attitude pattern in the population towards new technologies and the posterior slowdown of dynamism in industrial societies. During this time, social science acceptance research developed with impulse from the political side for determining the contributing factors of technology acceptance and deriving insights for theory and practice (Olbrecht, 2010).

In literature, there seems to be no general definition of acceptance. Some authors refer to acceptance as "an attitude of usually larger social groups toward individual technologies that can be ascertained at a certain point in time and is expressed in certain forms of opinion and behavior" (Dierkes & Thienen, 1982, p. 12). There is a widely established conclusion in business acceptance research that offers to understand acceptance as a two-dimensional phenomenon which has an attitude and behavioral component (Müller-Böling & Müller, 1986). Attitudinal acceptance includes an affective, a cognitive, and a conative component. The second acceptance dimension is defined by the authors as actual behavior, according to which the acceptance object is actively accepted by a person because of observable use (Müller-Böling & Müller, 1986). Acceptance was also defined as the chance of gaining the explicit or tacit approval of an identifiable group of people with certain opinions, measures, proposals, and decisions, and able to count on their approval under specifiable conditions (Lucke, 1995, p. 104). Simon (2001) stated that acceptance "contradicts the term rejection and refers to the positive acceptance decision of an innovation by users" (Simon, 2001, p. 87). More

recently the concept of process acceptance was defined by Müllerleile (2019) as the affirmative positive basic attitude of the process participants towards a process. This attitude results from an inner, rational, or motivational-emotional conviction, by which the process is approved and recognized in its entirety. This conviction leads to a behavior which corresponds to an unchanged execution of the given process. It is obvious that acceptance can be changed positively or negatively through targeted influence, e.g., rational, or emotional argumentation (Müllerleile et al., 2019).

Based on the previous acceptance definition, it is important to clarify the relationship between attitudinal and behavioral acceptance. The question of when behavior can be predicted from attitudes is a key topic within social psychology. Numerous models have been developed to explain the attitude-behavior relationship (Bierhoff, 2006). The most important attitude theory was presented in 1975 by Fishbein and Ajzen as the Theory of Reasoned Action. The authors developed a theory for predicting behavior about whose execution or non-execution a person decides based on a systematic, cognitive evaluation of possible consequences (Fishbein & Ajzen, 1975). The model describes the causal relationships between beliefs, attitudes, subjective norm, behavioral intentions, and actual behavior (Hill et al., 1977).

Ajzen and Madden (1986) further developed the Theory of Reasoned Action into the Theory of Planned Behavior. They introduced perceived behavioral control as another independent variable. The authors recognized that behavioral intention is an inadequate predictor of behavior when personal control over the behavior is limited. In the theory supplement, the perceived behavioral control, in addition to attitude and subjective norm, should affect behavioral intention as well. This distinction from the other independent variables directly influences behavior. This changes at the same time the predictive power of behavioral intention. In the extended model, only the behavioral intention is predicted, not necessarily the actual behavioral execution. If no behavior occurs, either the behavioral intention may have changed (after the time of its measurement) or the person does not have the control to perform the intended behavior itself.

In the late 1980s, Davis introduced his Technology Acceptance Model (TAM). He argued that two characteristics influence the acceptance of new technologies by the user. First, the characteristic perceived usefulness expresses the individual conviction that the use of technology can contribute to an increase in one's own job performance. Usefulness is also related to relevance and value (Davis, 1989). Second, the characteristic perceived ease of use represents the ease of use of a technical system. It is intended to express the amount of expected mental and physical effort that a user must invest to operate the system. According to the model, a system that is more difficult to use is more likely to be rejected than a device that is comparatively easy to use. In addition, perceived ease of use

has a direct impact on both the intention and perceived usefulness of a technology (Davis, 1989). In the TAM, perceived usefulness and perceived ease of use are determined by external factors. These variables, modeled as design features, can characterize system characteristics, such as input devices (keyboard, mouse), user interface features (such as position of navigation elements), or support system features (such as virtual tutoring by a tutoring system, assistance devices integrated into the system) (Olbrecht, 2010, p. 30). According to the meta-analysis by King and He (2006) in numerous studies on the TAM, perceived usefulness has been found to be the strongest predictor of intention (King & He, 2006).

The next acceptance model was proposed by Kollmann (1998) as a dynamic acceptance model. He refers in his definition of acceptance to the conceptual distinction between an attitudinal and a behavioral aspect and adds the acceptance of action as a third factor. Acceptance forms the link between an internal appraisal and the formation of expectations (attitude level), an adoption of the innovation in use (action level), and a voluntary problem-oriented use, (usage level) up to the end of the entire usage process (Kollmann, 1998). He also points out that valid acceptance statements cannot always be made from observable behavior. No statements about behavioral acceptance can be made about the act of purchase or adoption alone. In his opinion, acceptance needs to be understood as a process in which the intensity and frequency of use can allow conclusions to be drawn about accepting behavior.

In the 2000s, the TAM was further developed with the inclusion of social factors. In the Extended Technology Acceptance Model (TAM2) the social factors included were subjective norm from the theory of reasoned action, voluntariness, and image. Combining social influence with cognitive instrumental processes it was possible to explain 60% of perceived usefulness. Social influence had a direct effect on the use intentions for mandatory but not for voluntary contexts (Venkatesh & Davis, 2000). The next development was the Technology Acceptance Model (TAM3), a more comprehensive model complemented with potential actionable guidance and with a higher differentiation of influential social factors such as experience with the innovation (Venkatesh & Bala, 2008). Venkatesh and Bala (2008) found that experience is an important moderator of perceived ease of use on behavioral intention such that the effect will be weaker with increasing experience.

Vankatesh et al. (2003) reviewed eight different acceptance models and the theory of reasoned action to formulate the Unified Theory of Acceptance and Use of Technology (UTAUT). They defined four factors of intention and usage: performance expectancy, effort expectancy, social influence, and facilitating conditions with their respective constructs and definitions. In this study, four moderators were suggested: age, gender, experience, and voluntariness. They noted that

performance expectancy appears to be a determinant of intention in most situations, and that the effect of facilitating conditions on usage was only significant when examined in conjunction with the moderating effects of age and experience. Age and gender also moderated key relationships between factors. The samples for these studies were composed of workers from different economic sectors with higher variance regarding age. The UTAUT outperformed the previous models and explained around 70% of the variance in user intentions to use information technology innovations.

Later, in 2009 the acceptance curve models by Ziemendorf (2009) and Kosta and Mönch (2009) put the subject in the centrum of the process and construct the process as a learning curve. Ziemendorf (2009) stated that the quantity of support is spilled over time. He proposes three phases. In the first phase, the preparation phase, the subject recognizes their own uncomforted situation with the new technology. In the second phase starts the acceptance construction, which in the third phase, transforms in identification of the subject with the technology. Another perspective is proposed by Kostka and Mönch (2009), they argued that the perceived own acceptance plays a key role for acceptance formation in a change process (Müllerleile et al., 2019, p. 71).

Concerning the concept of acceptance itself, Lucke (1995) pointed out some critic about insufficient concept-analytical penetration. It remains problematic that acceptance and the measurement of it implies a mathematical accuracy that is not given. According to her, this may have a particularly negative impact on research if it is not considered that acceptance is dynamic in time and context variant result of a process that takes place in the field of tension between object, subject, and context. In the context of acceptance-oriented technology research, Grundwald (2003) points out the lack of predictability of acceptance due to its volatile nature.

In addition, some critics regarding empirical research with TAM models remain current. A discussed problem of TAM studies is the validity of these studies. It is likely that many studies are not published due to publication bias. In their meta-analysis, King and He (2006) demonstrated the reliability of the TAM constructs (perceived usefulness and behavioral intention), however, in the case of the postulated correlations the relationships were ambiguous. Thus, some meta-analyses (Yousafzai et al., 2007a, 2007b) and literature reviews (Li, 2010) conclude that inconsistencies exist between empirical findings and TAM models.

Another problem is, as Müllerleile (2019) pointed out, unknown factors may intervene between the formation of the intention to use and the actual use that cannot be accounted for by the TAM models. In recent years, the relationship of users to technology has also changed. Whereas in the 1980s, it was still unusual for many people to own a PC workstation, today technology is also consumed in a highly hedonistic way. Thus, the question must be asked whether the various models

of technology acceptance come from a different past time (p. 89). Consequently, for younger students, digital natives[17] and especially new millennium learners (Centre for Educational Research and Innovation, 2007) which are currently enrolled in higher education regarding acceptance factors of the different elements in a digital learning environment might be investigated in a different way as in the early 2000s.

Furthermore, in educational context technology acceptance models frequently fail to be reproduced (Pedrotti & Nistor, 2016). The starting point for research in business education context was the problem with which many companies were confronted, that is, the lack of acceptance of newly introduced e-learning training courses (Bürg & Mandl, 2004, 2005; Harhoff & Küpper, 2002). Harhoff and Küpper (2002) found in their study from about 100 German companies that e-learning was used at least once a quarter by approx. 50% of the respondents and will continue to be used by around 50% of the respondents, which was stated as a relatively low rate. Another important finding in this study was that the behavioral acceptance of e-learning can be acceptance of employees who can be promoted at the organizational level by creating the appropriate framework conditions.

Acceptance in this context has psychological and pedagogical aspects. The concept has to manage the subjective perception of usage, attitude, behavior, and assessment regarding a learning environment by the learner (Klauser, 2004; Schlicht, 2012b). Some studies show that the acceptance from a learner environment change during the time when learners have a different experience of the learning environment at the beginning than when they are confronted with the whole learning situation (Deschler, 2007). Most of the previously described acceptance models deal primarily with acceptance of technological innovations. However, the most recent ones, besides the cognitive also have some motivational aspects discussed for the acceptance of them. In educational context, the motivational aspect is key for the learning process (Bürg, 2005). According to Bürg (2005), the acceptance of a learning offer is influenced by the subjective perception, the assessment of the teaching-learning characteristics, the conditions of the learning environment, and the personal cognitive and motivational conditions of the learner. Bürg (2005) also argued that among all these conditions, characteristics, assessments, and perceptions, there is an interaction which can be assumed to be a relationship between the acceptance of the learning offer and the behavior toward the offer. He stated that the behavior is influenced through the attitude of the learner towards the learning environment. Studies have shown that acceptance is an important indicator of learning success, and

[17]Digital natives are those people who grew up with digital media (e.g., Internet), and digital immigrants as those who came of age before the introduction of the digital media. The differences between the two age groups suggest that digital immigrants usually no more can learn to deal with digital media so naturally and quickly as digital natives (Prensky, 2001). Some authors define as digital immigrants, people born before 1980 and as digital natives people born after this date (Kirk et al.,2012; Thompson, 2013). Other term used for digital natives is net generation (Oblinger & Oblinger, 2005).

a key success factor for learning with new media (Klauser, 2006). Acceptance towards a virtual seminar is defined as the learners' willingness to use the learning offer (attitudinal acceptance) as well as via actual use (behavioral acceptance) (Bürg, 2005; Nistor et al., 2005).

Consequently, as argued by Schlicht (2012) in her cost-benefit analysis of professional development in the public sector, there are three aspects for the operationalization of the acceptance in business education and training in organizations. The constructivist aspect implies that acceptance is a dynamic process that changes during the learning process. This means acceptance should be understood as a result of the learning process as well. The disposition character refers to the situational aspect of the action, which could be observed in the actual participation in the training. Finally, it is expected that the acceptance will depend on how effective the learning experience for the learner was (p.143). According to Schlicht (2012), two dimensions can be formulated to measure the factors described by Bürg (2005), personal conditions, perceptions, and assessment of the learning offer regarding the acceptance of the learning offer and the acceptance of the technology supporting the learning environment. The first dimension can be understood as the acceptance of the learning offer, and it involves the subjective perception of the learning environment influenced by the cognitive and non-cognitive aspects of the learner. The second dimension is called acceptance of the technology supported training concept, indicating that the person should have experienced the technological support during the training. Both dimensions interact and can be analyzed with observation and evaluation of the use of the learning offer and the recording and evaluation of the individual, non-observable attitude with the help of standardized attitude tests (p. 143-145). In this dissertation, both dimensions were analyzed through the second way, with a standardized test of the acceptance at the end of the blended RBL course, when the students already have gone through the whole course, their learning curve, and they had the time to realize and reflect on the learning process and concept (Cosgrove & Olitsky, 2020).

Specifically, some studies regarding the acceptance of RBL in Germany have showed positive results. For example, the Quality Pact for Teaching project "Humboldt Reloaded-Science Practice from the Beginning" at the University of Hohenheim, Stuttgart, was funded between 2011 and 2020 by the Federal Ministry of Education and Research (Selje-Aßmann et al., 2018). This project included interventions in the areas of student advising, university communication, qualification of teaching staff, and development of formats for research-related teaching and learning in The Faculty of Agricultural Sciences, the Faculty of Natural Sciences, and the Faculty of Social and Economic Sciences (Voeth et al., 2015). These interventions were intended to improve the quality of teaching and student support. In student research projects, students were given the opportunity to participate in current research as early as their undergraduate studies. The aim was to develop the methodological

and personal competencies of the students, as well as interest in researching among suitable and motivated students, to promote young researchers in a targeted manner (Selje-Aßmann et al., 2018).

In this project, the acceptance study identified several acceptance dimensions for the target group of students and their significance for the students was determined. In deciding for or against participation in the project, the following factors were particularly important in all faculties: the practical relevance, the individual interest in the project content, and the insights into research (Voeth et al., 2015). Based on this feedback university structures were adapted considering the curricular characteristics specific to each faculty (Selje-Aßmann et al., 2018). The first phase of this study involved focus groups on which 22 dimensions were identified for the acceptance among students. Following the focus group discussions, a quantitative conjoint analysis measurement of benefits was carried out to check the set of acceptance dimensions. Thus, based on the conjoint analysis data, relative importance of the individual acceptance dimensions was calculated. Additionally, the conjoint analysis was linked with a quantitative survey to assess the actual state of the projects. For this purpose, teachers and students were asked to assess their current project based on the identified acceptance dimensions. By comparing the target and actual status, it was possible to determine the degree of acceptance. At the end, 18 dimensions were defined for the student's acceptance, some new and some reformulated from the first 22. The 10 most important dimensions were: Project content corresponding to own interests, practical relevance, credits obtention for participation in the project, supervision by the supervisor during the project, granting of insights into research, relevance of the methodology and/or the content for the later studies, collaboration and teamwork in the project, acquisition/improvement of own soft skills, project as an orientation aid for later studies, and project schedule (Voeth et al., 2015). A relevant finding for this dissertation was that for the Faculty of Social and Economics Sciences, the most important dimensions were credits obtention for the participation in the project, supervision, project content corresponding to own interests, and practical relevance. These dimensions were considered in this dissertation as the blended RBL course being a mandatory course, where students obtain credits for their participation, as well as obtaining supervision, and the learning environment design presented its practical relevance and covered content that corresponds to their own academic interests.

Finally, the study by Schlicht (2021) comparing face-to-face with blended RBL at Leipzig University supports the acceptance operationalization for this dissertation. She proposed 7 items for acceptance measurement with a Cronbach's alpha value of 0.762 at the end of the semester. These items included interrelated aspects previously discussed in this section for the dimensions of performance expectancy and perceived usefulness, such as, their perceptions and assessment of supervision, teamwork, relevance of the content for personal development, and practical relevance.

In this study around 85% of bachelor students perceived the learning concept as useful, which was considered as a high acceptance level by the author.

In conclusion, to answer RQ3. How was the acceptance level of the blended RBL course at the end of the semester (t2)? The following hypothesis is proposed:

H3: The acceptance level of the blended RBL course at the end of the semester(t_2) was high and above 85%

2.10 Control Variables for the Blended RBL Study

Control variables are considered extraneous variables that are not linked to the hypotheses and theories being tested in a study and their role is assumed to produce distortions in observed relationships. As argued by Spector & Brannick (2011) researchers clearly define some variables as being of no theoretical interest that need to be somehow removed in their effects on the study. However, rather than being included based on theory, control variables are often entered with limited comment by researchers (Spector & Brannick, 2011). This is assumed with often little concern about the existence and nature of mechanisms linking control variables and the variables of interest. To avoid this potential problem the nature of the control variables and their role in prior research results were analyzed to determine what control variables were included in this present dissertation.

Previous studies in online and blended learning used some of the usually referred to as sociodemographic variables, such as, gender, age, GPA, ethnicity, socioeconomic status, and previous vocational education and training (VET) as control variables with different results. In general terms, from previous studies learner performance by age and gender in online and blended learning have been found to indicate no significant differences between male and female learners or between different age groups (Kintu et al., 2017). Nevertheless, for example, one Australian study analyzed relationships between gender, nationality, participation, and performance in online learning with mixed results. In this study, it was found that on average, students of Asian cultures do perform poorer than those students of Western cultures in online courses, and that female students performed better than male students. However, there was no relationship between age and performance and participation (Coldwell et al., 2008).

Regarding management and business education, Arbaugh et al. (2010) reviewed fifteen years of research in online and blended learning. They stated that some of these demographic variables have been incorporated to online and blended learning research designs more frequently. The student

characteristics most examined were age, gender, and prior experience with technology and online learning. These studies usually have found no relationship between student age and online course outcomes in business education (Arbaugh et al., 2009; Arbaugh & Duray, 2002; Arbaugh & Hwang, 2013; Coldwell et al., 2008; Hwang & Arbaugh, 2006; Webb et al., 2005). Most studies also have failed to find a significant relationship between gender effects and online learning outcomes (Anstine & Skidmore, 2005; Arbaugh & Rau, 2007; Williams et al., 2006).

Concerning prior economic and business knowledge, some authors stated that completing a commercial or administrative vocational training in German speaking countries leads to the acquisition of study-relevant knowledge and skills. Therefore, students with this kind of training hold a higher level of economic and business knowledge than students without it at the beginning of their studies (Happ et al., 2016; Zlatkin-Troitschanskaia et al., 2013). In the USA a study among accounting students found that gender, and prior studies of accounting and computing systems were not significant influences on academic performance (Mcdowall & Jackling, 2006). Another American recent study about RBL strategies in a flipped microeconomics classroom showed that students who have taken a previous economics course experience had smaller learning gains, performing better than those without economics experience on the initial assessment. However, the coefficient on the treatment indicator is insignificant looking at the entire semester (Cosgrove & Olitsky, 2020). These findings are relevant; however, it is important to note that these studies do not consider research methods knowledge and skills acquired through previous VET or previous courses. Moreover, some authors argue that tertiary education is the first opportunity for most of freshmen to gain knowledge and skills in research (Lübcke & Heudorfer, 2019; G. Reinmann, 2019b).

Furthermore, previous studies in RBL such as Humboldt Reloaded (Selje-Aßmann et al., 2018; Voeth et al., 2015), and the participatory development of a digital setting for RBL in business education study programs (Schlicht, 2012b), do not report findings regarding the control variables age, gender, semester, and previous vocational and training education. It can be assumed that there were no significant differences between the different groups for these variables. However, little is known so far about the extent to which these characteristics differ between freshmen in blended RBL higher education.

Summarizing, based on the literature of RBL and economics and business education, the background variables of gender, semester, and previous VET were included as covariates. These demographic characteristics, and their influence on learning outcomes as knowledge and skills acquisition among students were considered in this study.

2.11 Proposed Conceptual Model for the Relationship Between Acceptance, Motivation, and Knowledge and Skills in Blended Research-Based Learning

Along with the previously discussed concepts in blended business and management education there are several models that try to explain the relationships among constructs for effective learning. The evaluation model presented by Klauser (2006) is a theory-driven type of evaluation based on the main success factors for pedagogic effectivity and efficiency in computer and network-based learning offers. He classified the main success factors in three types, student learning condition, learning environment, and learning results or outcomes. Student learning conditions can be cognitive and noncognitive including knowledge and learning strategies as cognitive and joy of learning, performance expectations and motivation as noncognitive. The learning environment includes the content, different media, and the learning culture. Among the learning outcomes are acceptance of the learning environment, motivation, and learning success. Through the interpretation of these learning outcomes, it is expected to find new insights for the improvement of the learning offer. According to Alkin (2005b), this evaluation could be classified as instrumental by use.

Furthermore, a recent study by Kintu, Zhu and Kagambe (2017) used a similar model to Klauser's model aimed at determining the significant predictors of blended learning effectiveness. They analyzed the relationship among business students' characteristics or background, design features, and learning outcomes. Learning outcomes in this model were performance, student satisfaction, intrinsic motivation, and knowledge construction. For intrinsic motivation, they used the intrinsic motivation inventory (Deci & Ryan, 1985). Multiple regression analysis results showed that blended learning design features such as technology quality, online tools, face-to-face support and student characteristics, specifically attitudes and self-regulation, predicted student satisfaction as an outcome. Their results indicate that some of the student characteristics as intrinsic motivation and design features especially the connection between learning objectives and content, the technology platform, and collaboration in teams were significant predictors for student learning outcomes in blended learning (Kintu et al., 2017).

Pedrotti and Nistor (2016) pointed out that despite studies in higher education rely on technology acceptance models for their analysis in blended and online learning, this approach still fails to explain attitudes and user behavior among students in this context. They claimed that the UTAUT model (Venkatesh et al., 2003) has been proven successful in workplace environments, but this is not the case in higher education context. As a possible reason, they see that the foundations of the model are based on extrinsic motivational factors which are predominant in organizational contexts, whereas for educational context, intrinsic motivators are key for the learning behavior. They

advanced this topic with a study in German universities by extending the UTAUT (Venkatesh et al., 2003) with the inclusion of intrinsic motivational aspects based on SDT (Deci & Ryan, 1985). Their main aim was analyzing the relationship between technology acceptance and motivation in general in different learning environments. Nevertheless, they excluded extrinsic motivational aspects in their study. Their findings were indicative of a possible link between autonomy-based constructs of motivation, and the acceptance of technological solutions to assist learning, yet these results were not statistically conclusive. They recommended further research should investigate the connections between students' motivation and their acceptance of technological solutions in learning environments. Following these conclusions and recommendations, this dissertation investigated such connections including not only intrinsic, but also extrinsic motivational aspects in a blended RBL educational setting.

Similarly, to further develop the model the learning outcomes in a RBL environment need to be understood further in depth. Learning outcomes are usually formulated as the goals or objectives for individual courses to verify the achievement of specific competences (Lübcke & Heudorfer, 2019). Lübcke and Heudorfer (2019) investigated six learning goals in Germany for RBL (selection/retention, research exposure, technical skills, and research enculturation) based on the academic's perception of the purpose of research experiences for undergraduate students (Wilson et al., 2012). Wilson et al. (2012) performed surveys of academics in Europe, in the USA, and in Australia finding a range of intentions but only some of them addressed the higher order and critical thinking skills related to research. They suggested that there is a lack of reflection among faculty on the goals of research experiences at the undergraduate level. Referring to Lübcke and Heudorfer's (2019) study in Germany, they carried out interviews with project coordinators of 21 RBL experiences for freshmen and developed goal systems on an aggregated level. Their formulated goals of RBL can be categorized into the goal systems of degree completion, academic (training) education, coherence, and selection. It is noticeable that the goals can be on an individual or institutional level, with some goals combining both perspectives. The goals of scientific or academic education are related more to the personal development of the students. The higher education institution was interested in increasing the motivation to study through appropriate measures. The "selection" target system is different, as it is strongly focused on selecting students for the institution. Although the selected students also derive individual benefits from this support, the primary focus was on promoting the next generation of scientists. However, they could not clearly assign the goals pursued by RBL to the institution or the individual. This study investigated an institutional level faculty's goal when they pursued RBL with freshmen, which are important for the reflection on the design and evaluation of the learning environment. Although they were only based on the perspective of project

coordinators, and thus representatives of the institution of higher education, improving motivation is an important goal for RBL.

On the other side, in this dissertation, the focus was at the micro level and the analysis of learning outcomes include cognitive and noncognitive aspects of students RBL experience on research methods subject. Thus, achieving research competence was aimed through the blended RBL course on research methods. Research competence was understood as the ability to conduct independent research (Gess et al., 2017). This combines the two facets previously discussed in sections 2.7 and 2.8. In the cognitive facet, it is considered knowledge of methods, including knowledge of the methodological about the methodological background as well as the research process knowledge, that is, the theoretical knowledge of how research must proceed. In addition, it is considered here the noncognitive, motivational component of research competence, which contributes to the application of the existing knowledge of the cognitive component in a potential research activity (Weinert, 2001). This motivational facet included the value-related research interest, and research-related self-efficacy (Wessels et al., 2018). Value-related research interest includes beliefs about the benefits of research. Consequently, self-efficacy is about subjective certainty of being able to cope with new or difficult research situations. Richardson et al. (2012) found in their meta-analysis that the most important predictor of academic success was found to be self-efficacy beliefs, i.e., the extent to which students believe that they can master their studies through their own actions, and perform well (Bandura, 1978). According to the same study, intrinsic motivation is a significant factor in explaining academic success, but to a small extent (Richardson et al. 2012).

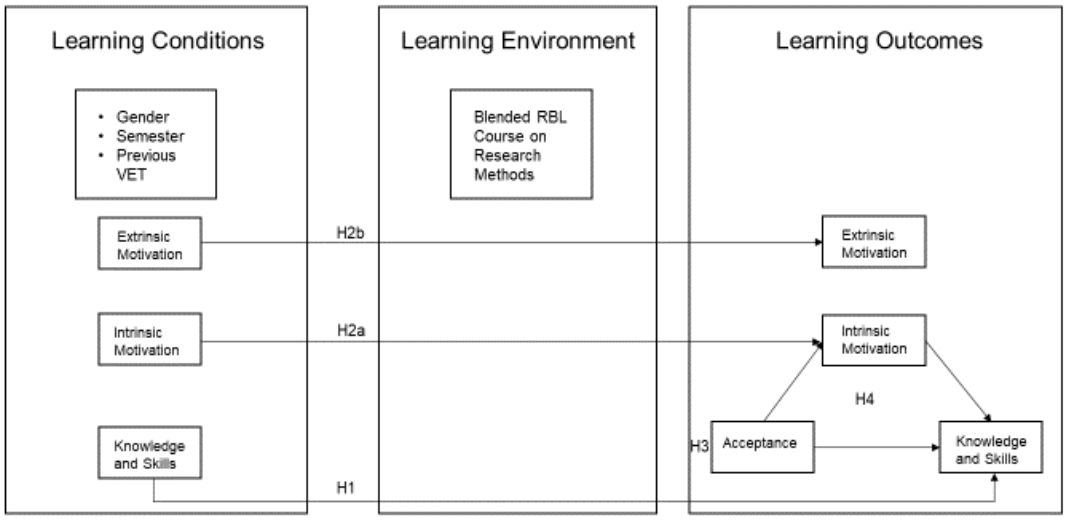
According to Wessels et al. (2018) existing models of research competence focus on cognitive aspects of research and conceptualize it as primarily encompassing methodological knowledge and skills (Gess et al., 2017). However, a focus on cognitive dispositions might render a model incomplete for explaining performance (Blömeke et al., 2015). Wessels et al. (2018) stated that the highly complex and demanding nature of research might require specific affective and motivational factors. They also agree with the fact that conducting research requires self-regulated learning. Their study expanded existing conceptions of research competence by recognizing the challenging situations that students face when conducting research and identifying the necessary affective motivational research dispositions to overcome them. Their resulting model covers a large breadth of dispositions and acknowledges the importance of interest for successfully conducting research.

In accordance with previous research, a conceptual model is proposed for this dissertation. Based on the models by Klauser (2006), Kintu et al. (2017), and Pedrotti and Nistor (2016), it was intended to build on their similarities, to include extrinsic motivational aspects, and to adapt it in the

direction of blended RBL analysis and requirements. Therefore, the three success factors defined by Klauser (2006) for computer supported learning were the framework of the model: student learning conditions or characteristics, learning environment, and learning outcomes. For student learning conditions, control variables such as gender, semester, and prior VET were considered. Research methods knowledge, the situated learning component, self-regulation, and self-efficacy (metacognitive), which contribute to the application of existing knowledge of the cognitive component in a potential academic or professional activity were included in knowledge and skills measurement. Knowledge and skills, intrinsic motivation, and extrinsic motivation were measured at the two points of time which helped to test the hypotheses proposed for the different constructs. The learning environment was also considered through the learning culture among the group as a component of the acceptance of the learning environment. The relationships among the variables and the hypotheses generated were supported with previously discussed findings in blended learning and RBL. The proposed conceptual model is presented in Figure 2.1.

Figure 2. 1

Proposed Conceptual Model



Note. VET: vocational education and training.

Regarding the relationships between acceptance, intrinsic motivation, and knowledge and skills, a mediation model is proposed. It is acknowledged by studies on the Assessment of Higher Education Learning Outcomes (AHELO) that only through the combination of various cognitive, metacognitive, and affective-motivational components it can be expected to produce competency in

a specific domain (Zlatkin-Troitschanskaia et al., 2015). Thus, it is expected in this study that through a combination of cognitive and noncognitive aspects, self-perceived knowledge and skills will increase among students. In addition, previous studies in high school context have shown that cognitive variables were stronger predictors of performance, but affective-motivational variables demonstrated incremental validity (Kupermintz, 2002). Nevertheless, performance and competence in those studies were measured with summative evaluations, including knowledge tests and GPA. This study investigated those relationships measured with self-perceptions for a self-regulated learning environment in higher education. This approach was also supported because, as previously stated, the role of motivation is still not clear in those learning environments (Martens & Metzger, 2017).

Wessels et al. (2018) also advocated for further research on the interplay of cognitive and affective-motivational research dispositions. They, as well as other authors see the need to understand how exactly cognitive and affective-motivational dispositions interact to lead learning processes (Blömeke et al., 2015; Wessels et al., 2018). As this dissertation followed the recommendation adapting the UATU with intrinsic motivational aspects for the acceptance of technologies in learning environments by Pedrotti and Nistor (2016), an interaction between acceptance and motivation was expected.

The conceptual model proposed in this dissertation addressed these questions by proposing a possible mediation of the effect of acceptance on research competence cognitive aspects by the motivational aspects during the learning process in a blended RBL environment. As described, cognitive and noncognitive facets are closely related but prior research does not provide evidence on the relationship of these factors to each other. This relationship is the basis for the argumentation of a mediation between acceptance and motivational and cognitive aspects. The consideration of possible moderator and mediator variables is also supported by recommendations for future research in general in higher education field (Richardson et al. 2012) and specifically for business education (Arbaugh & Hwang, 2013). As extrinsic and intrinsic motivational factors were included in this dissertation, the suggested mediation should be proven with both aspects, however, the intrinsic motivational aspects are expected to influence the relationship among acceptance and knowledge and skills as they have proven to be more relevant regarding the acceptance of technology supported learning environments in educational contexts (Wessels et al., 2018).

This simple mediation model followed definitions and methods by Hayes (2013). It contains two consequent variables, intrinsic motivation and knowledge and skills, and two antecedent variables acceptance and intrinsic motivation, with acceptance causally influencing knowledge and

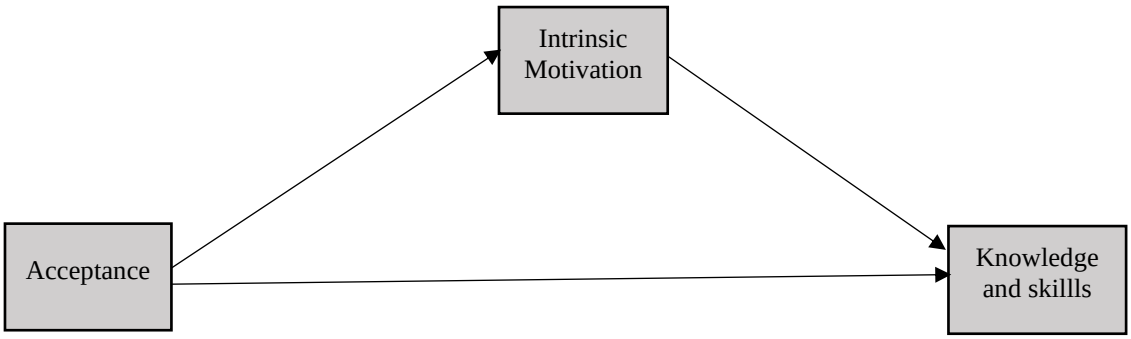
skills and intrinsic motivation, while intrinsic motivation causally influencing knowledge and skills. There are two pathways by which acceptance is proposed as influencing knowledge and skills. One pathway leads from acceptance to knowledge and skills without passing through intrinsic motivation and is called the direct effect of acceptance on knowledge and skills. The second pathway from acceptance to knowledge and skills is the indirect effect of acceptance on knowledge and skills through intrinsic motivation. The indirect effect represents how knowledge and skills is influenced by acceptance through a causal sequence in which acceptance influences intrinsic motivation, which in turn influences knowledge and skills. Here, intrinsic motivation is called the mediator variable. The proposed conceptual diagram of the simple mediation model is shown separately according to Hayes (2013) in Figure 2.2.

Therefore, to answer research questions five and six (RQ5 and RQ6): Which relationship exists between the acceptance of the blended RBL course and the changes in motivation? and which relationship exists between the acceptance of the blended RBL course and the changes in knowledge and skills? The following hypothesis was derived:

H4: Intrinsic motivation mediates the effect of acceptance on knowledge and skills.

Figure 2. 2

Proposed Conceptual Diagram of Simple Mediation Model for Acceptance influencing Knowledge and Skills



3 Longitudinal Research Design of the Learning Process and Acceptance within the Blended RBL Course at Leipzig University

3.1 General Settings of the Blended RBL Course on Research Methods

This study is based on a blended RBL mandatory course on research methods for business education students, which is also an elective course for business and economics students at Leipzig University. Students participated during their semester by combining weekly face-to-face sessions with self-paced online sessions. For online sessions, the digital complex learning environment (CLE)[18] previously developed with a design-based research approach over the learning management system ILIAS was used (Schlicht, 2021; Schlicht & Klauser, 2017). Some learner characteristics and general blended learning design features were measured in relation to learning effectiveness since the outcomes are aimed at understanding the learning process development and acceptance after the implementation of the last digital environment prototype developed for the blended RBL course. In 2021, the COVID-19 pandemic restrictions forced switching from face-to-face sessions to live online sessions, where instructor and students used the BigBlueButton platform enabled for this purpose by the Leipzig University.

The blended learning process under which the various variables were tested involved face-to-face sessions with the same instructor and online self-study during a 15-week semester, including independent self-study and teamwork throughout the formal sessions and outside them. The evaluations (pre- and post-test see Appendix A) were carried out at the beginning, in the first session, and at the end of the semester, before the final semester examinations. In 2017 and 2019, paper and pen questionnaires with items on student characteristics and learning outcomes, including acceptance of the learning offer, were distributed during the face-to-face sessions among students. In 2021, the same questionnaires were available online, and the students answered it during the live online sessions. This will be explained in more detail in the data collection procedures and analysis part of this study.

The blended RBL course on research methods presented an innovative instructional design. This instructional design combined different principles, such as presenting complex practical management problems as starting and reference points, taking heterogeneity (understood as management practice with social and ecological conflicts) into account, varying the degree of

[18]A complex learning environment is a multidimensional design of teaching contents and goals with complex procedures and methods (Achtenhagen & John, 1992) for a detailed explanation see section 2.2.3.

difficulty and complexity, linking various areas of knowledge, generative problem solving, promoting metacognition, learning through teaching, evaluating performance development, and designing feedback (for deeper understanding, see Schlicht, 2021). These principles were achieved and enhanced by combining relevant current theoretical content with the context of the German energy industry by developing numerous multimedia elements including pictures, graphs, videos, animations, audios, exercises, glossary entries and literature references. As indicated by Reinmann (2016), also here, the three pedagogical dimensions guided the design of the learning environment. For example, during the first part of the course, students were given the problem situation (activation) and theoretical knowledge to approach it (procurement) within the complex learning environment on ILIAS, then the task of working up the state of research on a topic for their research proposal. Here, they were moving between an information and exploration space. According to these dimensions, RBL activities and multimedia elements were designed and assigned or sequenced (Engler & Gerstenberg, 2020) here to the phases of a cyclical research process (Huber, 2014, p. 23; Bundesassistentenkonferenz BAK, 1970).

The focus of the blended RBL course on research methods was academic research for taking management decisions in complex situations by stimulating research competence within their cognitive and noncognitive dimensions. It was expected that after the course, students would be able to structure management practice problems in a holistic and academic manner and conceive research designs that generate relevant insights and academic knowledge. This would enable them to take better-informed management decisions (Klauser, 1999; Schlicht, 2012, 2021).

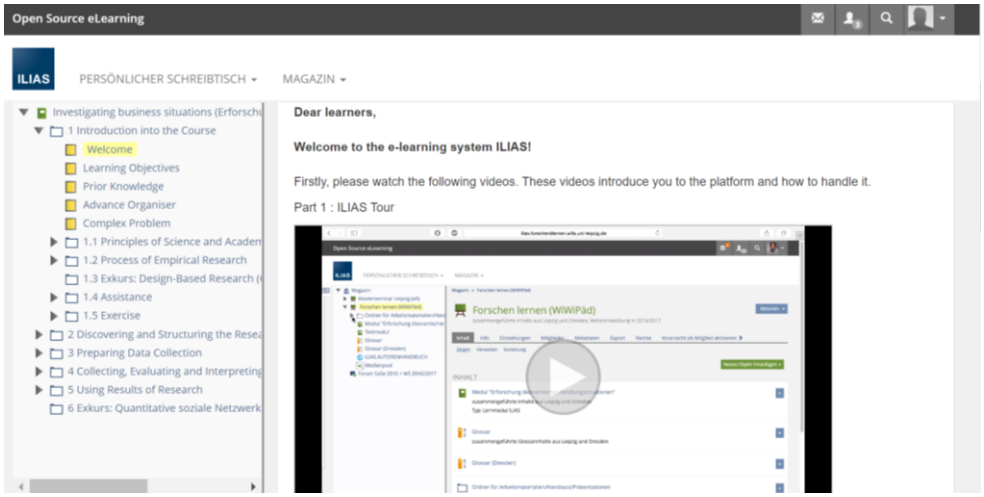
3.1.1 Blended RBL Course Description

At the beginning of the course, students received a course description, including the topics that should be covered in each face-to-face session, the general learning objectives, goals, and the assessment rules. Also, they were introduced to the digital learning environment on ILIAS with a welcome message and a brief explanation of the learning management system and its use (see Figure 3.1). Learning objectives for each module were also available in the digital learning environment. The weekly face-to-face sessions were carried out in computer rooms at Leipzig University to guarantee permanent access to the digital complex learning environment on ILIAS, the sessions were divided into two blocks. The first block was called seminar and the second practice, with a duration of two hours each. The first one is for covering the session's main contents and material through discussion with the instructor, while the second is for exercising an interesting aspect of the weekly topic, mostly on ILIAS. This agreed with the blended learning definition, where the digital support should account

for between 30 and 79% of the course (Allen et al., 2007; Arbaugh et al., 2010; Garrison & Kanuka, 2004). The type of digital media along the blended RBL course included 271 content pages with 343 figures and graphs, 34 videos and animations, 44 audios, 140 tasks and exercises, 116 glossary definitions, and 50 suggested references (Schlicht, 2021).

Figure 3. 1

Welcome to the Blended RBL Course on Research Methods on ILIAS



Note. Students used the German version.

In both sessions, the instructor guided and supported activities with live discussions on the topics and explored the resources within the digital complex learning environment on ILIAS together with the students. A detailed view of the sessions is presented in Table 3.1. Most learning platforms also offer methods for tests and self-tests. These features on ILIAS were also used to give feedback to students. These tests usually involved not only multiple-choice questions but also open questions. Self-tests could be carried out at any time on the LMS. The summative assessment was achieved following recommendations on RBL through a written work with the proposed research design for the complex management problem selected and the final presentation (Selje-Aßmann, 2020). The written work and its final presentation were prepared in groups of 3 to 4 students voluntarily formed at the first session. During each face-to-face session, students were asked to sit together with their groups in the computer room to facilitate ILIAS use, advance their final work, and improve the learning environment within the group.

Table 3. 1

Blended RBL Course Sessions Topics Overview

Week	Seminar	Practice
1.	Welcome to the course, groups formation, evaluation Pre-test, getting to know the digital learning environment on ILIAS, and self-study.	
2.	Chapter 1 Introduction to the course. Principles of academic research.	Literature research exercise
3.	Chapter 2: Discovering and structuring research problems	
4.	Chapter 2. Narrowing social problems	Problem delimitation exercise
5.	Intermediate presentation of the social problem selected by each group	
6.	Chapter 3: Research questions and hypotheses and definition of terms	Formulating research questions
7.	Presentation of the social problem selected and research question(s)	
8.	Methods selection	Writing scientific texts (Ch. 5.1) and complying with formal standards (Ch. 5.2)
9.	Population, sample selection, and sampling methods	
10.	Instrument development	Flash synopsis
11.	Chapter 4: Basics of quantitative data analysis (SPSS)	
12.	Basic features of qualitative data analysis	
13.	Submission of the written work with the detailed research design	
14.	Preparation for oral final presentations, counseling by tutor and evaluation post-test	
15.	Final group presentations	

3.1.2 Portrayal of the Complex Learning Environment and the Blended RBL Course on Research Methods

In the summer semester 2016, master's students at Leipzig University and TU Dresden worked together across locations with instructors' guidance to implement the first prototype for CLE. Practical relevance was established within the CLE in terms of content through collaboration with

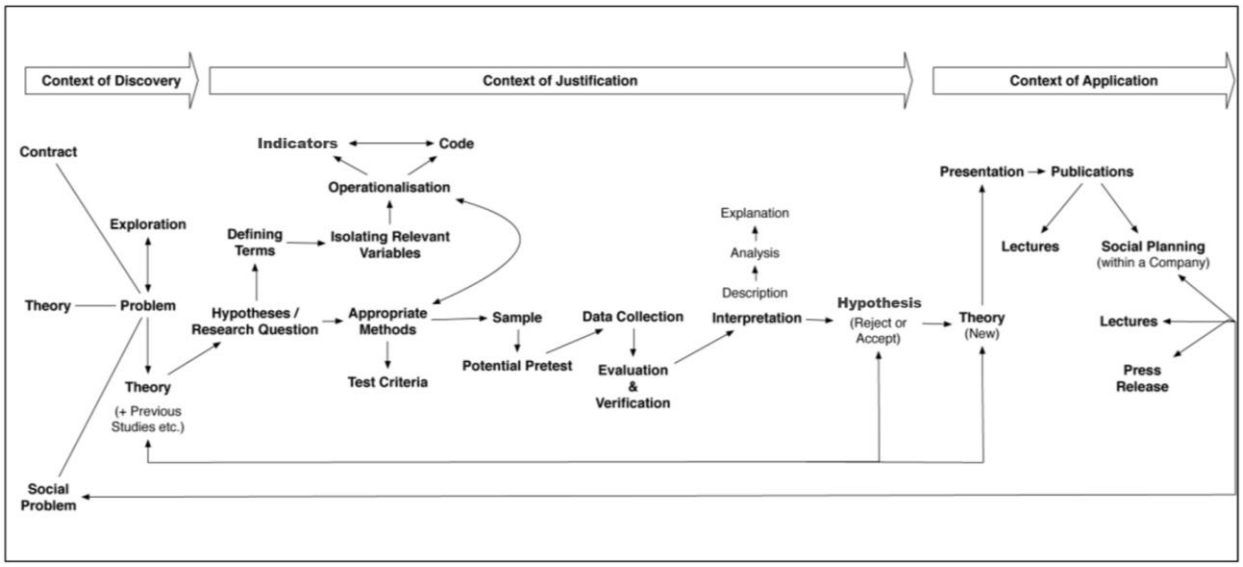
companies from the German energy industry (Schlicht et al., 2017, p. 44). This content was adapted to the context and linked with research into real operational business processes (e.g., for biogas order processing and for customer satisfaction and complaint management).

The CLE comprised various instructional elements. The first element was the division of content in chapters following the main phases of a research process as defined by Friedrich (1990) (Schlicht, 2017), which is also in agreement with the phases defined by Huber (2014) and the German Federal Assistants Conference (Bundesassistentenkonferenz BAK, 1970). In total, five chapters were presented to the students, including an introduction to the course, discovering and structuring research problems, preparing data collection, collecting, analyzing, evaluating, and reflecting data and using research results. The second element was a work folder for each student to create and manage their own presentations and working materials. The third element was a glossary that explained briefly important terms. The fourth element was a forum that supported communication and cooperation between instructors and students. The last element were the wikis which provided support and encouraged the groups to teamwork on an ongoing basis (for review, see Schlicht et al., 2017). These digital elements were designed according to the recommendations and reflections from previous studies (Dehne et al., 2019; Huber et al., 2009; Jungmann et al., 2018; Reinmann et al., 2019; Reinmann, 2019b; Schirmer & Marín, 2020).

The chapters (of the module in the digital CLE) included, besides the sequenced topics, different navigation areas presented as folders to support the learning process, and facilitate the access to relevant material. The first of these areas was the introduction folder with general information regarding the topics covered in the chapter. The next area was the learning objectives folder. Here, students reviewed and controlled what they were expected to achieve by the end of the chapter. Another area was the previous knowledge folder, which listed the necessary knowledge and skills to understand the topics covered in the present chapter. Also, this folder included links to the relevant elements within the digital CLE when this is applied. After the previous knowledge folder was located, the advance organizer folder (Schlicht et al., 2017) provided the graphic overview of the research process following the definition by Friedrich (1990). Each chapter highlighted the phase covered (see Figure 3.2). At the end of each chapter, a folder with relevant exercises was presented to promote self-study and facilitate the independent verification of learning objectives achieved by students. The chapters' general structure can be observed in the drop-down menu over the left area in Figure 3.3.

Figure 3. 2

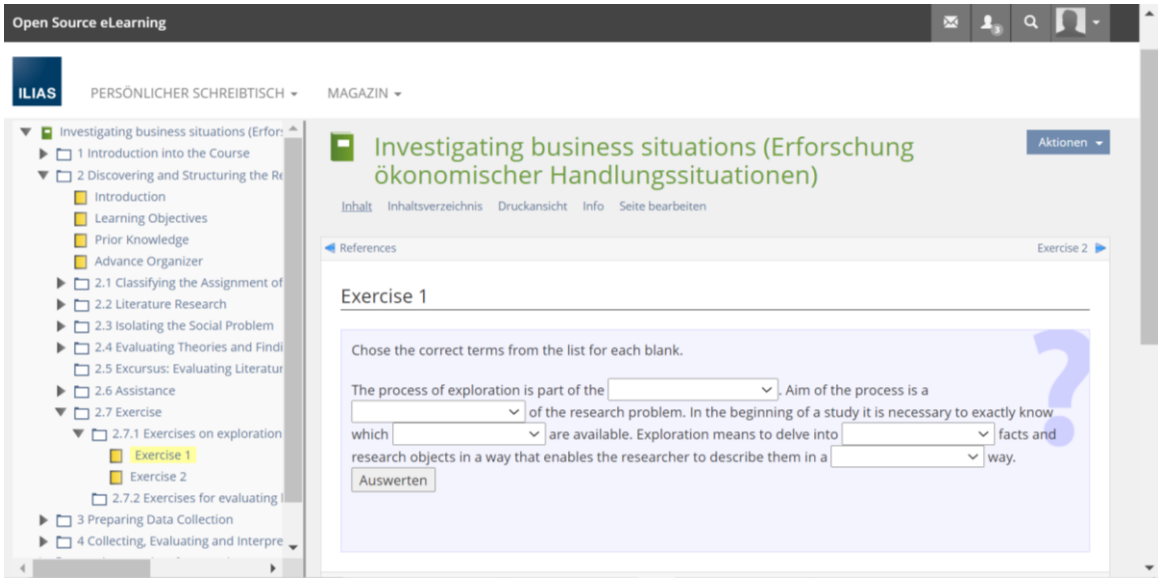
Research Process Model for Empirical Research Adapted from Friedrich – Advance Organizer in ILIAS



Note. Translated from the German original version. From "WiWiPäd: ein komplexes Lehr-Lern-Arrangement für forschendes Lernen in wirtschaftswissenschaftlichen und wirtschaftspädagogischen Studiengängen," by J. Schlicht, F. Klauser, M. Hommel, and B. Fürstenau, 2017, HDS. Journal, (1), p. 45. Copyright 2017 by HDS Journal.

Figure 3. 3

Structure of the Chapters Included in the CLE in ILIAS



The digital CLE started the first chapter with a simulation and a complex problem presentation. The student assumed the role of a trainee in the human resources department at the energy company, Sonnenberga AG. The student had a virtual office and received numerous

information about the company and some communications through different channels, such as emails and telephone calls, simulated with digital elements including audios and graphics. His first assignment was to collaborate with some colleagues on a project for the executive board. The trainee had to prepare a research design according to academic standards to analyze how effectively the employees of Sonnenberga AG communicate and cooperate while carrying out their business processes. Chapter 1 continued with the presentation of the principles and processes of empirical research and finished with review questions and exercises.

In Chapter 2, students would learn how to discover and delimitate a research problem. Students reviewed different sources from the company and performed a literature review. In the practice session, the instructor guided students with a practical exercise including keywords selection according to their topic of interest, classification of relevant types of sources, and using various databases and library resources available. Students worked in groups using the University's Library site and the digital CLE's resources at the same time in ILIAS. At the end of this chapter, students delimited the social problem and made a short presentation to the whole class, where they discussed it with fellow students and the instructor for clarity and improvement. With the problem definition and delimitation, the groups were ready to start with the next chapter.

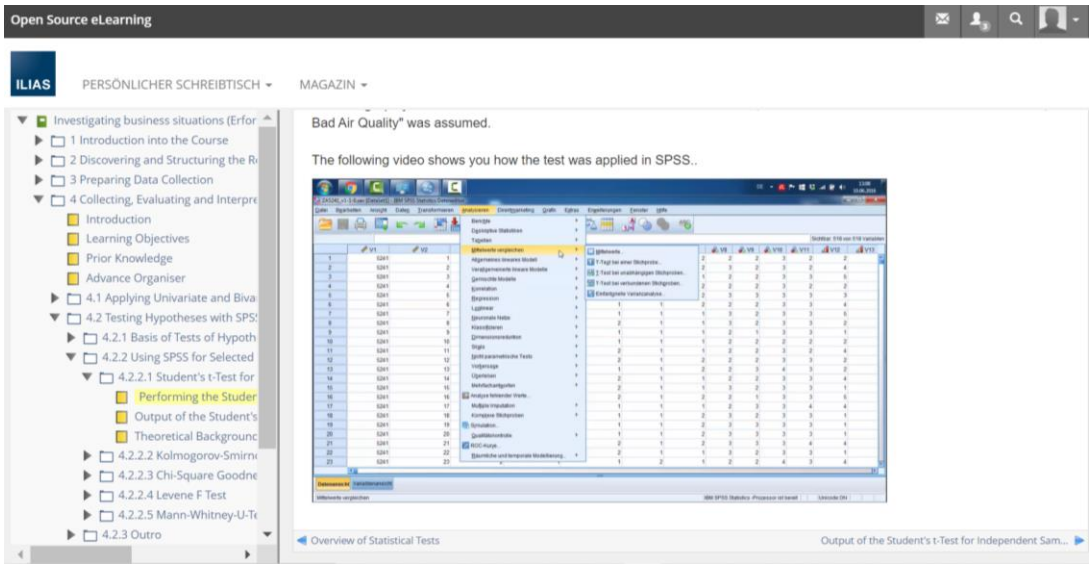
In the following sessions of Chapter 3, the preparation for data collection was covered. Research questions and hypotheses definition was a time-consuming process for students. It was the first time that most of the students had to research in an academic manner, and it was difficult for them to cope with the rules for a correct formulation of research questions and hypotheses, as well as the definition of terms. In the middle of this chapter, students presented their problem definition, research questions, and hypotheses. Additionally, they received feedback from the class and the instructor to continue with the research design. For the latter, they defined the proper methodological approach to answer their research questions, the sample size, the sampling procedure, and the instruments for data collection. In the practice session, they performed an exercise with APA (American Psychological Association) standards for academic writing and covered the content of Chapter 5 in ILIAS.

The last sessions covered chapter 4 resources on quantitative and qualitative research. According to their research design, they practiced the most pertinent resources for their research. If the group designed a quantitative study, they practiced the use of IBM SPSS Statistics for Windows with various tutorials and resources available in the digital CLE (see Figure 3.4). The instructor supported each group by practicing and selecting the most appropriate tools for their research. Students wrote down and submitted their research proposals, made the final evaluation of the course

(post-test), and had group consultations regarding the final presentation with the instructor. At the end of the semester, the final examination included the research proposal, its oral presentation, and a final discussion during the last face-to-face session.

Figure 3. 4

Video Tutorial for IBM SPSS Statistics' use on ILIAS



3.2 Implementing a Quasi-Experimental Design for Understanding the Learning Process and Acceptance Within the Blended RBL Course

This dissertation applied a quantitative design where descriptive and inferential statistics were used to identify student learning conditions and learning outcomes data from the blended RBL course. This method was selected because it is a means to describe systematically, factually, and accurately the characteristics of an existing phenomenon (Isaac & Michael, 1995; Mertens, 2010; Shadish et al., 2015). Following the definitions for quasi-experimental designs by Campbell and Stanley (1966), a longitudinal One-Group Pre-test-Post-test Design was performed:

Equation 1

One-Group Pre-test-Post-test Design

0_1 X 0_2 (1)

Where 0 represents measurement or observation, and X represents the experimental treatment (Campbell & Stanley, 1963; Mertens, 2010; Shadish et al., 2015). This quasi-experimental design had one observation at the beginning (0_1) and one observation at the end (0_2) of the blended RBL course, which was the treatment.

The phenomenon for this study involves the self-perception of the learning process, including cognitive and noncognitive facets such as knowledge and skills, motivation, and the acceptance of the blended RBL course. Performing various tests for student learning conditions or background variables to determine their relationships, evidence of causality, and whether they are significant in blended RBL effectiveness. Furthermore, exploratory factor analysis and moderation models were tested for validity and predictors of blended RBL effectiveness.

3.3 General Description of the Sample and Participants

The whole group of undergraduate students enrolled in the summer semester (SS) blended RBL course at Leipzig University was asked to participate in this study in 2017, 2019, and 2021 to assess student learning outcomes involving the blended RBL course. This convenient sampling comprised 93 participants, but only 89 responses were received (33 male and 56 female) at the beginning of the semester. Among the 89 students, 32 had previous VET. No incentives were offered for participation. Sample sizes for the three semesters are shown in Table 3.2.

Table 3. 2

Sample Sizes

Semester Year	Sample Size (N)
SS2017	32
SS2019	29
SS2021	32
Total	93

3.4 Learning Process and Acceptance Instrumentation

Instrumentation assessed three forms of learning results or outcomes (acceptance, self-perceived research-based learning or knowledge and skills acquisition, and self-perceived motivation). Actual

learning with knowledge tests was not assessed in this study[19]. The items used for the present study were taken from the questionnaire developed for RBL by Schlicht et al. (2017), which are also consistent with previous studies in online and blended learning in management and business education (Alavi, 1994; Arbaugh & Duray, 2002). This questionnaire was developed and applied in the German language (Schlicht et al., 2017; Schlicht, 2021). For this study, the English version was translated by native expert speakers at the Academic Lab of the Leipzig University (see Appendix A for both versions of the questionnaire).

Specifically, to assess one's own perception of the acquisition of knowledge and skills, as well as motivation, items using a six-point Likert-type scale to measure the perceived degree of learning and motivation (where 1 is "Not at all applicable " and 6 is " totally applicable ") were used. These items aimed to assess changes throughout the semester. For assessing students' perceived increase in RBL knowledge and skills and motivation, this study collected both pre- and post-perception data, before and at the end of the course at each semester. Besides, for measuring acceptance, items with a four-point Likert-type scale were applied (where 1 is "strongly disagree" and 4 is "strongly agree"). This data was collected only in the post-test at the end of each semester where students of the RBL course already attended and can report their own perception of it (Cosgrove & Olitsky, 2020).

Explicitly, three items to assess intrinsic motivation and three items to assess extrinsic motivation were used for the instrumentation of motivation. For example, an intrinsic motivation item, such as "I enjoy researching practical solutions", while an extrinsic motivation item, such as "Without outside pressure, I wouldn't get involved" were employed. In addition, for measuring the meta-cognitive and cognitive aspects of the learning process, knowledge and skills, and acceptance (performance expectancy and perceived usefulness (Venkatesh & Bala, 2008)) were measured with five and seven items, respectively. Items such as "I can design and implement research studies myself" and "The didactic approach of "research-based learning" is useful" (Schlicht et al., 2017; Schlicht, 2021) were applied.

Regarding control variables such as gender, semester, degree program, and previous VET, different categories were presented. For gender, for example, three categories were used including male, female, and other and for previous VET, a dichotomous yes/no item was employed. Operationalization is presented in Table 3.3.

[19] In this study was aimed to gain knowledge from student's perspective by reflecting and assessing their learning process and success themselves. According to Sembill (1992) the idea is to create RBL as a complex problem-solving process in education, with this approach students should be enabled to verify their problem-solving process and to justify it (p.3).

Table 3. 3

Variables Operationalization

Variable	Operationalization
Gender	Male, female, other
Degree program	Bachelor business or economics, bachelor business education
Motivation	Intrinsic motivation (6 points Likert scale) Extrinsic motivation (6 points Likert scale) (Deci & Ryan, 1985)
Previous VET	Previous vocational education and training yes/no (dichotomous)
Acceptance of blended RBL course	4 point Likert scale (Schlicht & Klauser, 2014; Schlicht, 2021)
Knowledge and skills (knowledge acquisition)	6 point Likert scale (Schlicht & Klauser, 2014; Schlicht, 2021)
Time metric	Semester Measurement time points (t1, t2)

3.5 Instrument Validity and Reliability

Two statistical methods were performed with which the validity and reliability of a questionnaire can be tested: exploratory factor analysis and Cronbach's alpha (Bornstedt, 1977; Ratray & Jones, 2007).

3.5.1 Factor analysis for Motivation, Knowledge and Skills, and Acceptance

Achieving construct validity with a questionnaire requires all items together to represent the underlying construct. Exploratory factor analysis (EFA) detects the constructs or factors that underlie a dataset based on the correlations between variables (Field, 2009; Tabachnick & Fidell, 2014). The factors that explain the highest proportion of variance the variables share is expected to represent the underlying constructs. In contrast to the commonly used principal component analysis, factor analysis does not have the presumption that all variance within a dataset is shared (Costello & Osborne, 2005;

Field, 2009; Tabachnik & Fidell, 2014). Since that generally is not the case either, factor analysis is assumed to be a more reliable questionnaire evaluation method than principal component analysis (Costello & Osborne, 2005).

Some prerequisites need to be fulfilled to conduct a reliable EFA. The sample size needs to be big enough (Costello & Osborne, 2005; Field, 2009; Tabachnik & Fidell, 2014). The smaller the sample, the bigger the chance that the correlation coefficients between items differ from the correlation coefficients between items in other samples (Field, 2009). The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO)[20] can signal in advance whether the sample size is large enough to reliably extract factors (Field, 2009), a KMO Measure of Sampling Adequacy should be above .60 before performing their EFA (Howard, 2016) which is the case for the scales in this study. For motivation scale pre-test and post-test, the KMO measure is .751 and .742, for knowledge and skills, .671 and .704, and for acceptance of the RBL course, .713. Bartlett's test of sphericity is also significant in all cases. This indicates that the data is not an identity matrix, and is appropriate for EFA (Howard, 2016). Additional prerequisites are variables measured at the interval level, and the data should be approximately normally distributed (Field, 2009).

3.5.2 Normality Assumption for Motivation, Knowledge and Skills, and Acceptance

In this study, all items are measured with Likert scales. The normality tests do not suit discrete distributed data, as the items were graphically revised with histograms and Q-Q plots for each item (see Appendix B). For the variables in this study, intrinsic and extrinsic motivation, acceptance, and knowledge and skills normality was revised in two manners with normality tests, such as Kolmogorov-Smirnov (K-S) test and the Shapiro-Wilk test and graphically with histograms and Q-Q plots (Field, 2009; Tabachnick & Fidell, 2014). The K-S test for the variables was performed with the sum of the items for each variable in this study[21]. Results from the K-S test were for self-perceived intrinsic motivation in pre-test, $D(63) = 0.099$, $p = .200$, and for extrinsic motivation in post-test $D(63) = 0.099$, $p = .200$, both normally distributed. For the other variables, the K-S test is significant, indicating the distributions are not normal, for extrinsic motivation in pre-test, $D(63) = 0.114$, $p<.05$, for knowledge and skills in pre-test, $D(63) = 0.119$, $p<.05$, for intrinsic motivation in post-test, D(63)

[20] The KMO "represents the ratio of the squared correlation between variables to the squared partial correlation between variables." (Field, 2009, p. 647). Therefore, KMO values are usually interpreted in this way values between 0.60 through 0.70 – Mediocre – Okay, values between 0.70 through 0.80 – Middling – Okay, values between 0.80 through 0.90 – Meritorious – Good, and values between 0.90 through 1.00 – Marvelous – Great (Howard, 2016).

[21] Nunnally and Bernstein (1994), McIver and Carmines (1981), and Spector (1992) discuss the reasons for using multi-item measures instead of a single item for measuring psychological attributes.

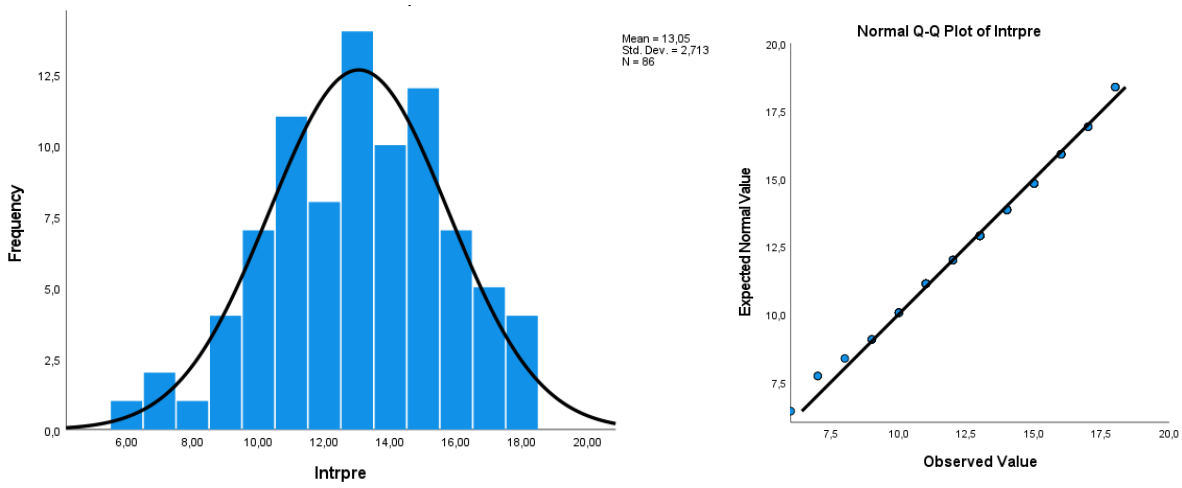
= 0.112, p<.05, for knowledge and skills in post-test, D(63) = 0.144, p<.05, and for the acceptance, D(63) = 0.136, p<.05.

Furthermore, the Shapiro-Wilk test indicated most of the variables to be normally distributed. Intrinsic motivation in pre-test, D(63) = 0.973, p = .176, knowledge and skills in pre-test, D(63) = 0.967, p = .090, intrinsic motivation in post-test, D(63) = 0.976, p = .244, extrinsic motivation in post-test, D(63) = 0.976, p = .243, however, for extrinsic motivation in pre-test, D(63) = 0.954, p<.05, knowledge and skills in post-test, D(63) = 0.956, p<.05, and acceptance, D(63) = 0.950, p<.05, results show that they were significantly non-normally distributed. The Shapiro–Wilk test is considerably more powerful to detect deviations from normality than the K-S test, especially for small samples, even around 20 cases (Field, 2009). Nevertheless, these tests have their limitations; they are quite sensitive to small deviations from normality, and they do not report whether this deviation from normality is large enough to bias the statistical procedures. Field (2009) recommends plotting the data to make a better-informed decision regarding the extent of non-normality.

Following these directions, histograms and Q-Q plots were performed. Results for the variables that failed the normality tests are presented here. For comparative and explanatory purposes, a normally distributed variable, intrinsic motivation in pre-test was plotted. In Figure 3.5, the graphs show a normally distributed dataset, skewness = -0.249 and kurtosis = -0.311. This distribution is normal, its histogram is centered, and the points on the Q-Q plot are almost all over the line. The rest of the normally distributed variables were also plotted (see Appendix B).

Figure 3. 5

Histogram and Q-Q Plot for Intrinsic Motivation in Pre-test

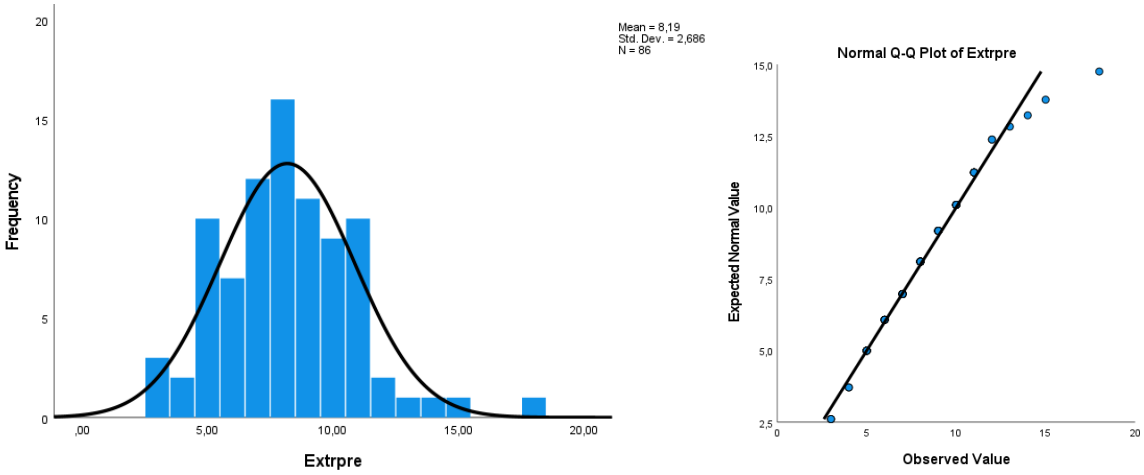


Note. Intrpre= intrinsic motivation in pre-test.

In Figure 3.6, the first problematic variable is plotted. The skewness= 0.610 and kurtosis =1.324 for extrinsic motivation in post-test show a slight deviation from the normal distribution, it is slightly positively skewed, and there is a larger concentration at the lower end of scores. At the end of the distribution, a high score could be the reason for the deviation, however, for the sample size, it is not intended to exclude cases. As the graphics show for the following statistical analysis this deviation can be considered low, so that an approximately normal distribution can be assumed.

Figure 3. 6

Histogram and Q-Q Plot for Extrinsic Motivation in Pre-test

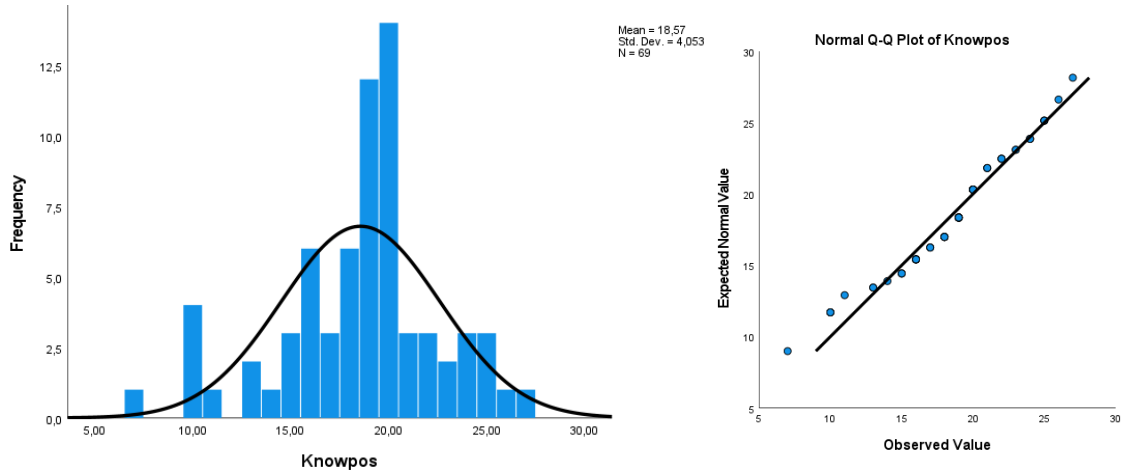


Note. Extrpre= extrinsic motivation in pre-test.

In Figure 3.7, the second problematic variable is plotted. For knowledge and skills in post-test the values for skewness= -0.510 and kurtosis =0.616 were not extreme. A slight deviation from the normal distribution can be recognized as few scores were at the lower end of the distribution, and it is slightly negatively skewed. However, the main concentration of scores is at the center of the distribution. At the lower end of the distribution, a low score could be the reason for the deviation, again, for the sample size it is not intended to exclude cases, and the graphics not showing great deviations from normality, then an approximately normal distribution can be assumed.

Figure 3. 7

Histogram and Q-Q Plot for Knowledge and Skills in Post-test

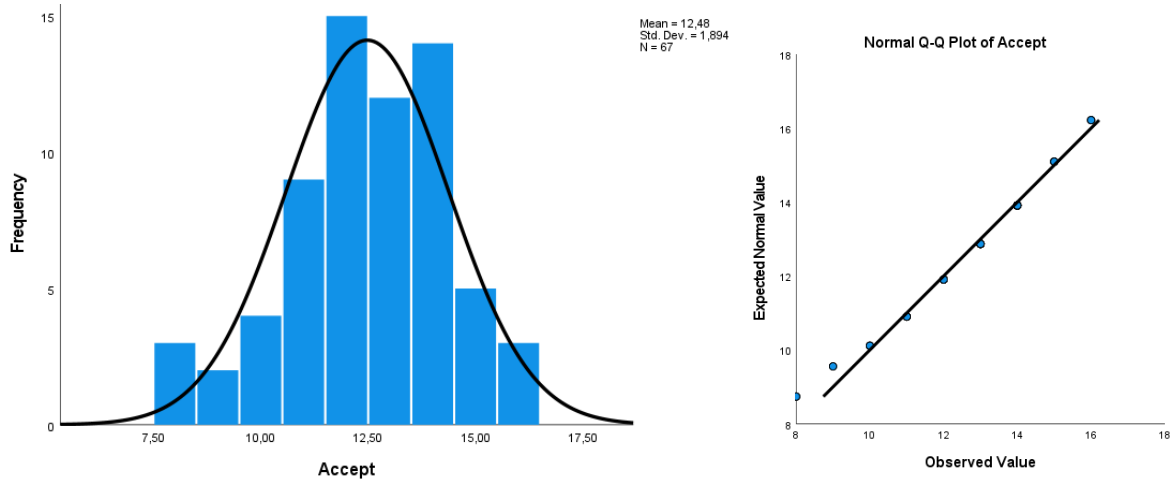


Note. Knowpos= knowledge and skills in post-test.

The last problematic variable, acceptance, is plotted In Figure 3.8. For the acceptance of the blended RBL, the values for skewness= -0.420 and kurtosis =-0.003 were low deviated from normal distribution. This can be recognized as few scores were at the lower end of the distribution. However, the main concentration of scores is at the center of the distribution. At the lower end of the distribution, two low punctuations could be the reason for the deviation. As previously explained, for the sample size, it is not intended to exclude cases, and the graphics not showing great deviations from normality, an approximately normal distribution can be assumed.

Figure 3. 8

Histogram and Q-Q Plot for Acceptance in Post-test



Note. Accept= acceptance in post-test.

The next step for the factor analysis is the correlation matrix inspection. If the matrix includes several sizable correlations, which exceed .3, then the matrix is factorable (Tabachnick & Fidell, 2014). In this case, we have several correlations which fulfill this condition (see Table 4.7 and Appendix D) and consequently, we can consider the factor analysis.

3.5.3 Extraction and Rotation Methods Selection for EFA

Among the several factor extraction methods available in the statistical packages are principal components, principal factors, maximum likelihood factoring, and unweighted and weighted least squares factoring (Tabachnick & Fidell, 2014). The unweighted least squares factoring (ULS) was selected for this study because it minimizes square differences between the observed and the reproduced correlation matrices (Tabachnick & Fidell, 2014). Furthermore, unlike maximum likelihood, ULS does not assume unique variance normality (Howard, 2016).

The rotation methods are either orthogonal or oblique, and the decision as to which method is appropriate depends on the preference for resultant rotated factors to be correlated, the orthogonal rotations do not allow the resultant rotated factors to be correlated (Costello & Osborne, 2005; Howard, 2016), which is, in this study, not preferable. EFA results should be able to account for these interrelations when scales are multidimensional, and oblique rotations allow for the resultant factors to be correlated (Howard, 2016), consequently a Promax oblique rotation was used for the motivation scale (Tabachnick & Fidell, 2014).

3.5.4 Bidimensional Scale for Motivation and Unidimensional Scales for Knowledge and Skills and Acceptance

The EFA results for the motivation scale in pre-test and post-test produced two factors. As expected, the first factor accounts for intrinsic motivation, and the second factor for extrinsic motivation. Tabachnick and Fidell (2014) state that .32 is a good rule of thumb for the minimum loading of an item, in the social sciences are low to moderate commonalities of .40 to .70 common magnitudes (Costello & Osborne, 2005). Three items loaded up for each factor with values above .40 which suggests that no other factors should be explored (see Table 3.4). EFA explained 67% of total variance in pre-test, and 75% in post-test.

Table 3. 4

Results from Factor Analysis of the Motivation Scales in Pre-test and Post-test

Motivation item	Pre-test		Post-test	
	Factor loading		Factor loading	
	1	2	1	2
Factor 1: Intrinsic motivation				
1. I enjoy researching practical solutions.	.55	-.20	.82	
2. I'm looking forward to getting to know something new.	.86	.14	.83	
3. I find the tasks interesting.	.89		.68	-.11
Factor 2: Extrinsic motivation				
4. Without outside pressure, I wouldn't get involved.	-.12	.54	-.13	.71
5. I'm only doing what's asked of me.		.57		.86
6. I get involved so I don't get in trouble.		.71		.77

Note. n Pre-test = 86. n post-test= 69. Extraction Method: Unweighted Least Squares. Rotation Method: Promax with Kaiser Normalization. Rotation converged in 3 iterations.2 factors extracted. 4 iterations required.

Regarding knowledge and skills and acceptance scales, the EFA results show as expected unidimensional scales. The items were not designed to measure different types of knowledge or the two acceptance dimensions because they are interrelated (see Table 3.5 and Table3. 6). For knowledge and skills, EFA explained 71% of total variance in pre-test, and 79% in post-test. The five items loaded up above .4, this supports the validity of the scale (Costello & Osborne, 2005). Similarly, for the acceptance scale, all seven items loaded up. However, the best results accounted for 73% of total variance with only four items loading up above .4. Consequently, only these four items were used for further inferential analyses (Howard, 2016). Nonetheless, all seven items were important and considered for the descriptive analysis.

Table 3. 5

Results from Factor Analysis of the Knowledge and Skills Scale in Pre-test and Post-test

Knowledge and skills item	Pre-test	Post-test
	Factor loading	Factor loading
	1	1
Factor 1: Knowledge and skills		
7. My knowledge is so comprehensive that I am well prepared for professional practice.	.70	.70
8. I can apply the theory to professional practice.	.68	.75
9. I am able to complete most of the tasks of my studies effectively.	.40	.69
10. I know research methods and procedures.	.62	.70
11. I can design and implement research studies myself.	.69	.68

Note. n pre-test = 86. n post-test= 69. Extraction Method: Unweighted Least Squares. 1 factor extracted. 4 iterations required.

Table 3. 6

Results from Factor Analysis of the Acceptance Scale in Post-test

Acceptance item	Post-test
	Factor loading
	1
Factor 1: Acceptance	
12. The research problems presented are relevant for my personal development.	.50
13. I recognize a connection between the topics and further contents of my studies.	.48
17. I've learned something new.	.71
18. The didactic approach of "research-based learning" is useful.	.83

Note. n post-test= 69. Extraction Method: Unweighted Least Squares.

1 factor extracted. 5 iterations required.

3.5.5 Reliability Estimates for Motivation, Knowledge and Skills, and Acceptance

Reliability is the degree to which an instrument consistently measures whatever it is measuring (Cortina, 1993). There are various approaches to reliability estimation, including test-retest,

alternative-forms, and internal consistency. Within internal consistency estimates the most common are alpha, split-half, and interrater (Cortina, 1993; Field, 2009; Osburn, 2021). The selection of the appropriate approach deals with the external factors that could influence measures' consistent results, such as the passing of time or the use of different items (Cortina, 1993). In this study, internal consistency was estimated with Cronbach's alpha. Since this reliability is important to guarantee stable measurements, and if it is not achieved, the data should not be used for taking important decisions (Cortina, 1993). Spector (1992) identified four characteristics that make a scale a summated rating scale. First, a scale must contain multiple items. The use of the word 'summated' in the name implies that multiple items will be combined or summed. Second, each individual item must measure something that has an underlying, quantitative measurement continuum. Third, each item has no "right" answer, thus summated rating scales cannot be used to test actual knowledge or ability. Finally, each item in a scale is a statement, and respondents are asked to give a rating about each statement (Spector, 1992).

In this study, reliability is estimated with the Cronbach's alpha test, which is a reliability technique that requires only a single test administration to provide a unique estimate of the reliability of a given test. Cronbach's alpha is the average value of the reliability coefficients one would obtain for all possible combinations of items when split into two half-tests (Cortina, 1993). The reliability analyses for each scale, Group 1 and 2, Pre-test and post-test (in t1 and t2) were analyzed and the reliability of each scale was calculated using Cronbach's alpha. The results are summarized in Table 3.7. The instrument yielded good reliability values for all scales where Cronbach's are greater or equal to 0.70, only for extrinsic motivation in pre-test, it was slightly below from this mark[22]. The reliability for all the perceived motivation, knowledge and skills, and acceptance items was as well analyzed with the objective of confirming whether a different combination of items would yield higher reliability, or whether a specific item was compromising the reliability of the scale or subscale. The reliability for the four proposed scales did yield a higher reliability in the post-test, which is not surprising given that the students have a better understanding of the items at the end of the semester. The individual items were then analyzed to examine whether a specific item may have been lowering the reliability of the three-item scale, and it was determined that none was detrimental, so the increased reliability was a result of the increased understanding of the items and not the improvement of the eliminated items. Consequently, the items initially selected for EFA in all scales were retained.

[22] The reason for a lower value of Cronbrach's alpha for extrinsic motivation in pretest could be a lack of understanding of the items at the beginning of the semester. This does not represent a problem for the inferential analysis in this study because the variables in post-test were used to test the different models.

Table 3. 7

Psychometric Properties for Motivation, Knowledge and Skills, and Acceptance Scales in Pre-test and Post-test

Scale	Pre-test				Post-test			
	M	SD	Min - Max	Cronbach's α	M	SD	Min - Max	Cronbach's α
Intrinsic motivation	13.0	2.7	6-18	.81	12.8	2.8	6-18	.81
Extrinsic motivation	8.2	2.7	3-18	.64	8.7	3.3	3-18	.79
Knowledge and Skills	16.2	3.6	5-26	.76	18.6	4.0	7-27	.83
Acceptance					12.5	1.9	8-16	.72

Note. n Pre-test = 86. n post-test = 69.

3.6 Data Collection Procedures and Analysis

The present study is a longitudinal quasi-experimental study with two measurement points, fourteen weeks apart. At the first measurement point (t1), during the first seminar session of the semester, the pre-test questionnaire was presented to the students, after the general presentation of the blended RBL course. Fourteen weeks later (t2), and one week before the last face-to-face session and the final examination, the post-test questionnaire was presented to the students.

Data collection began in April of 2017, and was completed by July 2021. On April 4, 2017 (t1), the pre-test questionnaire was printed in German, including a cover letter describing the purpose of the research (see Appendix A). All questionnaires were administered to the students of the blended RBL course in research methods at the Leipzig University, at the campus, and during the first face-to-face session of the SS. Students were assured that neither their personal identity nor their individual responses would be disclosed or could be traced back to them. Anonymity was guaranteed by generating a unique code with personal information by each student, and no other data, such as student number, was required. Participation was voluntary, and the first 30 minutes of the session were given to the students to complete the questionnaire. Each student had to take the questionnaire lying upside down on a separate table. At the end of the session, questionnaires were collected by the research

team. Likewise, data collection for the post-test was conducted in the same manner on July 4, 2017 (t2), the last session before the final examination of the blended RBL course. The same procedure took place for the Pre-test on April 9, 2019 (t1) and for the post-test on July 9, 2019 (t2).

In 2021, the face-to-face sessions were held with hybrid approach, because of COVID-19 pandemic restrictions, as the situation did not allow for paper and pen surveys in the classroom. Therefore, the questionnaire was designed with the online survey tool LimeSurvey and distributed to the students trying to replicate the previous procedure. At the beginning of the first hybrid face-to-face session for the pre-test questionnaire on April 13, 2021, and at the end of the semester the post-test questionnaire during the session before the final examination on July 13, 2021, in both cases they had 30 minutes to respond both times. Afterwards, all questionnaires were entered either manually or automatically into SPSS for processing.

Response rates were good for this study in 2017, with 96.8% for the pre-test, and 43.7% for the post-test. In 2019, the response rate for the pre-test was 100% and 93% for the post-test. Finally, in 2021, response rate was 100% for the pre-test and 87.5% for the post-test.

Quantitative data analysis included numerical punctuations obtained from the self-perceived motivation, knowledge and skills acquisition, and acceptance items from the questionnaire, items 9-14, 18-22, and 38-44, respectively. Responses for each of the 92 students, along with their sociodemographic data, were input into IBM SPSS Statistics for Windows version 27 to run statistical tests.

Data were analyzed by using IBM SPSS Statistics for Windows version 27. Tests of statistical analyses were performed to determine theory validation. The frequency and percentage of responses to items of the questionnaire were displayed using descriptive statistics, tables, and graphs. Inferential statistics included bivariate correlation analyses, one-way analysis of variance (ANOVA), paired samples t test, multiple regressions, and mediation analysis with a simple mediation model. For testing mediating effects, regression analyses were carried out using the PROCESS macro for IBM SPSSS Statistics developed by Hayes (2013).

4 Significant Gains on the Learning Process and High Acceptance of the Blended RBL Course at Leipzig University

4.1 Overview of the Evaluation Analysis at Leipzig University

This study intends to investigate the effects of the blended RBL course in research methods on self-perceived student motivation and knowledge and skills or knowledge acquisition, and the acceptance of the learning environment among business education bachelor students at Leipzig University. It also intended to investigate the factors that moderated knowledge and skills acquisition. The purpose of this study was achieved by examining the explanatory power of combined models. This chapter presents the results of the data analysis for the stated research questions.

The descriptive statistics, including univariate and bivariate statistics, were first reported, followed by the results of inferential statistics including the mediation effect of intrinsic motivation between the acceptance of the blended RBL course and self-perceived knowledge and skills level at the end of the semester. The presentation of the findings is arranged by the research questions. Descriptive statistics were used to answer the first three research questions regarding the level of knowledge skills and motivation at the beginning and at the end of the semester, and the acceptance level at the end of the course. Inferential statistics were used to answer the last three research questions regarding the relationships among motivation, acceptance, and knowledge and skills.

4.2 Sample Descriptive Statistics

In total, the actual sample at the beginning of the semester comprised 89 students enrolled in the blended RBL course who participated voluntarily in this research. The sample includes 56 (62.9%) women and 33 (37.1%) men. Most students reported not having previous VET (56; 63.6%) and being business education bachelor students (84; 94.4%). The average semester was 2.5., 82.6% were in the second semester and only 7 (8.1%) students were above the sixth semester, the standard deviation for the semester was 1.35. Sample information is reported in Table 4.1.

Table 4. 1

Sociodemographic Characteristics of the Participants

Sample characteristic	*n*	%	*M*	*SD*
Gender				
Female	56	63.6		
Male	32	36.4		
Degree program				
Bachelor of Business Education	84	95.5		
Bachelor of Business Administration	4	4.5		
Previous vocational education				
No	55	63.2		
Yes	32	36.8		
Semester			2.55	1.35

Note. N = 93 (*n pre-test* = 89, *n post-test* = 69).

4.3 Knowledge and Skills on Research Methods Increased After Attending the Blended RBL Course

To answer the first research question, how was the self-perceived level of knowledge and skills at the beginning and at the end of the semester? A scale consisting of 5 items on a 6-point Likert scale ranging from 1 (*not at all applicable*) to 6 (*totally applicable*) was used. As expected, the level of knowledge and skills was higher at the end of the semester than at the beginning, especially for the items directly related to research methods knowledge and skills, as this increase was statistically significant (see Table 4.2).

The results for the pre-test show a moderate perception level of knowledge and skills at the beginning of the semester. Students perceived a medium level of knowledge with means around 3.0 for the items investigating their preparation for professional practice (M = 3.5, SD = 1.0), their capacity for applying the theory (M = 3.0, SD = 1.2), and their research methods knowledge (M = 3.0, SD = 1.0). Furthermore, students did not feel prepared for designing and implementing research

studies (M = 2.6, SD = 1.1). These results were expected for newcomers in the blended RBL course on research methods as most of them are at the beginning of their studies, and have not had the possibility to research with an academic approach.

In contrast, the results for the post-test showed improvement in the perceived level of knowledge and skills at the end of the semester. Especially, for the items "I know research methods and procedures" (M = 4.1, SD = .9) and ". I can design and implement research studies myself" (M = 3.7, SD = 1.0), the means increased, suggesting a cognitive learning effect of the blended RBL course, which was intended with the instructional design. The descriptive statistics are presented in Table 4.2.

Table 4. 2

Descriptive Statistics for Knowledge and Skills Items

Item	Pre-test				Post-test			
	M	SD	Min	Max	M	SD	Min	Max
7. My knowledge is so comprehensive that I am well prepared for professional practice.	3.05	1.01	1	5	3.07	1.19	1	6
8. I can apply the theory to professional practice.	3.30	1.02	1	5	3.54	1.13	1	6
9. I am able to complete most of the tasks of my studies effectively.	4.19	0.82	1	6	4.12	.95	1	6
10. I know research methods and procedures.	3.03	1.07	1	6	4.13	.90	2	6
11. I can design and implement research studies myself.	2.67	1.15	1	6	3.71	1.04	1	6

Note. *n pre-test* =89, *n post-test* =69. Likert scale response anchors 1 (*not at all applicable*), 2 (*not applicable for most of the part*), 3 (*rather not applicable*), 4 (*rather applicable*), 5 (*mostly applicable*), and 6 (*totally applicable*).

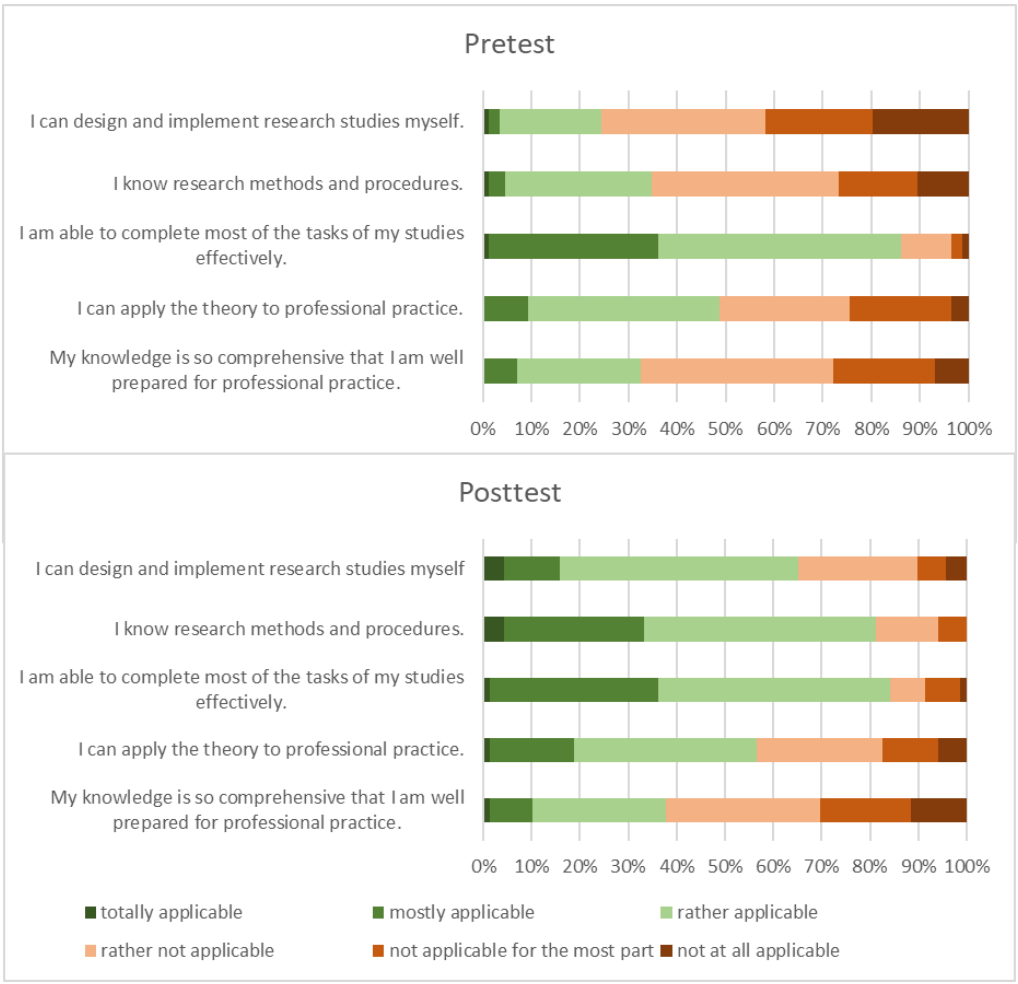
By taking a closer look into the responses, evidence of the increase in knowledge and skills in research methods was found. In the pre-test, only 30.2% of the students had positive responses (rather applicable to total applicable) to the question "I know research methods and procedures", after attending the course in the post-test, 48% of the students had positive responses. This also happened with the question "I can design and implement research studies myself" which accounted for only 21% positive responses in the pre-test and increased up to 50% positive responses in the post-test. In

the case of the item “My knowledge is so comprehensive that I am well prepared for professional practice”, a slight increase from 25% to 27% in positive answers can indicate that students perceived some benefit from attending the blended RBL course.

Unfortunately, for the item “I can apply the theory to professional practice”, a slight decrease from 39% to 37% positive responses can indicate that maybe the students did not understand how they can apply the theory learned during the blended RBL to practice. This also can be related to students pursuing careers in fields where they do not believe research methods or research competence will be part of their professional practice or useful for them (Reinmann, 2015). These results are shown in Figure 4.1.

Figure 4. 1

Knowledge and Skills Comparison with Pre-test and Post-test



4.4 Motivation Levels Remain Stable During the Blended RBL Course

Motivation analysis answers the second research question: How was the self-perceived level of motivation at the beginning and at the end of the semester? A scale consisting of 6 items (3 for intrinsic motivation and 3 for extrinsic motivation) on a 6-point Likert scale ranging from 1 (*not at all applicable*) to 6 (*totally applicable*) was used. According to the following results, the level of intrinsic motivation was slightly lower at the end of the semester than at the beginning, and the level of extrinsic motivation was slightly higher at the end of the semester than at the beginning. Even though the contrary was expected, these changes were not statistically significant (see Table 4.8), so the level can be considered stable during the semester for both types of motivation.

The analysis starts with the responses to the intrinsic motivation 6-point Likert scale. The level of intrinsic motivation at the beginning of the semester on average at M = 4.3, the item "I'm looking forward to getting to know something new" had the highest mean (M = 4.67, SD = .9), which shows superior interest for general learning. The motivation for researching practical solutions was also high with M =4.34 (SD=1.1). Students reported that they found the task interesting, with a good mean M = 4.0 (1.1). In general, students reported good levels of intrinsic motivation in t1.

In addition, the post-test reported slightly lower levels of intrinsic motivation. The mean for the item "I enjoy researching practical solutions" dropped down to M=4.1 (SD = 1.1). As for the item "I find the tasks interesting", the mean also dropped down to M = 3.9 (SD = .2). This slight decline suggests that students could be more concerned with extrinsic processes such as final examinations and achieving good grades at the end of the semester. Nonetheless, answers to the item "I'm looking forward to getting to know something new" improved slightly by achieving a mean of M = 4.7 (SD= .95). This outcome suggests a strong desire for learning among the students of the sample. These results are described in Table 4.3.

Table 4. 3

Descriptive Statistics for Intrinsic Motivation Items

Item	Pre-test				Post-test			
	M	SD	Min	Max	M	SD	Min	Max
1. I enjoy researching practical solutions.	4.34	1.15	1	6	4.17	1.11	2	6
2. I'm looking forward to getting to know something new.	4.67	.90	2	6	4.72	.95	2	6
3. I find the tasks interesting.	4.03	1.10	2	6	3.96	.21	1	6

Note. *n pre-test* =86, *n post-test* =69. Likert scale response anchors 1 (*not at all applicable*), 2 (*not applicable for most of the part*), 3 (*rather not applicable*), 4 (*rather applicable*), 5 (*mostly applicable*), and 6 (*totally applicable*).

Comparing responses from pre-test and post-test, the biggest change in positive responses can be seen in the item "I find the tasks interesting" from 69% to 62%. This indicates that despite the tasks being perceived as interesting, their perception declined at the end of the semester. For the item "I enjoy researching practical solutions", positive responses declined by 6%, from 80% to 74%, in the post-test, suggesting that students of the sample lost enjoyment of researching for practical purposes at the end of the semester. For the item "I'm looking forward to getting to know something new", a slight decrease from 93% to 91% positive responses can be seen (see Figure 4.2).

Although an increase in intrinsic motivation would be a desirable result, the lack of it can be related to the time of measure for this study, and the stress level experienced by students before final examinations. These results are in line with previous experimental studies with students in psychology, physical therapy, and other fields of study, which reported a general decrease in tendencies of motivational components during the study semester related to anxiety levels and evaluations (Bellhäuser et al., 2019; Bender, 2007; Koga, 2010; Nicholls et al., 2015). Another probable explanation was the psychological effects during the last year of the study (2021) due to the COVID-19 pandemic restrictions (European Commission. Directorate General for Education, Youth, Sport and Culture. & PPMI Group.; Organisation for Economic Co-operation and Development, 2021). By comparing the descriptive results of 2021 with 2019, the level of intrinsic motivation during the semester (positive responses) declined by around 5% in 2021, whereas in 2019, it increased almost by 5% (see Table 4.4). However, it is important to indicate that there was no significant effect of the year of study on intrinsic motivation. To test this relationship, Fischer's exact test was used because there were cells with expected frequencies lower than 5, which means the chi-square test was not appropriate (Field, 2009). Fischer's exact test values were not significant both for pre-test and post-test with $p>.05$.

The relationship between intrinsic motivation and the student's semester had no significant effect, this can be observed in Appendix C. Even though other studies report a quadratic distribution for the intrinsic motivation during the study program (Zlatkin-Troitschanskaia et al., 2013), in the present study this cannot be proved in the present study as the low variance in study semester of the sample was a limitation for the analysis. However, the declining trend in early semesters is consistent with previous results (Zlatkin-Troitschanskaia et al., 2013).

Figure 4. 2

Intrinsic Motivation Comparison with Pre-test and Post-test

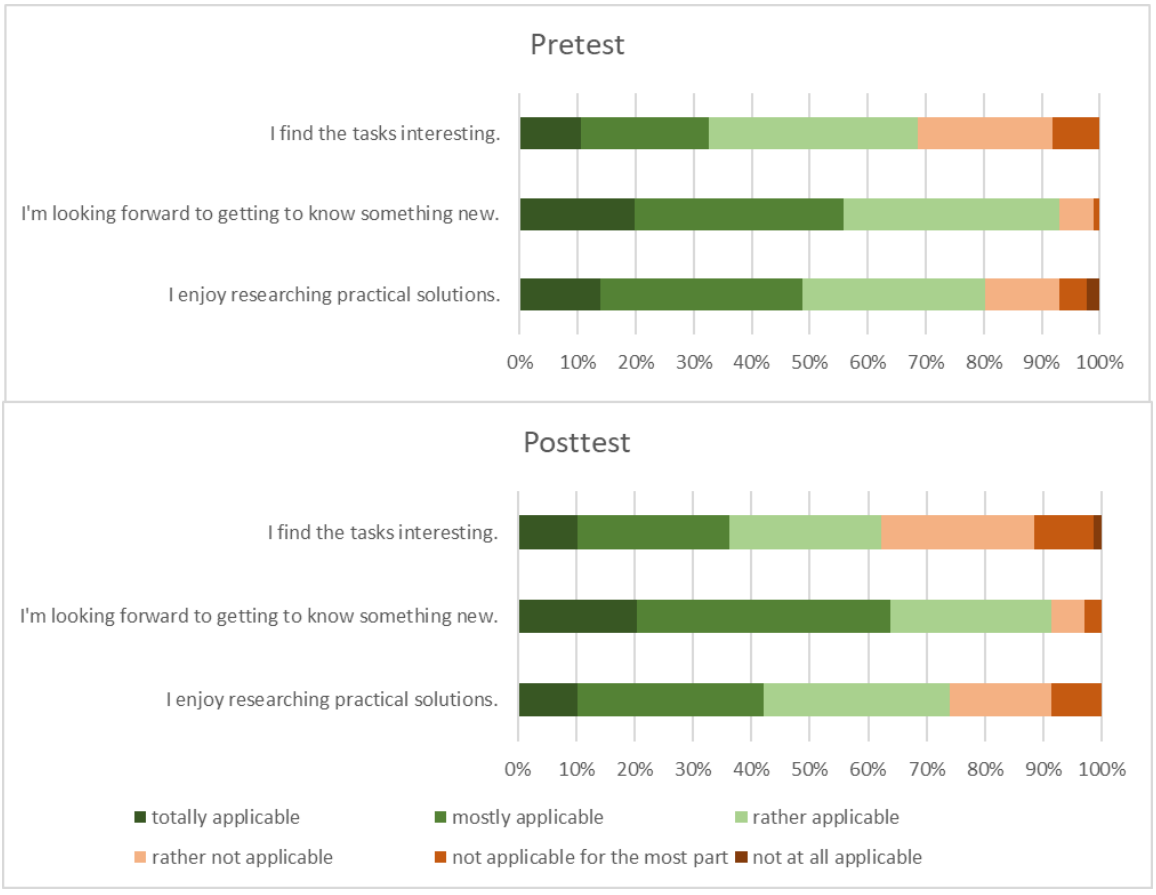


Table 4. 4

Year by Intrinsic Motivation Level (negative/positive) in Pre-test and Post-test

Year		Pre-test			Post-test		
		Negative	Positive	Total	Negative	Positive	Total
2017	Count	1	27	28	3	11	14
	%	3.6%	96.4%	100%	21.4%	78.6%	100%
2019	Count	5	21	26	4	23	27
	%	19.2%	80.8%	100%	14.8%	85.2%	100%
2021	Count	2	30	32	3	25	28
	%	6.25%	93.75%	100%	10.7%	89.3%	100%

Note. pre-test p = .921; post-test p =.776.

The average value of extrinsic motivation level at the beginning of the semester was M = 2.7, which is a moderate to low level of extrinsic motivation. The item “Without outside pressure, I wouldn't get involved”, had the highest mean (M = 3.2, SD = 1.2), which shows a moderated response to external pressure. The responses to the item “I'm only doing what's asked of me”, were also moderated with M = 2.9 (SD = 1.1). The extrinsic motivation that implies being afraid of external consequences showed the lowest level of positive responses for the item “I get involved so I don't get in trouble”, with M = 1.9 (SD =1.1). Students report low to moderate levels of extrinsic motivation, which can be interpreted as a sample more engaged with the learning process in t1.

At the end of the semester, some results are interesting for the items “Without outside pressure, I wouldn't get involved” and “I get involved so I don't get in trouble”. The mean for the first one slightly declined to M =3.1 (SD = 1.1), and for the second one increased to M = 2.55 (SD = 1.4). This shows an increase in concerns about dealing with unwanted consequences, however, they felt lower outside pressure. For the item “I'm only doing what's asked of me”, the mean slightly increases to M = 3.4 (SD =1.2). Students reported slightly higher levels of extrinsic motivation in two items. These results are presented in Table 4.5.

Table 4. 5

Descriptive Statistics for Extrinsic Motivation Items

Item	Pre-test				Post-test			
	M	SD	Min	Max	M	SD	Min	Max
4. Without outside pressure, I wouldn't get involved.	3.21	1.23	1	6	3.16	1.25	1	6
5. I'm only doing what's asked of me.	2.99	1.14	1	6	3.04	1.24	1	6
6. I get involved so I don't get in trouble.	1.99	1.14	1	6	2.55	1.49	1	6

Note. *n pre-test* =89, *n post-test* =69. Likert scale response anchors 1 (*not at all applicable*), 2 (*not applicable for most of the part*), 3 (*rather not applicable*), 4 (*rather applicable*), 5 (*mostly applicable*), and 6 (*totally applicable*).

A closer view to responses from pre-test and post-test shows that the biggest change in positive responses can be seen on the item “I get involved so I don't get in trouble”, from 11% to 27%. For the item “I'm only doing what's asked of me”, positive responses increased from 32% to 37%. The only item that showed a decline in positive responses was “Without outside pressure, I wouldn't get involved”, from 40% in pre-test to 31% in post-test, suggesting that students of the sample engaged with the blended RBL course, not because of outside pressure. Although an increase in extrinsic motivation was not expected, as previously stated for intrinsic motivation results, this also could be also related to the time of measure for this study and the level of stress experienced by students before the final examination. This is well consistent with previous findings (Bellhäuser et al., 2019; Koga, 2010; Nicholls et al., 2015). Results are presented in Figure 4.3.

Additionally, it was tested whether the pandemic restrictions of COVID-19 during the last year of the study (2021) could have psychological effects on extrinsic motivation levels. Descriptive results in 2021 were compared with 2019, during the semester the level of extrinsic motivation (positive responses) increased in 2019 from 30.8% to 44.5%, which is almost 14%. Furthermore, in 2021, this level also increased from 28.1% to 35.7%, by around 7.6% (see Table 4.6). Despite an increase in extrinsic motivation in both years, this suggests that in 2021, students were not as extrinsically motivated as in 2019 during the semester. The lower change in extrinsic motivation in 2021 between the start and the end of the semester may have been due to less personal contact with fellow students and instructors during the COVID-19 pandemic restrictions (European Commission. Directorate General for Education, Youth, Sport and Culture. & PPMI Group.; Organisation for Economic Co-operation and Development, 2021). However, as for intrinsic motivation, it is important to mention that there was no significant effect of the year of study on extrinsic motivation, Fischer’s exact test values were not significant in both cases, for pre- and post-test $p>.05$. The relationship

between extrinsic motivation and the student's semester had no significant effect, as observed in Appendix C.

Figure 4. 3

Extrinsic Motivation Comparison with Pre-test and Post-test

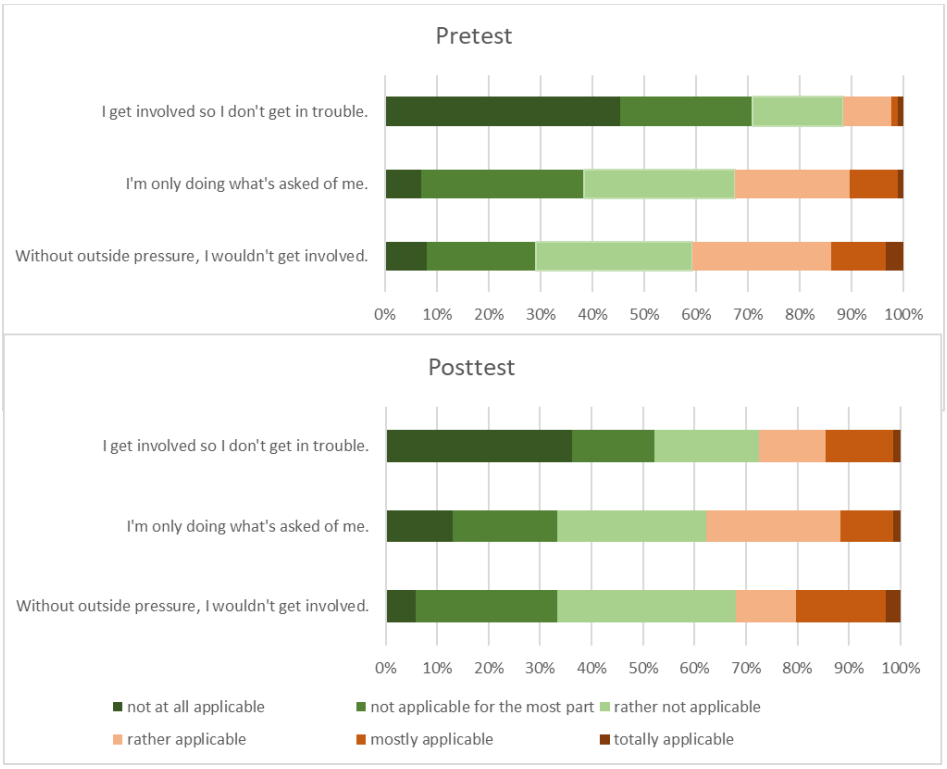


Table 4. 6

Year by Extrinsic Motivation Level (negative/positive) in Pre-test and Post-test

		Pre-test			Post-test		
Year		Negative	Positive	Total	Negative	Positive	Total
2017	Count	8	20	28	7	7	14
	%	28.6%	71.4%	100%	50%	50%	100%
2019	Count	18	8	26	15	12	27
	%	69.2%	30.8%	100%	55.5%	44.5%	100%
2021	Count	23	9	32	18	10	28
	%	71.9%%	28.1%	100%	64.3%	35.7%	100%

Note. Pre-test p = .499; post-test p =.384.

4.5 The Blended RBL Course on Research Methods Achieved High Acceptance Among Business Education Students

To answer the third research question: How was the acceptance level of the blended RBL course, a scale consisting of seven items on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*) was used for the descriptive analysis. The results for the post-test show a high acceptance level at the end of the semester. Students perceive a good level of acceptance with means around 3.0 for the items “The research problems presented are relevant for my personal development” (M = 2.7, SD = .6), “I am satisfied with the structure of the course” (M = 2.5, SD = .7), and “The instructor moderated well the discussion” (M = 2.9, SD = .6). For the items, “The learning environment in the group was good” (M = 3.2, SD = .7), “I've learned something new” (M = 3.4, SD = .5), and “The didactic approach of "research-based learning" is useful” (M = 3.2, SD = .7), the acceptance level was high, showing that students perceive they learned with the blended RBL course instructional design. They reported a good learning environment which was intended to foster learning on research methods. Results are presented in Table 4.7.

Table 4. 7

Descriptive Statistics for Acceptance Items

Item	Post-test			
	M	SD	Min	Max
12. The research problems presented are relevant for my personal development.	2.71	.60	2	4
13. I recognize a connection between the topics and further contents of my studies.	3.04	.68	1	4
14. I am satisfied with the structure of the course.	2.57	.76	1	4
15. The learning environment in the group was good.	3.24	.77	1	4
16. The instructor moderated well the discussion.	2.99	.64	2	4
17. I've learned something new.	3.45	.58	2	4
18. The didactic approach of "research-based learning" is useful.	3.24	.71	1	4

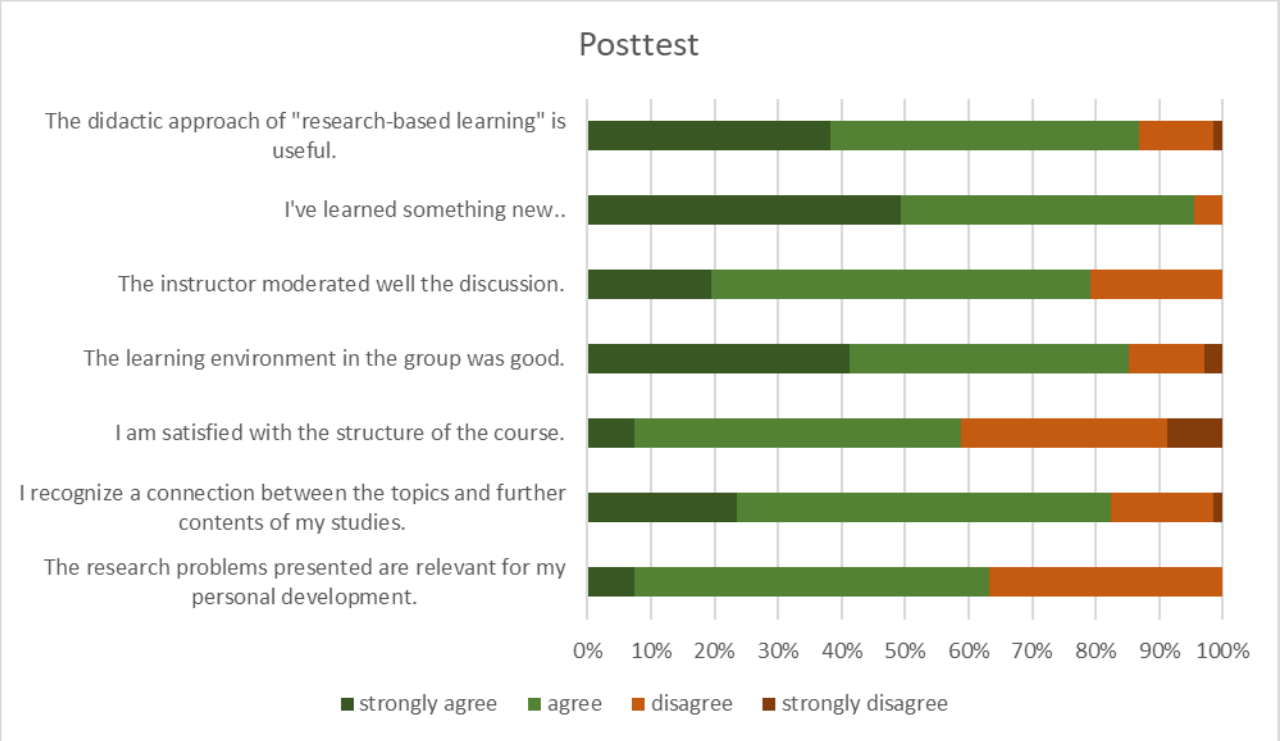
Note. *n post-test* =68. Likert scale response anchors 1 (*strongly disagree*), 2 (*disagree*), 3 (*agree*), and 4 (*strongly agree*).

As reported in Figure 4.4, positive responses were high for the seven acceptance items. 95% of students in the sample agree with learning something new during the blended RBL course. The didactic approach of the course was perceived as useful for 87% of the students. The learning environment was good for 85% of the students, which means face-to-face sessions and online learning made a good combination for them. 82% of the students acknowledged the connection between the topics learned during the course and their future studies. 79% of the students reported the instructor moderated the discussion well, this is a good result that can be improved in the future. 63% of the students perceived the research problems presented as relevant to their personal development, suggesting that a strong connection can be achieved by making this relevance more explicit during the course. Around 59% of students were satisfied with the structure of the course. This result gives room for improvement and further questions, which can help students to recognize a structured course.

Acceptance's good results confirm the assumption in the third hypothesis (H3) in this study for most of the aspects. However, for the performance expectancy dimension, the relevance of the content for their personal and career development was below the target of 85%. In general terms, these results are consistent with previous findings (Schlicht, 2021). Student perceptions of usefulness was a significant predictor and a central factor in explaining the acceptance and use of new technologies and e-learning offers (Nistor et al., 2005; Pedrotti & Nistor, 2016; van Raaij & Schepers, 2008). Prior research into blended learning effectiveness has confirmed that the learning environment, course structure, and instructor's suggestions and input were important factors for the learning process (Kintu et al., 2017).

Figure 4. 4

Acceptance Post-test



4.6 Evidence of Associations Between Motivation, Knowledge and Skills, and Acceptance

Initially, possible associations were examined, finding their directions and strength between the different variables of the study in pre-test and post-test. For this purpose, Pearson's correlations[23] were tested and analyzed, with results shown in Table 4.8. Because the data does not show substantial correlations (r >.9) between predictors, it is assumed the absence of multicollinearity (Field, 2009; Tabachnick & Fidell, 2014). The significant correlations for each variable in pre-test and post-test are presented below.

Intrinsic motivation in pre-test was significantly correlated with all variables in this study. There was a significant negative correlation between intrinsic motivation in pre-test and extrinsic motivation in pre-test, $r = -.42$, $p < .001$ and in post-test, $r = -.30$, $p < .005$. This direction was expected and is consistent with previous results, which shows the more individuals are intrinsically motivated,

[23] For confirmatory purposes nonparametric correlations Spearman's rho were also calculated with similar results, see Appendix D.

the less they perceive external locus of causality (Ryan & Deci, 2000). Intrinsic motivation in pre-test was significantly correlated with knowledge and skills in pre-test, $r = .24$, $p < .005$, and in post-test, $r = .39$, $p < .001$. Suggesting that highly intrinsically motivated students had a higher perception of their knowledge and skills levels than their lower intrinsically motivated peers. This motivation factor could lead to higher effectiveness of blended learning (Kintu et al., 2017). There was also a significant relationship between the acceptance of the blended RBL course and the intrinsic motivation in pre-test, $r = .41$, $p < .001$. This could indicate that intrinsically motivated students found the RBL course more useful and well-structured than students with lower intrinsic motivation level. This seems to be a consequence of more learners' involvement in the learning process by motivated students, who probably enjoyed the combination of the digital CLE in ILIAS with the face-to-face sessions.

Extrinsic motivation in pre-test was significantly correlated with extrinsic motivation in post-test, $r = .59$, $p < .001$, with intrinsic motivation in pre-test, $r = -.42$, $p < .001$, intrinsic motivation in post-test, $r = -.41$, $p < .001$, and with knowledge and skills in post-test, $r = -.28$, $p < .005$. The more the students were extrinsically motivated at the end of the course, the less they perceived good acquisition of knowledge and skills. This is consistent with previous results by Koga (2010), whereas other studies report no significant relationship between extrinsic motivation and learning outcomes (Eom et al., 2006; Eom & Ashill, 2016).

Knowledge and skills in pre-test were significantly related to intrinsic motivation in pre-test, $r = .24$, $p < .005$, and to knowledge and skills in post-test, $r = .70$, $p < .001$. This indicates that students who perceived a higher level of intrinsic motivation and knowledge and skills at the beginning of the semester also perceived a higher level of knowledge and skills at the end of the semester.

In post-test, intrinsic motivation also showed significant relationships with extrinsic motivation in post-test, $r = -.35$, $p < .005$, with knowledge and skills in post-test, $r = .45$, $p < .001$, and with the acceptance of the blended RBL course, $r = .61$, $p < .001$. Furthermore, knowledge and skills in post-test was also significantly related to the acceptance of the blended RBL course, $r = .36$, $p < .005$. Previous research also found that the instructional design is a key factor and can significantly influence blended learning success (Zhang & Dang, 2020).

To sum up, the acceptance of the blended RBL course was significantly correlated with intrinsic motivation in pre and post-test and with knowledge and skills in post-test. These results suggest a special relationship among these variables which was further analyzed in the following sections.

Table 4. 8

Correlations (bivariate) Between the Study's Variables in Pre-test and Post-test

			1	2	3	4	5	6	7
1.	Intrinsic motivation Pre-test	Pearson Correlation	1	-.423**	.243*	.594**	-.300*	.389**	.419**
		Sig. (2-tailed)		.000	.024	.000	.015	.001	.001
		N	86	86	86	65	65	65	64
2.	Extrinsic motivation Pre-test	Pearson Correlation	-.423**	1	-.171	-.415**	.586**	-.284*	-.206
		Sig. (2-tailed)	.000		.115	.001	.000	.022	.102
		N	86	86	86	65	65	65	64
3.	K&S Pre-test	Pearson Correlation	.243*	-.171	1	.074	-.041	.702**	.069
		Sig. (2-tailed)	.024	.115		.560	.744	.000	.586
		N	86	86	86	65	65	65	64
4.	Intrinsic motivation post-test	Pearson Correlation	.594**	-.415**	.074	1	-.352**	.446**	.609**
		Sig. (2-tailed)	.000	.001	.560		.003	.000	.000
		N	65	65	65	69	69	69	67
5.	Extrinsic motivation post-test	Pearson Correlation	-.300*	.586**	-.041	-.352**	1	-.186	-.135
		Sig. (2-tailed)	.015	.000	.744	.003		.127	.275
		N	65	65	65	69	69	69	67
6.	K&S post-test	Pearson Correlation	.389**	-.284*	.702**	.446**	-.186	1	.364**
		Sig. (2-tailed)	.001	.022	.000	.000	.127		.002
		N	65	65	65	69	69	69	67
7.	Acceptance post-test	Pearson Correlation	.419**	-.206	.069	.609**	-.135	.364**	1
		Sig. (2-tailed)	.001	.102	.586	.000	.275	.002	
		N	64	64	64	67	67	67	67

Note. K&S= knowledge and skills. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). Significant correlations are highlighted.

In a second analysis, a paired-samples t test was conducted to compare self-perceived intrinsic motivation, extrinsic motivation, and knowledge and skills levels by students before(pre-test) and after(post-test) their participation in the blended RBL course. Despite a small decrease on the means

for intrinsic motivation (Pre-test (M= 13.17 , SD= 2.71) and post-test (M= 12.97, SD= 2.72)) and an slight increase on the means for extrinsic motivation (Pre-test (M= 8.17 , SD= 2.79) and post-test (M= 8.79, SD= 3.36)), there was no significant difference in intrinsic and extrinsic motivation levels, these results are contrary to the assumptions in the second hypothesis for this study (H2a and H2b). Nevertheless, this concurs well with previous results by Schlicht (2021) and Schlicht et al. (2017). Those studies also reported little change in intrinsic motivation at the end of the semester were reported. This could be affected because of a perceived overload by the students. However, as the differences were not significant, motivation levels can be stated as stable during the semester. Fortunately, there was a significant difference in self-perceived level of knowledge and skills before (M= 15.93, SD= 3.58) and after the participation in the blended RBL course (M= 18.72, SD= 3.58), $t(64)=-7.82$, $p < .001$. This result confirms the assumption made in the first hypothesis for this dissertation (H1), and it is also in good agreement with Schlicht (2021), as her study reported significant difference in knowledge and skills at $p < .005$. Remarkably, the effect with the last prototype used in this study was stronger and significant at $p < .001$. This evidence has further strengthened the conviction that the blended RBL course supports especially the cognitive aspects of the learning process on research methods among business education students. Table 4.9 shows t-test results.

Table 4. 9

T-Tests for Paired Samples

		Paired differences			95% Confidence Interval of the Difference		*t*	*df*	Significance	
		M	*SD*	*SEM*	lower	upper			One-Sided p	Two-Sided p
Pair 1	Int. Mot.	0.200	2.450	.303	-0.407	0.807	0.658	64	.256	.513
Pair 2	Ext. Mot.	-0.615	2.848	.353	-1.321	0.090	-1.742	64	.043	.086
Pair 3	K&S	-2.784	2.869	.355	-3.495	-2.073	-7.824	64	.000	.000

Note. Int. Mot. = intrinsic motivation; Ext. Mot. = extrinsic motivation; K&S = knowledge and skills.

4.7 Intrinsic Motivation and Acceptance as Good Predictors for Knowledge and Skills Acquisition

Several variables were assessed, addressing the fourth research question: which factors can predict the learning process? Self-perceived intrinsic and extrinsic motivation, knowledge and skills, and acceptance were analyzed individually with simple and multiple regressions by selecting the other variables as predictors. These, along with other control variables included previous VET, student's semester, and gender. This analysis was guided by the directional assumptions of the theory regarding cognitive and noncognitive aspects of the learning process (Klauser, 2006; Sembill, 1992), which were defined, in this study, as intrinsic and extrinsic motivation and knowledge and skills. The short answer to the fourth research question is intrinsic motivation and acceptance were the better predictors for knowledge and skills acquisition, whereas previous VET, students' semester and gender did not show any significant effect.

When we are interested in a complex model with different predictors and a sample, it is important to select the most appropriate regression method. There are several methods involved including hierarchical, forced entry, and stepwise methods, and the decision as to which is best among these methods depends on the research context (Field, 2009). In this study, we have some variables with more theoretical importance than others. Due to this reason, and because the stepwise techniques are influenced by random variation in the data (Field, 2009; Tabachnick & Fidell, 2014), the hierarchical method with forced entry was selected and used for all the analysis. For multiple regressions, the sample size is important to be considered regarding the number of predictors and the size of the effect that is expected. In this study, a large effect is expected with around five or six predictors (including gender, previous VET, and student's semester). For this condition to be fulfilled, a sample size of 60 is required (Field, 2009), with valid cases above 62 for all the variables in the post-test, this condition is fulfilled.

Simple and multiple regressions to predict intrinsic motivation were performed. In the first simple regression, extrinsic motivation as predictor was found to be significant (B = -.30, SE = -.35, p =.003), an accounted for 12.4% of the variation in intrinsic motivation, allowing 87.6% of the variance to be explained by other variables. However, this model predicts intrinsic motivation significantly well (F = 9.55, p = .003). If intrinsic motivation increases by one unit, then extrinsic motivation will decrease by 0.3. This negative direction is in good agreement with previous research (Ryan & Deci, 2000). For the second simple regression, the acceptance was found to be significant (B = .90, SE = .61, p < .001). If acceptance increases by one unit, then intrinsic motivation will

increase by 0.9. Acceptance accounted for 37% of the variation in intrinsic motivation and was a better prediction of it ($F = 38.22$, $p < .001$). Knowledge and skills were also a significant predictor of intrinsic motivation ($B = .31$, $SE = .08$, $p < .001$). This model was a good fit accounting for 19.9% of intrinsic motivation variability ($F = 16.61$, $p < .001$).

The hierarchical multiple regression for intrinsic motivation showed that control variables, previous VET, student's semester, and gender were not significant predictors. For the first model with only two predictors, extrinsic motivation, and acceptance, R^2 had a value of 0.48 ($F = 18.05$, $p < .001$), knowledge and skills were found to be not significant ($B = .096$, $SE = .071$, $p = .149$). When the other three predictors, previous VET, student's semester, and gender were included as well (model 2), the R^2 value increased only to 0.49 ($F = 8.79$, $p < .001$)., so, the inclusion of these three predictors explained only 1% of the variation in intrinsic motivation and they were found to be not significant, previous VET ($B = .066$, $SE = .566$, $p = .907$), student's semester ($B = .163$, $SE = .206$, $p = .432$), and gender ($B = -.081$, $SE = .633$, $p = .899$). The results for the multiple regression are shown in Table 4.10.

Only two cases were problematic with standard residuals slightly lower than -2.5, however, this represents less than 5% of the sample and is not a cause of concern (Field, 2009). The assumption of no collinearity was successfully assessed, the average VIF was very close to 1, and the tolerance was greater than 0.8 [24]. An important assumption by multiple regression is linearity and homoscedasticity. This can be tested by plotting the standardized residuals (*ZRESID) against the standardized predicted values (*ZPRED) in SPSS. In Figure 4.5, the graph shows points randomly dispersed throughout the plot. This confirms the assumption of linearity and homoscedasticity (Field, 2009; Tabachnick & Fidell, 2014). The last assumption to check is the normal distribution of residuals by looking at the histogram and normal probability plot of the data, this was confirmed with the bell-shaped curve on the histogram and the proximity of the points to the straight line, which represents a normal distribution in the P-P plot. There is not a perfectly normal distributed data set here, but it is fair to assume that the distribution of residuals is normal, see Figure 4.6. The model is accurate for the sample and could be generalizable for freshmen business education students.

[24] According to some authors there can be concerns if the largest VIF is greater than 10, if the average VIF is greater than 1, and if the tolerance is below 0.2 (Field, 2009, p. 242)

Table 4. 10

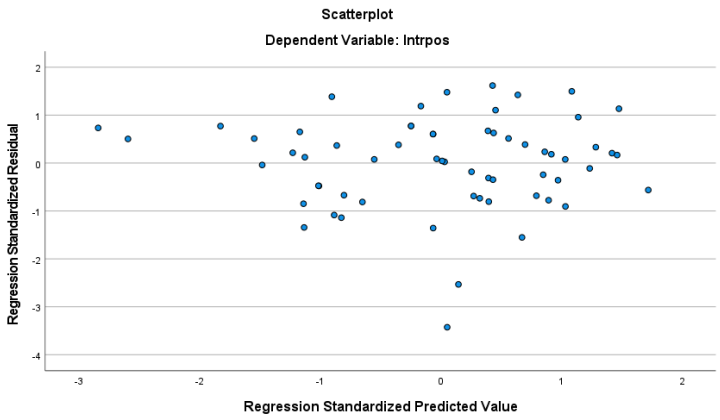
Hierarchical Regression Results for Intrinsic Motivation

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.48***	.48***
Constant	4.59	.23	8.96	2.18			
Extrinsic motivation post-test	-.26	-.42	-.11	.08	-.33**		
Acceptance post-test	.70	.41	.98	.14	.48***		
K&S post-test	.10	-.04	.24	.07	.15		
Step 2						.49	.01
Constant	4.23	-.43	8.89	2.32	-.33		
Extrinsic motivation post-test	-.26	-.42	-.10	.08	.49**		
Acceptance post-test	.71	.41	1.00	.15	.14***		
K&S post-test	.10	-.05	.24	.07	.01		
Previous vocational education	.07	-1.07	1.20	.57	.08		
Student's semester	.16	-.25	.58	.21	-.01		
Gender	-.08	-1.35	1.19	.63			

Note. K&S = knowledge and skills; CI=confidence interval; *LL*= lower limit; *UL* = upper limit. *p<.05. **p<.01. ***p<.001.

Figure 4. 5

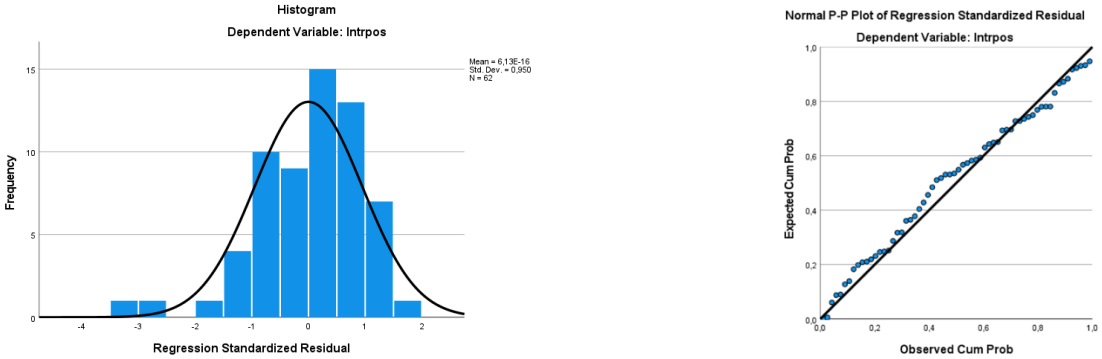
Plot of Standardized Residuals against Standardized Predicted Values



Note. Intrpos= intrinsic motivation post-test.

Figure 4. 6

Histogram and Normal P-P Plot of Residuals for Intrinsic Motivation Multiple Regression



Note. Intrpos= intrinsic motivation post-test.

After analyzing the self-perceived motivation, simple and multiple regressions were performed to predict self-perceived knowledge and skills. As expected from a simple regression on intrinsic motivation, intrinsic motivation was also a significant predictor of knowledge and skills (B = .31, SE = .08, p < .001), when the intrinsic motivation increases by one unit, then knowledge and skills will increase by 0.31. This model was a good fit accounting for 19.9% of intrinsic motivation variability (F = 16.61, p < .001). Furthermore, extrinsic motivation was not a significant predictor of knowledge and skills (B = -.225, SE = .145, p = .127) this model was not a good fit, accounting for only for 3.4% of knowledge and skills variability (F = 2.39, p = .127). According to this result, extrinsic motivation will not be further analyzed as a possible predictor of knowledge and skills. Acceptance was also a significant predictor of knowledge and skills (B = .765, SE = .242, p = .002). If the acceptance level is increased by one unit, knowledge and skills will also increase by 0.765. This model was a good fit accounting for 13.3% of knowledge and skills variability (F = 9.96, p=.002).

Controlling by the previous VET, student's semester, and gender was performed. These variables were found to be not significant predictors in the hierarchical multiple regression of knowledge and skills. For the first model with only two predictors intrinsic motivation and acceptance, R^2 had a value of 0.15 (F=5.20, p=.008). However, both predictors were found to be not significant, intrinsic motivation (B = .413, SE= .212, p=.056) and acceptance (B = .289, SE= 0.306, p=.349). When the other three predictors, previous vocational education, student's semester, and gender were included as well (model 2), the R^2 value increases only to 0.18 (F=2.558, p=.037). The inclusion of these three predictors explained only 3% more of the variation in knowledge and skills and they all were also found to not be significant, previous VET (B = .869, SE= 1.004, p=.391),

student's semester (*B* = .351, *SE*= .367, *p*=.344), and gender (*B* = 1.455, *SE*= 1.113, *p*=.196). The results for the hierarchical multiple regression are shown in Table 4.11.

In this regression, only some cases were problematic, with standard residual slightly lower than -2.5. However, this represents less than 5% of the sample and is not a cause of concern (Field, 2009). The assumption of no collinearity was also successfully assessed, the average VIF was very close to 1, and the tolerance was greater than 0.9 [25]. in Figure 4.7, the graph shows randomly dispersed points throughout the plot. This confirms the assumption of linearity and homoscedasticity (Field, 2009; Tabachnick & Fidell, 2014). Normal distribution of residuals was also confirmed by viewing the histogram and normal probability plot of the data. Normal distribution of residuals can be assumed by looking at the P-P plot, see Figure 4.8.

Table 4. 11

Hierarchical Regression Results for Knowledge and Skills

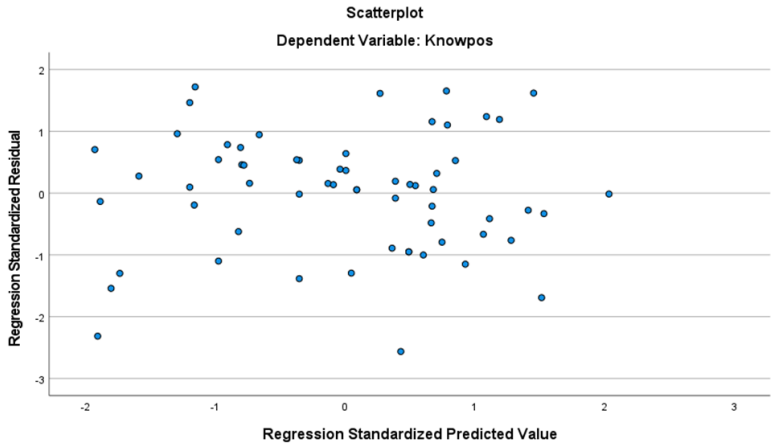
Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.15**	.15**
Constant	9.74	3.42	16.05	3.15			
Intrinsic motivation post-test	.41	-.01	.84	.21	.29		
Acceptance post-test	.29	-.32	.90	.31	.14		
Step 2						.18	.03
Constant	7.85	.97	14.73	3.44			
Intrinsic motivation post-test	.37	-.06	.80	.21	.26		
Acceptance post-test	.30	-.32	.92	.31	.14		
Previous voc. Edu.	.87	-1.14	2.88	1.00	.11		
Student's semester	.35	-.38	1.09	.37	.12		
Gender	1.45	-.77	3.68	1.11	.17		

Note. CI=confidence interval; *LL*= lower limit; *UL* = upper limit. *p<.05. **p<.01. ***p<.001.

[25] According to some authors there can be concerns if the largest VIF is greater than 10, if the average VIF is greater than 1, and if the tolerance is below 0.2 (Field, 2009, p. 242)

Figure 4. 7

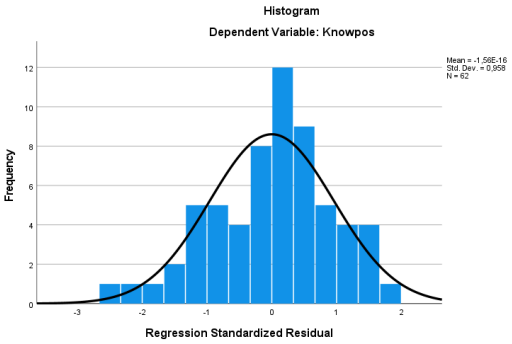
Plot of Standardized Residuals against Standardized Predicted Values

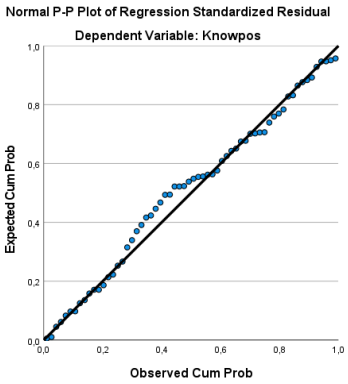


Note. Knowpos= knowledge and skills post-test.

Figure 4. 8

Histogram and Normal P-P Plot of Residuals for Intrinsic Motivation Multiple Regression





Note. Knowpos= knowledge and skills post-test.

Despite the assumptions being fairly met, the model[26] does not give further information regarding the relationship among acceptance, intrinsic motivation and knowledge and skills. These results show that control variables, previous VET, student's semester, and gender, are not significant predictors neither of intrinsic motivation nor of knowledge and skills. Notwithstanding the lack of agreement, these findings compare well with previous research (Eom & Ashill, 2016; Fleming et al., 2017; Zhang & Dang, 2020). From correlation and regressions results there is evidence of

[26] Another two cross-lagged panel models among intrinsic motivation, knowledge and skills, and acceptance were performed using SPSS Amos, unfortunately they had no significant results to report.

associations among acceptance, intrinsic motivation, and knowledge and skills. This was further analyzed and interpreted with a mediation model in the next section.

4.8 Total Mediation Effect of Intrinsic Motivation Between Acceptance and Knowledge and Skills

After finding evidence of associations among acceptance, intrinsic motivation, and knowledge and skills, here the path analysis of how the effect of acceptance on knowledge and skills can be partitioned into direct and indirect influences and is presented. The previous results of this study showed positive and significant regression coefficients between intrinsic motivation, knowledge and skills, and acceptance. This means, that the more students were intrinsically motivated, the more they improved their knowledge and skills, and the more students expressed acceptance of the blended RBL course, the more they were intrinsically motivated, and the more they improved in knowledge and skills. With the path analysis of how the effect of acceptance on knowledge and skills can be partitioned into direct and indirect influences, research questions five and six (RQ5 and RQ6) were addressed: which relationship exists between the acceptance of the blended RBL course and the changes in motivation, and which relationship exists between the acceptance of the blended RBL course and the changes in knowledge and skills? Summarizing, the aim was to understand how the relationship between motivation, acceptance, and knowledge and skills works (Pedrotti & Nistor, 2016). The answers to these research questions were significantly positive for the relationships between acceptance, intrinsic motivation, and knowledge and skills, as there was found that intrinsic motivation has a total mediation effect between acceptance and knowledge and skills.

To examine this mediating effect, a simple mediation model approach as described in section 2.11 was performed. The model followed the definitions and procedures by Hayes (2013) using simple mediation with only three variables. Two consequent variables, which are intrinsic motivation and knowledge and skills, and two antecedent variables, which are acceptance and intrinsic motivation, with acceptance causally influencing knowledge and skills and intrinsic motivation, while intrinsic motivation causally influencing knowledge and skills. There are two pathways by which acceptance is proposed as influencing knowledge and skills with intrinsic motivation in one pathway as the mediator variable. The conceptual model explanation was previously presented in section 2.11, and the conceptual diagram can be reviewed in Figure 2.2.

Although causality could be seen as a problem for mediation analysis, this study follows Hayes' (2013) argument: "one can conduct a mediation analysis even if one cannot unequivocally stablish causality given the limitations of one's data collection and research design" (p. 89). Sometimes research limitations such as data collection points or lack of random assignation do not lend to causal claims. However, one can cautiously apply the mathematical method to understand and model the relationships between variables.

The statistical diagram for the simple mediation model is presented in Figure 4.9. This statistical diagram represents two linear models with two equations:

Equation 2

Intrinsic Motivation Regression Equation

$$\text{Intrinsic motivation} = i_1 + a^*\text{acceptance} + e_M \quad (2)$$

Equation 3

Knowledge and Skills Regression Equation

$$\text{Knowledge and skills} = i_2 + c'^*\text{acceptance} + b^*\text{intrinsic motivation} + e_k \quad (3)$$

The regression intercepts are i_1 and i_2, e_M and e_k are errors in the estimation of intrinsic motivation and knowledge and skills, respectively, and *a*, *b*, and *c'* are the regression coefficients given to the antecedent variables in the model in the estimation of the consequences and the signs of these coefficients are important for the interpretation. The direct effect of the acceptance on knowledge and skills is c', the indirect effect of acceptance on knowledge and skills is the product of *a* and *b*, and the total effect of acceptance on knowledge and skills is equal to the sum of the direct and indirect effects of acceptance:

Equation 4

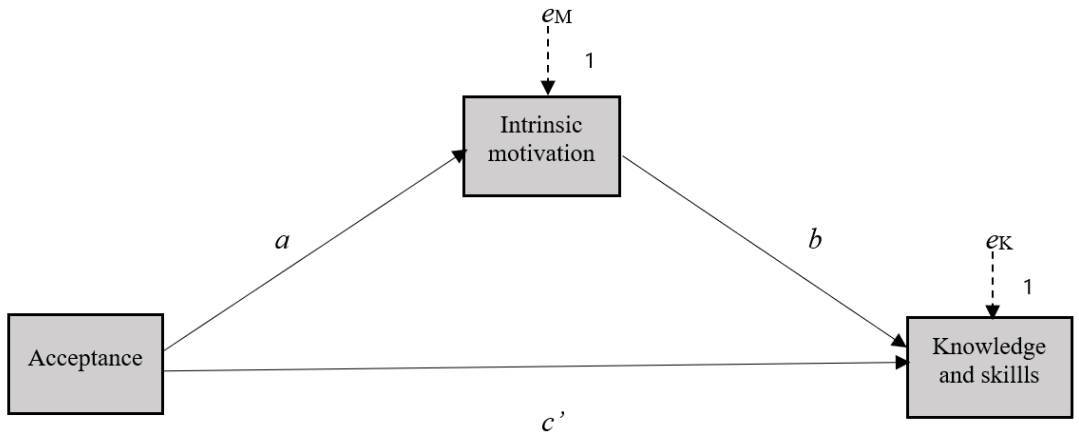
Total Effect Equation

$$c = c' + ab \quad (4)$$

For a detailed mathematical explanation behind these equations see Hayes (2013). For interpretation purposes a positive effect means that a case higher in acceptance is estimated to be higher in knowledge and skills, whereas a negative direct effect means that the case higher in acceptance is estimated to be lower in knowledge and skills.

Figure 4. 9

Statistical Diagram of Simple Mediation Model for Acceptance influencing Knowledge and Skills



Note. a, b, and *c'* = direct effect*;* e_M = error in intrinsic motivation estimation*;* e_K = error in knowledge and skills estimation.

These coefficients, the conditional process, and inference in the mediation analysis were estimated with PROCESS version 4.0[27] procedure for IBM SPSS Statistics for Windows version 27 developed by Hayes (2013), which combines ordinary least squares (OLS) regression, Johnson-Neyman technique for probing interactions, and the generation of bootstrap confidence intervals for products of parameters (Hayes, 2013)[28].The mediation analysis, here, was performed using the model 4 of PROCESS through the bias-corrected and accelerated bootstrapping method, with 5,000 bootstraps. For the mediation analysis, random bootstraps were performed on the main sample to estimate the direct effect (*c'*) and indirect effects (*a* and *b* and the total effect or *c*) of the acceptance, and the mediator variable (intrinsic motivation) on the dependent variable (knowledge and skills). This method was selected as the most adequate because it is used on small samples, such as the one used in this study, and does not require assumptions of normality and homoscedasticity (Hayes, 2013; Hayes & Rockwood, 2017). When the effect is significant, the model calculates the bootstrap's confidence intervals (LLCI and ULCI). A rejection of the null hypothesis that the indirect effect is zero or an interval estimate that doesn't include zero is sufficient to support a claim of mediation of the effect of acceptance on knowledge and skills through intrinsic motivation (Hayes, 2013; Hayes & Rockwood, 2017).

Interestingly, the results presented in Table 4.11 and Table 4.12 show a total mediation effect of intrinsic motivation between the acceptance and knowledge and skills. Acceptance is significantly

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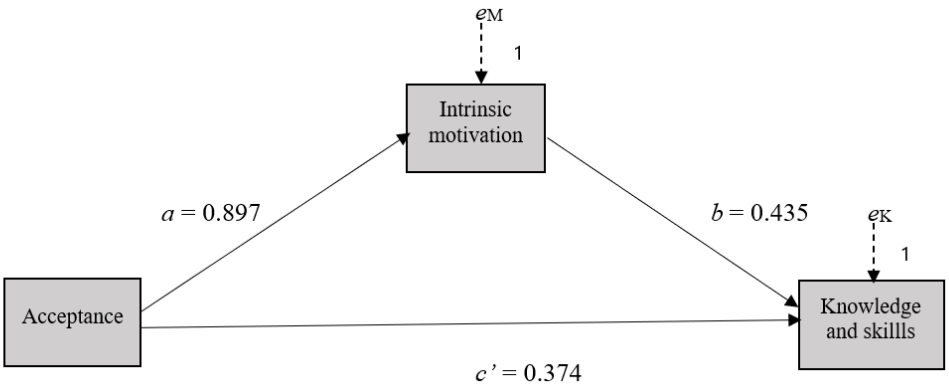
[28] The PROCESS procedure or "macro" is freely available for download at www.afhayes.com. The detailed documentation describing its use is also available (Hayes, 2013).

and positively related to intrinsic motivation, and the indirect effect *a* is high by 0.89, according to Hattie (2015, 2011), this represents a large effect in higher education teaching, and mediators and moderators should be considered. The indirect effect of intrinsic motivation on knowledge and skills is positively significant with its *b* value of 0.43 (see Table 4.10), and the direct effect of acceptance on knowledge and skills c' is 0.374. These results agree with the assumption in the fourth hypothesis (H4) of this study, a total mediation by intrinsic motivation on the effect of acceptance on knowledge and skills was confirmed. The statistical diagram for this model is presented in Figure 4.10.

Figure 4. 10

Statistical Diagram of Simple Mediation Model for Acceptance influencing Knowledge and Skills



Note. a, b, and c' = direct effect; eM = error in intrinsic motivation estimation; eK = error in knowledge and skills estimation.

The total effect of acceptance on knowledge and skills is the sum of the direct and the indirect effects, which is significant for this model (c = 0.764, 95% C.I. [0.28, 1.24], p = .0024). However, the positive influence of the acceptance on knowledge and skills turns to be not significant when the influence of intrinsic motivation is considered (c' = 0.374, 95% C.I. [-0.219, 0.986], p=.2124), thus indicating a total mediation of intrinsic motivation. This means that the relationship between acceptance and knowledge and skills is not a direct one. There is a mechanism, namely, the intrinsic motivation that accounts for that relationship, and without this mediator in the model, it could be wrongly inferred that the relationship between the acceptance and knowledge and skills is direct.

Finally, for inferential purposes, standardized coefficients are interpreted. The total effect of acceptance on knowledge and skills has a standardized coefficient of 0.3744. This implies that for each unit that we can improve the punctuation in the acceptance scale, an improvement by 0.3744 in the scale of knowledge of skills is expected through the indirect effect of intrinsic motivation, which

is 0.3904. This indirect effect is close to the benchmark of 0.4 defined by Hattie (2011, 2015) of what works best in higher education teaching, which confirms that the intervention with the blended RBL course could be classified as an effective good strategy. This indirect effect is also significant because zero is not included between the LLCI and ULCI (see Table 4.11).

Table 4. 12

Model Coefficients for the Intrinsic Motivation Study

		Consequent								
		Intrinsic Motivation					Knowledge and skills			
Antecedent		*Coeff.*	*SE*	*p*	Std. *B*		*B*	*SE*	*p*	Std. *Coeff.*
Acceptance	*a*	0.897	0.145	<.001	0.608	*c'*	0.374	0.297	.2124	0.178
Intrinsic motivation		----	----	----		*b*	0.435	0.201	.0346	0.305
Constant	i_1	1.730	1.831	.348		i_2	8.391	2.996	.0067	
		$R^2 = 0.370$					$R^2 = 0.191$			
		$F(1, 65) = 38.221$, $p < .001$					$F(2, 64) = 7.587$, $p = .0011$			

Note. n post-test = 67.

Table 4. 13

Total, Direct, and Indirect Effects of Acceptance on Knowledge and Skills through Intrinsic Motivation

			95% CI	
Effect	Estimate	*SE*	*LLCI*	*ULCI*
Indirect	0.3904	0.1721	0.0622	0.7477
Direct	0.3744	0.2972	-0.2194	0.9681
Total	0.7648	0.2424	0.2807	1.2488

Note. Effect is significant if the C.I. does not include zero.

The extrinsic motivation was also tested for confirmatory purposes. Results in Table 4.13 show that there is no mediator effect through extrinsic motivation between the acceptance and

knowledge and skills. This confirms that the total mediation effect was only accounted for by intrinsic motivation[29].

Table 4. 14

Total, Direct, and Indirect Effects of Acceptance on Knowledge and Skills through Extrinsic Motivation

			95% CI	
Effect	Estimate	*SE*	*LLCI*	*ULCI*
Indirect	0.0466	0.0536	-0.0283	0.1795
Direct	0.7182	0.2428	0.2332	1.2031
Total	0.7648	0.2424	0.2807	1.2488

Note. Effect is significant if the C.I. does not include zero.

[29] These results were also revised within the framework of the Saxon Doctoral Program in Management Research during the workshop Behavioral Research with Experiments conducted by Prof. Dr. Fritze in 2022.

5 Discussion and Conclusion

5.1 Discussion of the Findings

This dissertation examined the self-perceived learning outcomes including the acceptance level among business education freshmen in a blended RBL course on research methods following the invitation by Redpath (2012) for advancing knowledge in online and blended business education. The research model was tested by using descriptive and inferential statistics and mediation path analysis. The hypotheses in this study received partial support. Most of the findings conform to the theoretical foundations, and only one of the four hypotheses was not supported by empirical finding. In general terms, it was found that the last prototype of the blended RBL course's design promoted self-perceived learning in its cognitive facet among students. Therefore, blended delivery and format design envisioned in this present study supported learning confirming the teaching-learning potential of digital media when used in a didactically carefully manner by determining teaching-learning objectives, selecting, and sequencing appropriate teaching-learning materials (Reinmann, 2011).

Regarding the didactic design of the blended RBL environment, the three dimensions of teaching defined by Reinmann (2016), procurement, activation, and accompaniment supported learning. The interactions among these dimensions enhanced the procurement or facilitation of knowledge by showing students the relevant existing scientific knowledge in research methods in a situated way. The format design envisioned in this present study was characterized by learners (co-)design, experience, and reflection on the process of a research project. Thus, they gained knowledge and skills from the development of questions and hypotheses, the choice and execution of methods, and the examination and presentation of results in learning groups for active collaboration in the context of a situated managerial problem (Huber, 2009, p. 11; Klauser, 1998; Sembill, 1992). Students were able to structure management practice problems, think as a scholar, and propose research designs for insights generation for management decision, and in doing so, advancing their research competence in the cognitive dimension (Klauser, 1999; Schlicht, 2012, 2021).

Whitin the present study it was also possible to find the role of intrinsic motivation as a mediator between the acceptance of the blended RBL environment and self-perceived knowledge and skills. In the following, the focus will be on each research question and their interpretation according to the respective expectations.

Improvement of self-perceived level of knowledge and skills

In developing self-perceived level of knowledge and skills on RBL, students reported a positive and significant improvement. Students perceived after attending the course improvements in their research methods knowledge and skills, and their capacity in designing and implementing research studies by themselves. All in all, the results show a significant effect with the last prototype used in this study at $p < .001$ for knowledge and skills. Nevertheless, there was a slightly not significant decline by around 2% in the perception of the usefulness of the course for their professional practice at the end of the semester.

The fact that the self-perceived level of knowledge and skills significantly improved with the last prototype of the blended RBL course is not surprising given the findings of other researchers who have discovered the cognitive gains with blended RBL environments. RBL fosters research skills, metacognitive competencies, and an academic mindset (Gess, C., Deicke, W., & Wessels, I., 2017; Huber, 2004). The study in blended RBL by Schirmer and Marín (2020) stated that the self-determination of RBL is made possible when students can co-determine the selection and use of digital tools according to their approach, and the constructivist aspects of learning, thus, as a result, they construct their own perspective and build new knowledge and skills according to their own approach to a topic. In addition, the controlled experiment by Wulf et al. (2020) showed that cognitive research competence improves significantly with traditional instruction, and with RBL with a medium effect size. Although the cognitive research competence in the RBL group was only slightly higher than in the control group, the difference was not significant by variance analysis. Furthermore, the study by Schlicht (2021) also compared face-to-face RBL instruction with the first prototypes for the blended RBL course on research methods evaluated in this dissertation. In the third cycle of her study, results were positive, achieving again significant effects in knowledge and skills acquisition with the blended RBL course. Even though previous studies confirm the relationship between RBL, blended RBL and cognitive gains in research competence, it lacks the analysis with the last prototype for the blended RBL course and the unique situational context of COVID-19, which revealed new experiences related to this construct, as their stability despite the related restrictions in 2021.

Additionally, other studies strongly support that through the concept of RBL, students are enabled to reflect on the theoretical and practical knowledge and how to make it feasible in their future professional field (Fiegert & Kunze, 2020, p. 215). However, the slight decline reported by students in the usefulness of the course is contrary to this expectation. One possible explanation is as stated by Reinmann (2015), that despite RBL offering many opportunities to promote academic

competence development, it also causes resistance. The concept of resistance is relevant here because, according to her, this resistance could be to academic goals and norms that are incompatible with a learning attitude that accepts study only as a transition to a profession (or as an opportunity for advancement in a profession), and resistance to scientific knowledge and skills whose value for a career outside of science or academia is not clear. This resistance could be also enhanced by the specific challenges for freshmen in their transition from school to university (Reinmann et al., 2019).

Stable results in self-perceived level of motivation

The self-perceived level of motivation was reported stable with no significant improvement at the end of the semester. Contrary to the expectations, intrinsic motivation declined, and extrinsic motivation increased, both in a marginal non-significant manner though. Overall, intrinsic motivation was reported to be at a good level, students reported interest in learning something new, and this improved at the end of the semester. However, their perceptions decreased somewhat regarding researching practical solutions and the interest on the tasks of the course. Regarding extrinsic motivation, their self-perceived level at the beginning of the semester was moderate to low. Their response to external pressure declined at the end of the semester whereas concerns about dealing with undesirable consequences increased.

Notwithstanding the results in motivation with the blended RBL course were contrary to the second hypothesis (H2a and H2b), they were not unexpected. The intention with the didactic design was stimulating intrinsic motivation while discouraging extrinsic motivation, but previous studies reported contradictory results showing that this could not be the case. Wulf et al. (2020) with their controlled experiment with bachelor students reported no significant changes in motivation at the end of the semester in either group (face-to-face or RBL). In their study, both groups presented a lower autonomous motivation at the end of the semester than at the beginning of the semester, but this was only significant for the control (face-to-face) group. In addition, on the descriptive level, a slight decrease in value-related interest in research was observed for the RBL group.

Likewise, in the study by Schlicht (2021), the blended RBL approach did not demonstrate a positive effect on intrinsic or extrinsic motivation during the semester with the previous prototype. One possible explanation is that the uncertainty and tentativeness inherent to academic work might cause feelings of frustration and worry when students try to find meaning and structure within the information available at the different phases of the research process (Wessels et al., 2018), thus, increasing extrinsic motivational factors. Another possible explanation is as previously discussed for the cognitive aspects, the resistance aspect described by Reinmann (2015). She suggested that RBL

can also generate resistance because research work differs from learning behavior from high school or defies considerations of usefulness, which can also affect motivational aspects in the learning process with RBL. Accordingly, as previous findings also suggest that interest in research increases when the participants consider the course to be useful for their later professional life (Wessels et al., 2018), as a result of a decrease in the perception of usefulness of research by students, combined with compulsory tasks that were contributory towards student's final grade (Bowyer & Chambers, 2017), could lead to a decline in interest and intrinsic motivation by offering higher extrinsic motivation.

Furthermore, Martens and Metzger (2017) stated that students' patterns of motivational regulation during the transition from school to university depend on situational characteristics, personal dispositions, and experiences. For some students, the response to this new situation could be that their feelings of insecurity and anxiety might increase. As a result, intrinsic motivation could decline while extrinsic motivation increases. Another study also indicated a decrease in intrinsic motivation at the end of the semester. In this study, it was examined whether the effect was internal or external. The authors suggested this effect was internal and supported that students who engage in research early in the semester have different personality and performance characteristics compared to those who engage late in the semester (Nicholls et al., 2015).

High level of acceptance

The acceptance level at the end of the semester was high confirming the expectations in the third hypothesis (H3). The results for the post-test showed that students perceived the research problems as relevant for their personal improvement and assessed positively other factors in the learning environment such as the structure of the course, the learning process within the group, and the moderation by the instructor. In summary, they found the didactic approach with the blended RBL course on research methods useful. They also recognized the connection between the topics learned during the course and their future studies. Only three aspects, despite having good values (between 59 and 82%), were below the acceptance target in this study (85%), the moderation by the instructor, the relevance of the research problems for their personal development and the structure of the blended RBL course.

These results are logical and consistent with previous findings in the literature regarding the acceptance of RBL in Germany. The study by Voeth et al. (2015) within the project "Humboldt Reloaded-Science Practice from the Beginning" (at the Faculty of Social and Economic Sciences, University of Hohenheim, Stuttgart), identified several acceptance dimensions for the target group of students. In deciding for or against participation in the project, the following factors were particularly

important in all faculties: the practical relevance, the individual interest in the project content, and the insights into research. They defined 18 dimensions for student's acceptance. The most important dimensions for students at the faculty were credits obtention for the participation in the project, supervision, project content corresponding to own interests, and practical relevance.

Moreover, the study by Pedrotti and Nistor (2016) explored the relationship between motivational and acceptance factors in different online learning contexts in Germany. They combined a data set containing items relating to user motivation (according to SDT) and technology acceptance (according to the UTAUT). Their results showed significant differences in acceptance and motivational levels between the different learning environments. They found six factors, among them, effort expectancy and performance expectancy with very high results for two environments and high results for the other two, thus confirming a high acceptance for online learning environments.

The previous study by Schlicht (2021) comparing face-to-face with the third cycle of the blended RBL environment at Leipzig University supported the results as well in this dissertation. Her study included interrelated aspects for the dimensions of performance expectancy and perceived usefulness. Comparing her results for the different aspects, students reported higher acceptance levels with the last prototype in some. For example, the didactic approach was useful for 87% of the students, compared to previously being perceived in that way for 85%. The perception of the learning environment in the group also improved from 77% to 85%. Their perceptions and assessment of instructor's moderation and supervision increased from around 65% to 79%. The connection between the topics covered in the course and their future studies also rose from 80% to 82%. The perception of the structure of the course increased from 52% to 59%. Finally. 63% of the students perceived the research problems presented as relevant for their personal development, only this result was below the previous result with the third cycle prototype (75%). Here is also plausible as a possible explanation, the previously discussed resistance to RBL didactic in the early stages of university studies due to differences between research work and previous learning experiences in high school, or because it challenges considerations of usefulness for students' later professional life (Reinmann, 2015; Reinmann et al., 2019; Wessels et al., 2018).

Factors influencing the learning process

Regarding the factors influencing the learning experience, intrinsic motivation and acceptance were the better predictors for knowledge and skills acquisition whereas previous VET, student's semester and gender did not show any significant effect. The acceptance of the blended RBL course was significantly correlated with intrinsic motivation in pre- and post-test and with knowledge and skills

in post-test. Simple and multiple regressions to predict intrinsic motivation were performed. In the first simple regression, predictor extrinsic motivation was found to be significant, and if intrinsic motivation increases by one unit, then extrinsic motivation will decrease by 0.3. This negative direction is in good agreement with previous research (Ryan & Deci, 2000). For the second simple regression, the acceptance was found to be significant, and if acceptance increases by one unit, then intrinsic motivation will increase by 0.9. Acceptance was found to be a significant predictor of intrinsic motivation. Knowledge and skills were also a significant predictor of intrinsic motivation. The hierarchical multiple regression for intrinsic motivation showed that control variables, previous VET, student's semester, and gender were not significant predictors.

These results, including the direction, were expected and are consistent with previous results, which show the more individuals are intrinsically motivated, the less they perceive external locus of causality (Ryan & Deci, 2000). A meta-analysis (Deci et al., 2001) confirmed that practically every sort of expected reward on task performance, threats, and deadlines threatens intrinsic motivation because people experience them as controllers of their behavior. Prior studies also suggested that highly intrinsically motivated students had a higher perception of their knowledge and skills levels than their lower intrinsically motivated peers (Deci et al., 1991). The key role of intrinsic motivation is attributed to meeting three basic psychological needs, which markedly impacts a students' level of self-fulfillment. One of them is the need for competence, which can be understood as confidence in own success in achieving a goal (Deci et al., 1981). This motivation factor could lead to higher effectiveness of blended learning (Kintu et al., 2017).

Accordingly, there was also a significant relationship between the acceptance of the blended RBL course and the intrinsic motivation in pre-test. This could indicate that intrinsically motivated students found the blended RBL course more useful and well-structured than students with lower intrinsic motivation level. This seems to be a consequence of more learner involvement in the learning process by motivated students, who probably enjoyed the combination of the digital CLE in ILIAS with the face-to-face sessions. This result is also in agreement with the findings by Nicholls et al. (2015), that students who engage in research early in the semester are more intrinsically motivated and have different personality and performance characteristics compared to those who engage late in the semester. Furthermore, the more the students were extrinsically motivated at the end of the course, the less they perceived good acquisition of knowledge and skills. This is consistent with previous results by Koga (2010), whereas other studies report no significant relationship between extrinsic motivation and learning outcomes (Eom et al., 2006; Eom & Ashill, 2016). This dissertation also found that students which perceived a higher level of intrinsic motivation and knowledge and skills

at the beginning of the semester also perceived a higher level of knowledge and skills at the end of the semester.

Furthermore, knowledge and skills in post-test was also significantly related to the acceptance of the blended RBL course. This finding, which was also expected as previous research, also find that the instructional design is a key factor and can significantly influence blended learning success (Zhang & Dang, 2020). Zhang and Dang (2020) found in their study with freshmen of computer information systems at a major public university in the United States that their own motivation to learn could significantly influence students' perceptions of learning climate, and blended learning flexibility, which are related to acceptance. They also found that the instructional design factor can significantly influence blended learning success demonstrating the importance of course design and specific instructional methods that can effectively support both the offline and online components of a blended course. For cognitive research skills with RBL, the study by Wulf et al. (2020) found significant improvements with a medium effect size. However, the effect in the RBL group was only slightly higher than in the control group, and the difference was not significant by variance analysis. In this dissertation, the effect was stronger and significant among business education students. These results agree with the study by Schlicht (2021), as she reported successful results regarding knowledge and skills acquisition and acceptance with the previous prototype for the blended RBL course for business education students.

Relationships between acceptance, motivation, and knowledge and skills

Concerning the relationships between the acceptance of the blended RBL course and the change in motivation and knowledge and skills, it was found that intrinsic motivation has a total mediation effect between acceptance and knowledge and skills. The simple mediation model proposed in this dissertation (H4) was supported by empirical findings with the blended RBL course and can be classified as an effective intervention in higher education (Hattie, 2015). Thus, it was supported a model containing two consequent variables; intrinsic motivation and knowledge and skills, and two antecedent variables; acceptance and intrinsic motivation, with acceptance causally influencing knowledge and skills as well as intrinsic motivation, and the latter causally influencing knowledge and skills. There are two pathways by which acceptance is influencing knowledge and skills. One pathway leads from acceptance to knowledge and skills without passing through intrinsic motivation. It is called the direct effect of acceptance on knowledge and skills. The second pathway from acceptance to knowledge and skills is the indirect effect of acceptance on knowledge and skills through intrinsic motivation. It was found that, for each unit that we can improve the punctuation in

the acceptance scale, an improvement of 0.3744 in the scale of knowledge of skills is expected through the indirect effect of intrinsic motivation which is 0.3904. Here, intrinsic motivation is the mediator variable. Extrinsic motivation was also tested with no effects from acceptance or on knowledge and skills.

These results were consistent with previous research studies, which were indicative of a possible link between intrinsic motivation and the acceptance of technological solutions assisting learning processes. Pedrotti and Nistor (2016) extended the UTAUT (Venkatesh et al., 2003) for higher education context by including intrinsic motivation aspects based on SDT (Deci & Ryan, 1985). Nonetheless, they excluded extrinsic motivational aspects. They analyzed the relationship between technology acceptance and motivation in general in different online learning environments at a German university. Their results suggested a possible relationship between autonomy-based constructs of motivation and the acceptance of technological solutions that assist learning processes, yet these results were not statistically conclusive. Therefore, they advocated for further research on the connections between student's motivation, and their acceptance of technology in educational contexts.

Moreover, Martens and Metzger (2016) found motivation significant for the implementation of self-regulated learning. Their study was based on the Integrated Model of Learning and Action which is a systematic framework to describe necessary regulation processes of motivation, cognition, and metacognition[30]. This research involved bachelor students of Business Economics and Educational Science at Hamburg University, and investigated the connections between students' motivation, and new learning situations especially in transition phases to higher education, where students are confronted with a new curriculum. They stated that, although motivational, intentional, and volitional processes, and strategies that must be fulfilled and implemented by the students themselves, the forming of a learning motivation, a learning intention, and the implementation of a learning action can be supported by the learning environment.

In this dissertation, the findings were conclusive showing how acceptance, intrinsic motivation, and knowledge and skills interact with each other. Empirical findings with business education students supported that a high acceptance level of the blended RBL environment has a positive effect on cognitive aspects on learning by a total mediation of intrinsic motivation. This research contributes to previous literature in some ways. Firstly, it fills the literature gap, and conceptualizes the simple mediation model to analyze the effect of acceptance of blended RBL in

[30] The Integrated Model of Learning and Action is a further development of the Rubicon model of action phases (Heckhausen & Leppmann, 2011)

cognitive and non-cognitive learning outcomes. The findings of this study strengthen previous studies and show that both acceptance of a blended RBL environment and intrinsic motivation are important for thriving self-perceived cognitive aspects. Moreover, it was investigated and supported the total moderation effect of intrinsic motivation on the relationship between acceptance and knowledge and skills on RBL while no effect by extrinsic motivation was established. Thus, addressing the inquiry regarding these aspects by Pedrotti and Nistor (2016), and advancing previous research in blended RBL by Schlicht (2021).

5.2 Limitations

There are some limitations in this dissertation that need to be addressed when interpreting the obtained findings. Firstly, the research design with a longitudinal quasi-experiment lacks the advantages that an experiment with a control group offers. Although this is desired and preferred, it is a challenge for higher education as different groups for a subject are not usually available, as in this case, only one course in SS was offered at Leipzig University for the blended RBL course to be implemented.

The sample used was composed mainly of freshmen in business education at Leipzig University. Although it was enough in size to comply with analyses' requirements, it could be improved by increasing number of participants ensuring, in that way, coverage for other factors in the model and improving conditions for using different statistical methods and analyses. The sample can be also improved including other universities and higher education institutions to achieve generalization to different higher education contexts and disciplines. As participation in this study was voluntary and no incentives were used, it was also possible a positive selection, highly intrinsic motivated and high-performing students could positively influence the results (Blömeke et al., 2008). Other researchers can address these issues by using incentives and measuring other student characteristics such as personality types and performance characteristics in the supported effects of acceptance, and intrinsic motivation in cognitive aspects of the learning process (Nicholls et al., 2015).

Another limitation is the measurement of cognitive and non-cognitive facets only two times during the semester. It was also based exclusively on the students' self-assessment. Although self-assessment is a proper measure for self-regulated learning processes such as RBL, it would be desirable to supplement the recording learning outcomes with final grade, GPA, or external assessments to increase the validity of the results. Future research should therefore pursue a

longitudinal experimental design that considers different time points during the semester to follow closely the development of the different variables and improve validity with other measures.

This study was additionally limited to the general perception of the whole blended RBL environment by students. This was a design decision to stimulate participation in the study without increasing complexity for the students. However, insights regarding perceptions from the different elements used in face-to-face sessions and within the digital CLE including videos, texts, graphics, tutorials, and tests would help to differentiate most effective aspects of the instructional design.

Finally, instructor's characteristics were not investigated in this study as the same educator was responsible of the blended RBL course during the study. However, future research with different educators can integrate an assessment of instructors' characteristics and their point of view of the learning process. As stated by Hattie (2015) teaching has an important effect in learning processes, though it is more critical how instructors think about their role and their ways of thinking about teaching and learning. This could also be an opportunity to investigate the double wheel model proposed for RBL, which places students at the center of one wheel, and teachers at the center of the second wheel (Lübcke et al., 2019). In general, educational-psychological research (Hattie 2015) can predict relatively well what share the individual aspects have in the successful learning outcome. An educator teacher can influence themself and the teaching itself, yet this explains about 30% of the variance differences of student learning outcomes. Students with their characteristics, and student processes clarify approx. 50% of the variance differences in student learning outcomes. One of the major factors is the student interest in the course topic, which educators can help influence.

5.3 Implications for Practice

Several implications for practice were derived from this dissertation. Regarding SoTL, the results, their interpretation and reflection are expected to enhance engagement in research in business education, exchange of experiences, discussion, and future teaching at Leipzig University. Following recommendations by Hattie (2015), "when educators focus on defining, evaluating, and understanding their impact this leads to maximizing student learning and achievement" (p. 90), the main implication is that by evaluating learning outcomes with the blended RBL course on research methods, it was possible to understand better the learning process. Moreover, finding evidence on how acceptance, intrinsic motivation, and knowledge and skills interacted in this learning environment to successfully promote learning on research methods with freshmen in business education. It is suggested to use this finding to improve learning environment design across faculty

improving teaching practices and learning achievement among students. On the other side, implementing this kind of studies in other courses is also suggested to understand learning processes in other subjects at Leipzig University, as well as other institutions.

Specifically, for educators in higher education, the instructional design within the last prototype of the blended RBL course showed that the combination of face-to-face sessions with a digital CLE promoted self-perceived learning outcomes. Thus, an RBL approach was effective in teaching research methods to freshmen in business education with the advantages of flexibility, and availability in accessing course resources through an LMS such as ILIAS. This was possible even under unexpected conditions as the restrictions imposed in 2021 during the COVID-19 pandemic. Hence, a blended RBL approach could also be applied teaching research methods in other undergraduate programs in other faculties in the field of social sciences, especially in early phases of studies. Likewise, for other subjects, a blended learning approach could be from advantage facing disruptive situations and their restrictions in the future.

As acceptance effect on knowledge and skills through intrinsic motivation is key for the learning process, implications should be derived. Whit this study, it was stated that for each unit that we can improve the punctuation in the acceptance scale, an improvement by 0.3744 in the scale of knowledge of skills is expected through the indirect effect of intrinsic motivation, which is 0.3904. Therefore, it is necessary to positively influence acceptance of the blended RBL course. This could be done in different manners, for example, by including new research complex problems in other relevant areas for students' future professional practice. In doing so, the perception involving the performance efficacy dimension of acceptance can increase, and the effect in intrinsic motivation and knowledge and skills as well. Nevertheless, this implies that the last prototype should be improved and extended.

In addition, increasing intrinsic motivation at the end of the semester would be beneficial for the learning process. Despite this study found a slight decrease in intrinsic motivation, it was not clear what the possible causes of this result were. Therefore, it is recommended to implement activities that could hinder this decline, and hopefully increase intrinsic motivation level among students. A feedback session with the instructor and peers on week twelve (one week before submission) for discussing their research project could help students with self-competence feelings and improve intrinsic motivation and the learning process. This feedback can also be carried out and stimulated by the instructor in the online discussion board of the LMS. Results from a prior study with business students showed that participation on electronic discussion boards has a significant influence on learning performance, even after considering age, gender, type of class, and previous grades of

students (Hwang & Arbaugh, 2006). Furthermore, when online feedback is implemented as an assisting technological feature, where the online activity is implemented next to face-to-face activities, as opposed to offering purely online instruction, students will most likely benefit from its advantages (Higgins et al., 2019) A recent meta-analysis (Jongsma et al., 2022) showed that online peer feedback is more effective than offline peer feedback, with an effect size of 0.33. They also stated that transparent communication about the relevance of peer feedback to students possibly will reduce negative perceptions about it and increase motivation (Keller, 2010).

5.4 Recommendations for Future Research

Although some recommendations were presented along with the limitations in this study, other recommendations are addressed here as well. In general, for educational administrators and faculty, it can also be suggested following the student's development on research competence throughout their studies. By integrating measures in longitudinal studies along the curriculum in other courses that involve the application of research knowledge and skills, and in the evaluation of their undergraduate thesis can be supported if the learning process regarding research methods is successful during and at the end of studies.

Regarding social science research knowledge and skills' assessment, it would be beneficial to include the tests results besides self-assessment of students. For this purpose, the competency test developed by Gess (2018) could be implemented. This test allows us to survey the development of research-related knowledge and skills during studies in social sciences. Authors suggest that it can be used in all teaching formats in social science courses and is based on a model of research competence. The model includes research process knowledge, research methods knowledge, and methodological knowledge. Likewise, the research steps finding and defining a research problem, planning a research project, and analyzing and interpreting data (Gess, 2018; Gess et al., 2019; Thiem & Gess, 2020). In this model, the cognitive facet of research competence in the social sciences was developed, and research competence is understood as a learnable, cognitive performance disposition that relates functionally to situations and demands of empirical social research, and thus is understood via the reception of research (Klieme & Leutner, 2006). Including this test results on objective research knowledge and skills would complement students' self-assessment.

Future studies should also continue to investigate the adaptation of the UTAUT to higher educational context by Pedrotti and Nistor (2016). Aspects regarding the combined influence of acceptance and motivation on their use intentions and their use behavior should be explored.

Establishing different user's profiles and personality types would be helpful explaining behavior and intentions. Hence, new groups could be detected and further analyzed to find significant differences between specific profiles, types, and/or considering age groups, and the impact of, for instance, new gender identity, which was not found in this study.

Including measures of the actual usage of the digital elements in the blended RBL environment is also recommended. This involves a more detailed evaluation of each kind of digital element and activities designed in the blended RBL course. As LMS offer the possibility to access usage information, then it is possible to collect it without great effort. However, anonymity is an issue that impeded their collection and allocation to students in this study. If anonymity is not an issue, this data could be related to the self-perceived aspects reported by students. By including this new information for each student, the results would be expanded, and insights derived from their analysis and interpretation could guide further specific implications for practice, the improvement of the digital CLE, and the learning achievement with the blended RBL course.

Furthermore, more research is needed to understand emotional and affective aspects of motivational processes over a long period of time in blended RBL. Emotions such as anxiety, self-esteem, and depression, as well as affective aspects, for instance, such as frustration and uncertainty tolerance and their effects on learning processes demand further study. The model of affective-motivational research dispositions in social sciences by Wessels et al. (2018) offers the opportunity for testing with students the range of affective and motivational dispositions mentioned in the interviews with educators. Moreover, testing these aspects for moderating interactions in longitudinal research designs could provide more insights on their relationships and effects on the learning process in blended RBL.

In summary, the results of this dissertation support further research on blended RBL in higher education. First, this research complies with the advancement of the SoTL, and by using longitudinal studies, a better understanding of teaching and learning process could be achieved. Moreover, a research design like the one used in this dissertation can be combined with instruments for research competence testing and, in doing so, more richness in the learning process data could be achieved. Also, it is expected that by analyzing more individual characteristics of students and instructor's new insights can be gained. Regarding the specific digital elements of the blended learning environment, they could be further investigated in depth by including usage data from the platform to complement students' self-reported data. Furthermore, several affective and motivational aspects can be included in future longitudinal research to test moderation and other relationships. Given the increasingly importance use of the Internet to deliver business higher education and education in general, because

of the COVID-19 pandemic, it is highly likely that research opportunities will increase in the future. Therefore, it is expected that this dissertation motivates more business education scholars to examine topics that interest them in the context of blended RBL environments.

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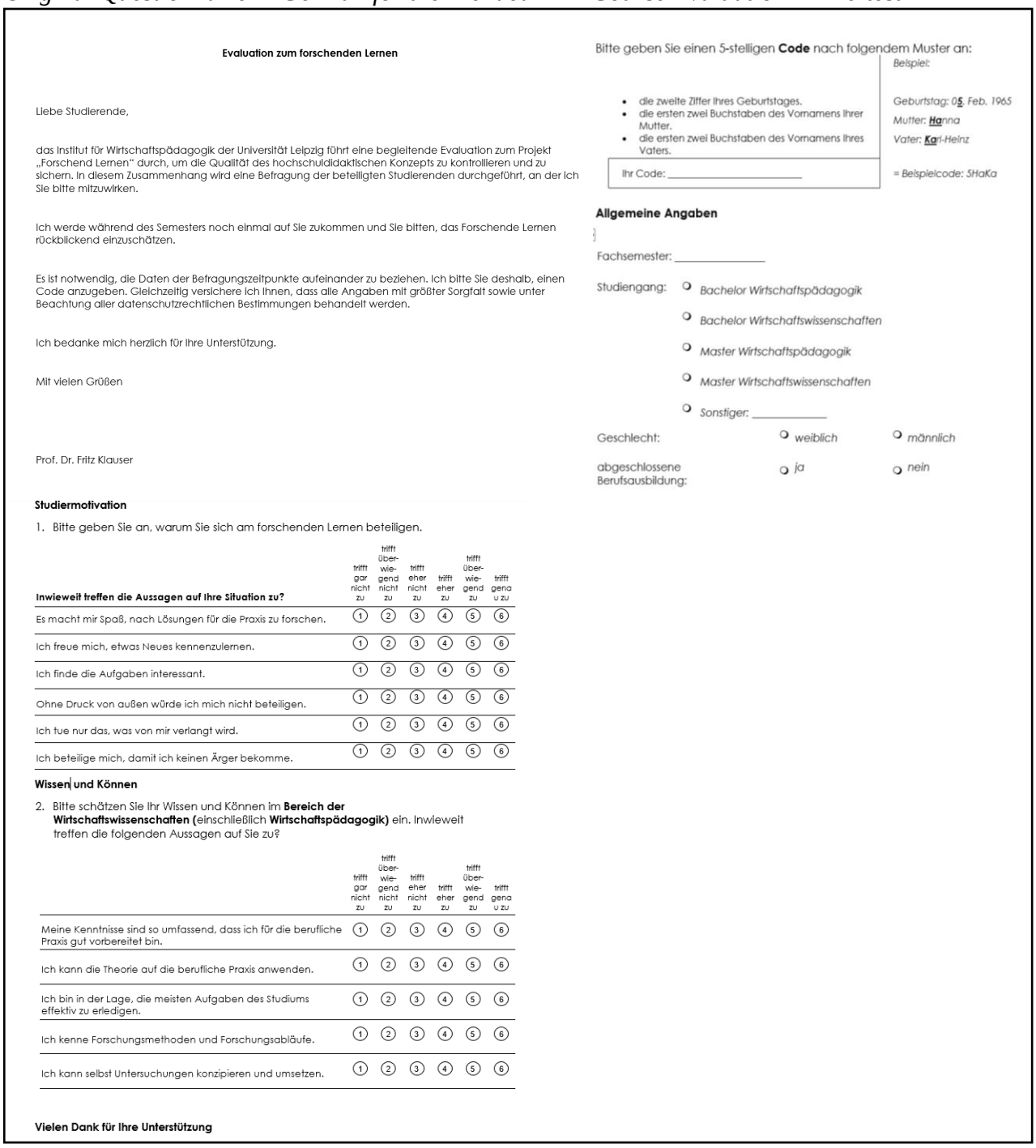
Zlatkin-Troitschanskaia, O., Beck, K., Sembill, D., Nickolaus, R., & Mulder, R. H. (2009). *Lehrprofessionalität: Bedingungen, Genese, Wirkungen und ihre Messung* [Teaching professionalism: conditions, genesis, effects and their measurement]. *Beltz-Bibliothek*. Beltz. http://deposit.d-nb.de/cgi-bin/dokserv?id=3299494&prov=M&dok_var=1&dok_ext=htm

Appendix A

Pre-test and Post-test Questionnaires in German and English

Figure A. 1

Original Questionnaire in German for the Blended RBL Course Evaluation in Pre-test



Evaluation zum forschenden Lernen

Liebe Studierende,

das Institut für Wirtschaftspädagogik der Universität Leipzig führt eine begleitende Evaluation zum Projekt „Forschend Lernen" durch, um die Qualität des hochschuldidaktischen Konzepts zu kontrollieren und zu sichern. In diesem Zusammenhang wird eine Befragung der beteiligten Studierenden durchgeführt, an der ich Sie bitte mitzuwirken.

Ich werde während des Semesters noch einmal auf Sie zukommen und Sie bitten, das Forschende Lernen rückblickend einzuschätzen.

Es ist notwendig, die Daten der Befragungszeitpunkte aufeinander zu beziehen. Ich bitte Sie deshalb, einen Code anzugeben. Gleichzeitig versichere ich Ihnen, dass alle Angaben mit größter Sorgfalt sowie unter Beachtung aller datenschutzrechtlichen Bestimmungen behandelt werden.

Ich bedanke mich herzlich für Ihre Unterstützung.

Mit vielen Grüßen

Prof. Dr. Fritz Klauser

Bitte geben Sie einen 5-stelligen **Code** nach folgendem Muster an:

Beispiel:

- die zweite Ziffer Ihres Geburtstages.
- die ersten zwei Buchstaben des Vornamens Ihrer Mutter.
- die ersten zwei Buchstaben des Vornamens Ihres Vaters.

*Geburtstag: 0**5**. Feb. 1965*
*Mutter: **Ha**nna*
*Vater: **Ka**rl-Heinz*

Ihr Code: _____ = *Beispielcode: 5HaKa*

Allgemeine Angaben

Fachsemester: _____

Studiengang:
- *Bachelor Wirtschaftspädagogik*
- *Bachelor Wirtschaftswissenschaften*
- *Master Wirtschaftspädagogik*
- *Master Wirtschaftswissenschaften*
- *Sonstiger:* _____

Geschlecht: *weiblich* *männlich*

abgeschlossene Berufsausbildung: *ja* *nein*

Studiermotivation

1. Bitte geben Sie an, warum Sie sich am forschenden Lernen beteiligen.

Inwieweit treffen die Aussagen auf Ihre Situation zu?	trifft gar nicht zu	trifft überwiegend nicht zu	trifft eher nicht zu	trifft eher zu	trifft überwiegend zu	trifft genau zu
Es macht mir Spaß, nach Lösungen für die Praxis zu forschen.	1	2	3	4	5	6
Ich freue mich, etwas Neues kennenzulernen.	1	2	3	4	5	6
Ich finde die Aufgaben interessant.	1	2	3	4	5	6
Ohne Druck von außen würde ich mich nicht beteiligen.	1	2	3	4	5	6
Ich tue nur das, was von mir verlangt wird.	1	2	3	4	5	6
Ich beteilige mich, damit ich keinen Ärger bekomme.	1	2	3	4	5	6

Wissen und Können

2. Bitte schätzen Sie Ihr Wissen und Können im **Bereich der Wirtschaftswissenschaften (**einschließlich **Wirtschaftspädagogik)** ein. Inwieweit treffen die folgenden Aussagen auf Sie zu?

	trifft gar nicht zu	trifft überwiegend nicht zu	trifft eher nicht zu	trifft eher zu	trifft überwiegend zu	trifft genau zu
Meine Kenntnisse sind so umfassend, dass ich für die berufliche Praxis gut vorbereitet bin.	1	2	3	4	5	6
Ich kann die Theorie auf die berufliche Praxis anwenden.	1	2	3	4	5	6
Ich bin in der Lage, die meisten Aufgaben des Studiums effektiv zu erledigen.	1	2	3	4	5	6
Ich kenne Forschungsmethoden und Forschungsabläufe.	1	2	3	4	5	6
Ich kann selbst Untersuchungen konzipieren und umsetzen.	1	2	3	4	5	6

Vielen Dank für Ihre Unterstützung

Note. Adapted from the research-based learning evaluation at Leipzig University (Juliana Schlicht et al., 2017; J. Schlicht, 2021).

Figure A. 2

Original Questionnaire in German for the Blended RBL Course Evaluation in Post-test

Bitte geben Sie einen 5-stelligen **Code** nach folgendem Muster an:

- die zweite Ziffer Ihres Geburtstages.
- die ersten zwei Buchstaben des Vornamens Ihrer Mutter.
- die ersten zwei Buchstaben des Vornamens Ihres Vaters.

Ihr Code: _____

Beispiel:

*Geburtstag: 0**5**. Feb. 1965*
*Mutter: **Ha**nna*
*Vater: **Ka**rl-Heinz*

= Beispielcode: 5HaKa

Studiermotivation

3. Bitte geben Sie an, warum Sie sich in diesem Semester am Forschenden Lernen beteiligen.

Inwieweit treffen die Aussagen auf Ihre Situation zu?	trifft gar nicht zu	trifft überwiegend nicht zu	trifft eher nicht zu	trifft eher zu	trifft überwiegend zu	trifft genau zu
Es macht mir Spaß, nach Lösungen für die Praxis zu forschen.	1	2	3	4	5	6
Ich freue mich, etwas Neues kennenzulernen.	1	2	3	4	5	6
Ich finde die Aufgaben interessant.	1	2	3	4	5	6
Ohne Druck von außen würde ich mich nicht beteiligen.	1	2	3	4	5	6
Ich tue nur das, was von mir verlangt wird.	1	2	3	4	5	6
Ich beteilige mich, damit ich keinen Ärger bekomme.	1	2	3	4	5	6

Wissen und Können

4. Bitte schätzen Sie Ihr Wissen und Können im **Bereich der Wirtschaftswissenschaften (**einschließlich **Wirtschaftspädagogik)** ein. Inwieweit treffen die folgenden Aussagen auf Sie zu?

	trifft gar nicht zu	trifft überwiegend nicht zu	trifft eher nicht zu	trifft eher zu	trifft überwiegend zu	trifft genau zu
Meine Kenntnisse sind so umfassend, dass ich für die berufliche Praxis gut vorbereitet bin.	1	2	3	4	5	6
Ich kann die Theorie auf die berufliche Praxis anwenden.	1	2	3	4	5	6
Ich bin in der Lage, die meisten Aufgaben des Studiums effektiv zu erledigen.	1	2	3	4	5	6
Ich kenne Forschungsmethoden und Forschungsabläufe.	1	2	3	4	5	6
Ich kann selbst Untersuchungen konzipieren und umsetzen.	1	2	3	4	5	6

Gestaltung des Forschenden Lernens

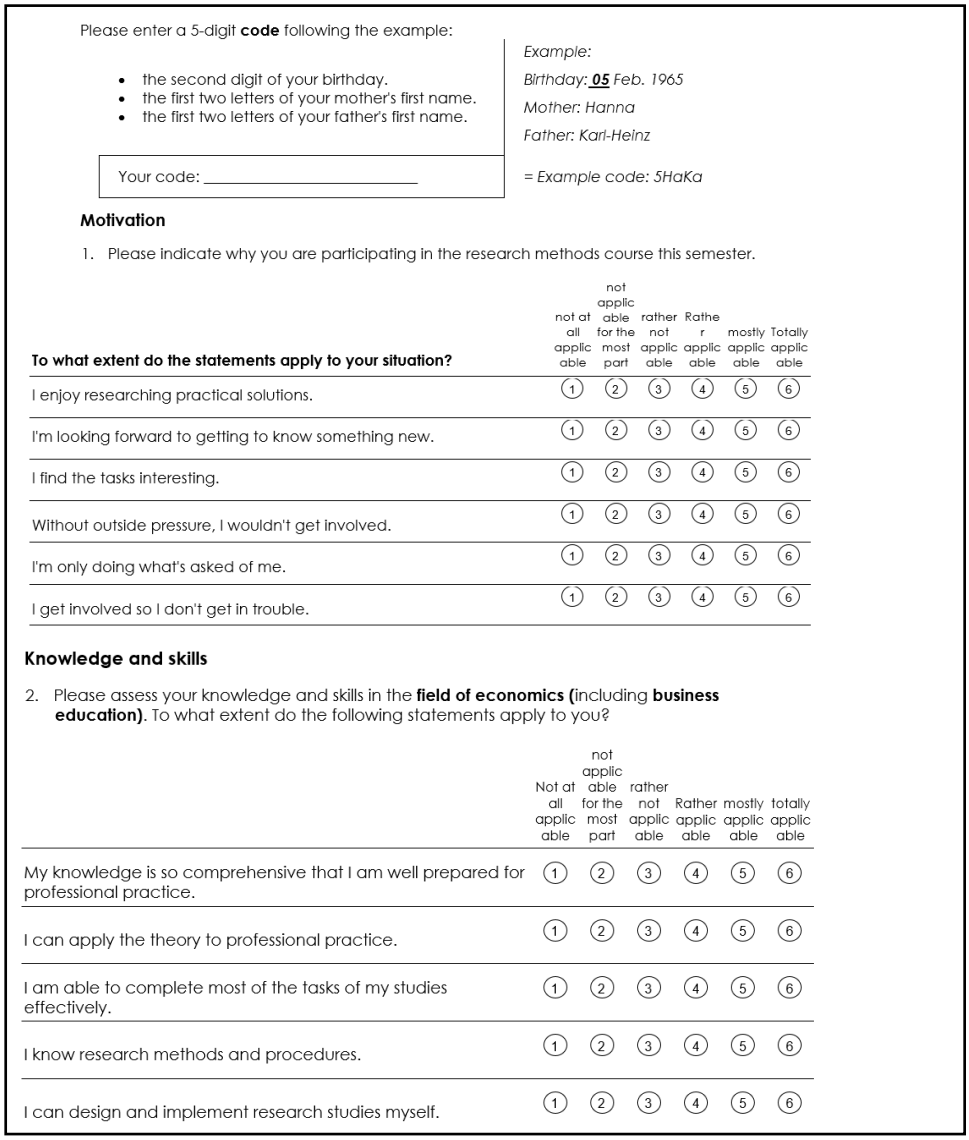
5. Wie bewerten Sie die Gestaltung des Seminars zur Bachelorarbeit?

	stimme gar nicht zu	stimme weniger zu	stimme zu	stimme sehr zu
Die dargestellten Forschungsprobleme sind für meine persönliche Entwicklung relevant.	1	2	3	4
Ich erkenne einen Zusammenhang zwischen den Themen und weiteren Inhalten meines Studiums.	1	2	3	4
Ich bin mit dem organisatorischen Ablauf des Seminars zufrieden.	1	2	3	4
Das Lernklima in der Teilnehmergruppe war gut.	1	2	3	4
Die Dozenten haben die Diskussion gut moderiert.	1	2	3	4
Ich habe etwas Neues gelernt.	1	2	3	4
Der hochschuldidaktische Ansatz des „Forschenden Lernens“ ist nützlich.	1	2	3	4

Note. Adapted from the research-based learning evaluation at Leipzig University (Juliana Schlicht et al., 2017; J. Schlicht, 2021).

Figure A. 3

English-translated Questionnaire for the Blended RBL Course Evaluation in Pre-test



Please enter a 5-digit **code** following the example:

- the second digit of your birthday.
- the first two letters of your mother's first name.
- the first two letters of your father's first name.

Example:
*Birthday: **05** Feb. 1965*
Mother: Hanna
Father: Karl-Heinz

Your code: _____ *= Example code: 5HaKa*

Motivation

1. Please indicate why you are participating in the research methods course this semester.

To what extent do the statements apply to your situation?	not at all applicable	not applicable for the most part	rather not applicable	Rather applicable	mostly applicable	Totally applicable
I enjoy researching practical solutions.	1	2	3	4	5	6
I'm looking forward to getting to know something new.	1	2	3	4	5	6
I find the tasks interesting.	1	2	3	4	5	6
Without outside pressure, I wouldn't get involved.	1	2	3	4	5	6
I'm only doing what's asked of me.	1	2	3	4	5	6
I get involved so I don't get in trouble.	1	2	3	4	5	6

Knowledge and skills

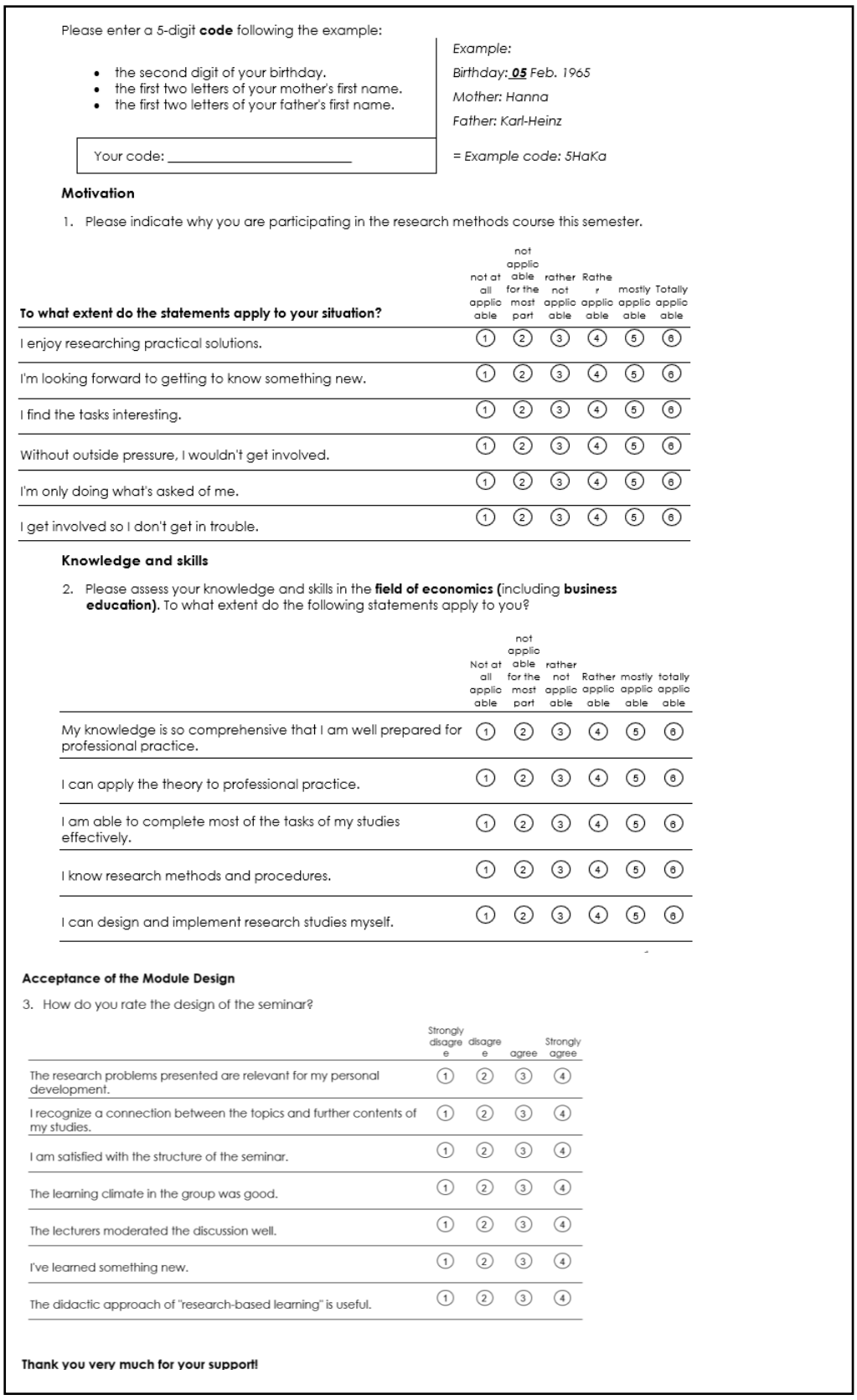
2. Please assess your knowledge and skills in the **field of economics (**including **business education)**. To what extent do the following statements apply to you?

	Not at all applicable	not applicable for the most part	rather not applicable	Rather applicable	mostly applicable	totally applicable
My knowledge is so comprehensive that I am well prepared for professional practice.	1	2	3	4	5	6
I can apply the theory to professional practice.	1	2	3	4	5	6
I am able to complete most of the tasks of my studies effectively.	1	2	3	4	5	6
I know research methods and procedures.	1	2	3	4	5	6
I can design and implement research studies myself.	1	2	3	4	5	6

Note. Adapted and translated from the research-based learning evaluation at Leipzig University (Juliana Schlicht et al., 2017; J. Schlicht, 2021).

Figure A. 4

English-translated Questionnaire for the Blended RBL Course Evaluation in Post-test



Please enter a 5-digit **code** following the example:

- the second digit of your birthday.
- the first two letters of your mother's first name.
- the first two letters of your father's first name.

Example:
*Birthday: **05** Feb. 1965*
Mother: Hanna
Father: Karl-Heinz

Your code: _____ *= Example code: 5HaKa*

Motivation

1. Please indicate why you are participating in the research methods course this semester.

To what extent do the statements apply to your situation?	not at all applicable	not applicable for the most part	rather not applicable	Rather applicable	mostly applicable	Totally applicable
I enjoy researching practical solutions.	1	2	3	4	5	6
I'm looking forward to getting to know something new.	1	2	3	4	5	6
I find the tasks interesting.	1	2	3	4	5	6
Without outside pressure, I wouldn't get involved.	1	2	3	4	5	6
I'm only doing what's asked of me.	1	2	3	4	5	6
I get involved so I don't get in trouble.	1	2	3	4	5	6

Knowledge and skills

2. Please assess your knowledge and skills in the **field of economics (**including **business education)**. To what extent do the following statements apply to you?

	Not at all applicable	not applicable for the most part	rather not applicable	Rather applicable	mostly applicable	totally applicable
My knowledge is so comprehensive that I am well prepared for professional practice.	1	2	3	4	5	6
I can apply the theory to professional practice.	1	2	3	4	5	6
I am able to complete most of the tasks of my studies effectively.	1	2	3	4	5	6
I know research methods and procedures.	1	2	3	4	5	6
I can design and implement research studies myself.	1	2	3	4	5	6

Acceptance of the Module Design

3. How do you rate the design of the seminar?

	Strongly disagree	disagree	agree	Strongly agree
The research problems presented are relevant for my personal development.	1	2	3	4
I recognize a connection between the topics and further contents of my studies.	1	2	3	4
I am satisfied with the structure of the seminar.	1	2	3	4
The learning climate in the group was good.	1	2	3	4
The lecturers moderated the discussion well.	1	2	3	4
I've learned something new.	1	2	3	4
The didactic approach of "research-based learning" is useful.	1	2	3	4

Thank you very much for your support!

Note. Adapted and translated from the research-based learning evaluation at Leipzig University (Juliana Schlicht et al., 2017; J. Schlicht, 2021)

Appendix B

Histograms and Q-Q Plots by Item

Figure B. 1

Histograms and Q-Q Plots for the Item "I enjoy researching practical solutions" in Pre-test and Post-test

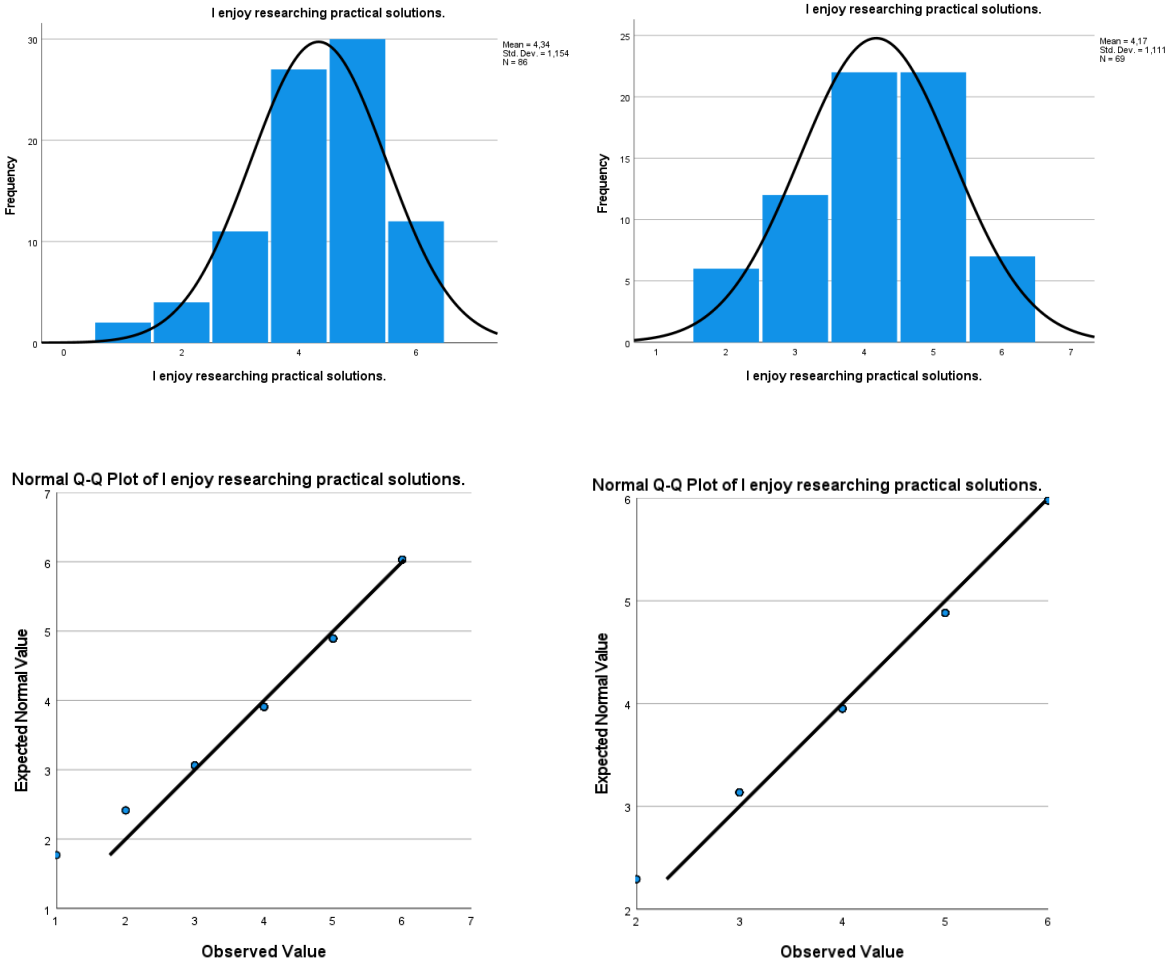


Figure B. 2

Histograms and Q-Q Plots for the Item "I'm looking forward to getting to know something new" in Pre-test and Post-test

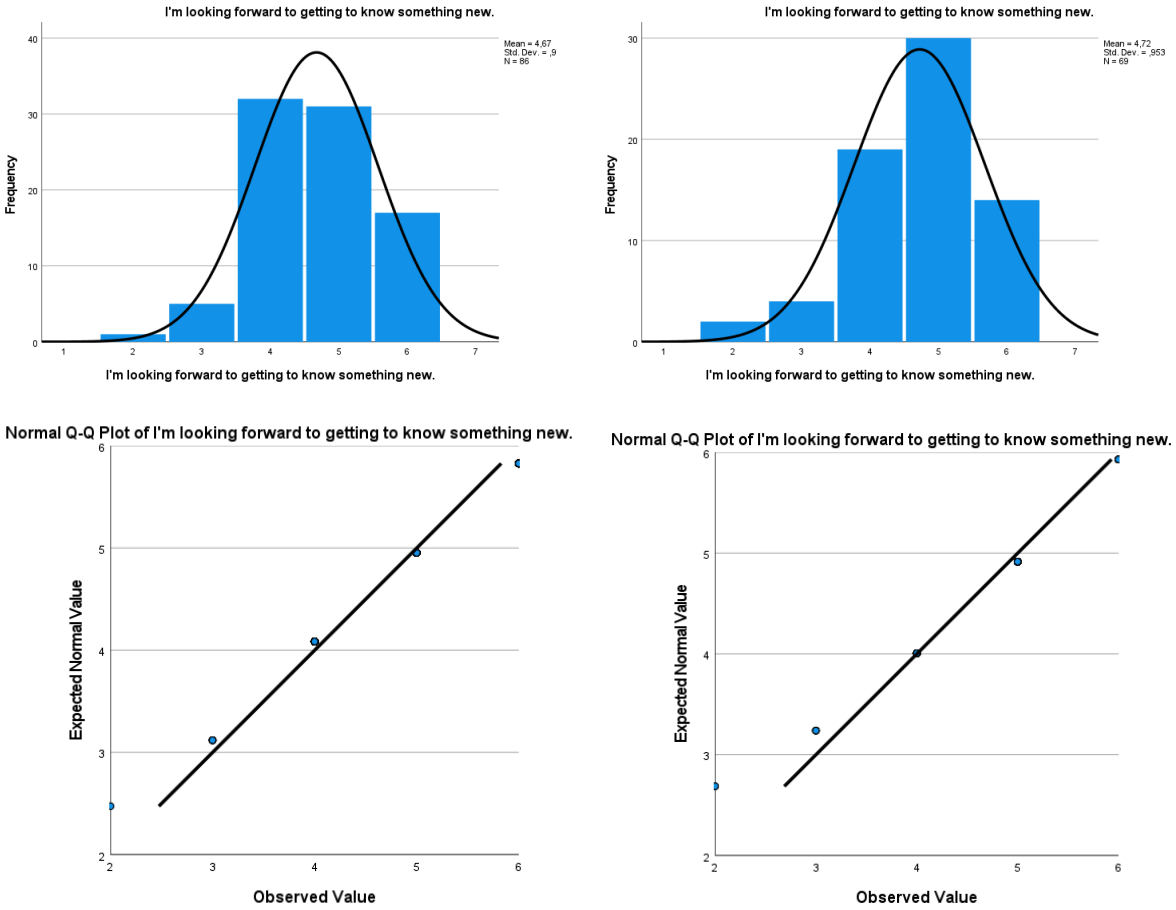


Figure B. 3

Histograms and Q-Q Plots for the Item "I find the tasks interesting" in Pre-test and Post-test

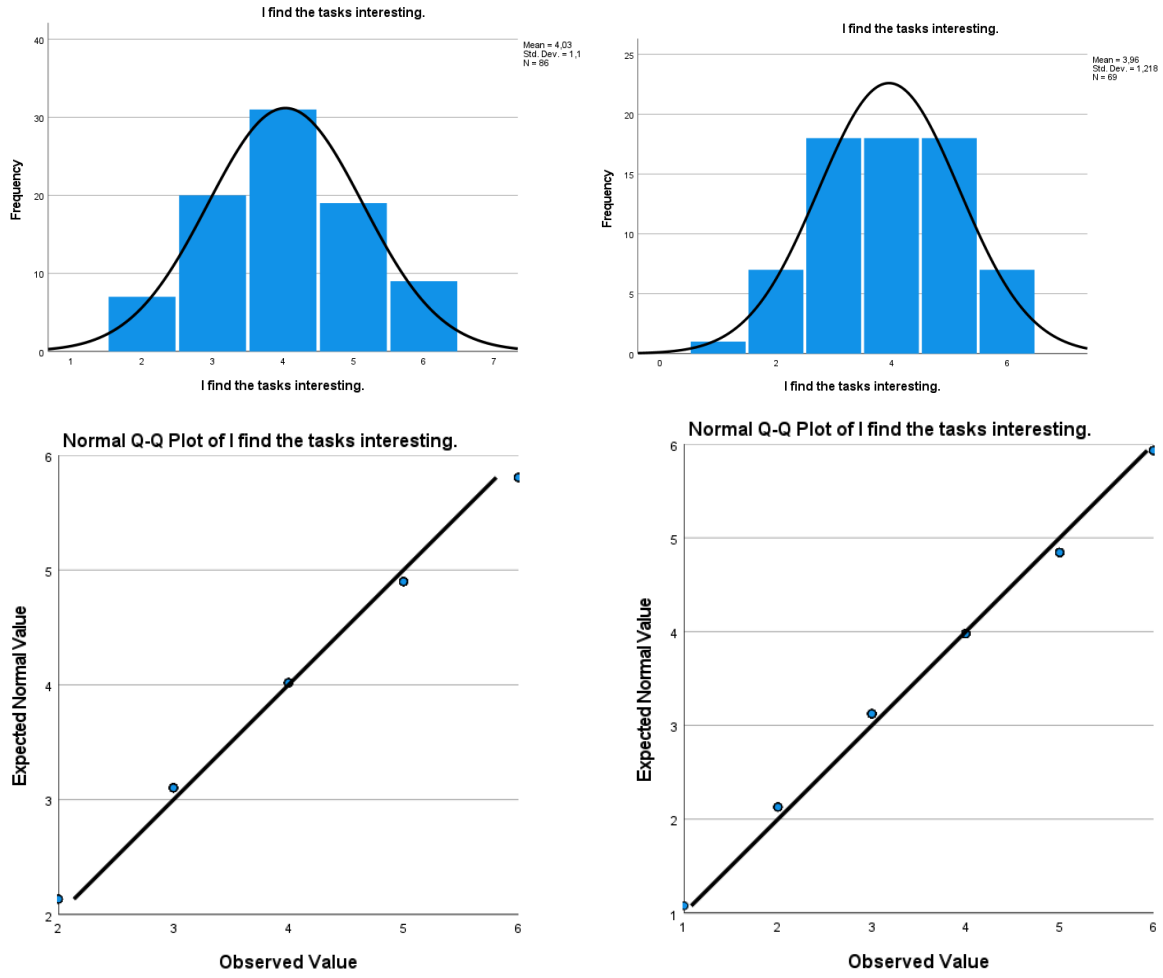


Figure B. 4

Histograms and Q-Q Plots for the Item "Without outside pressure, I wouldn't get involved" in Pre-test and Post-test

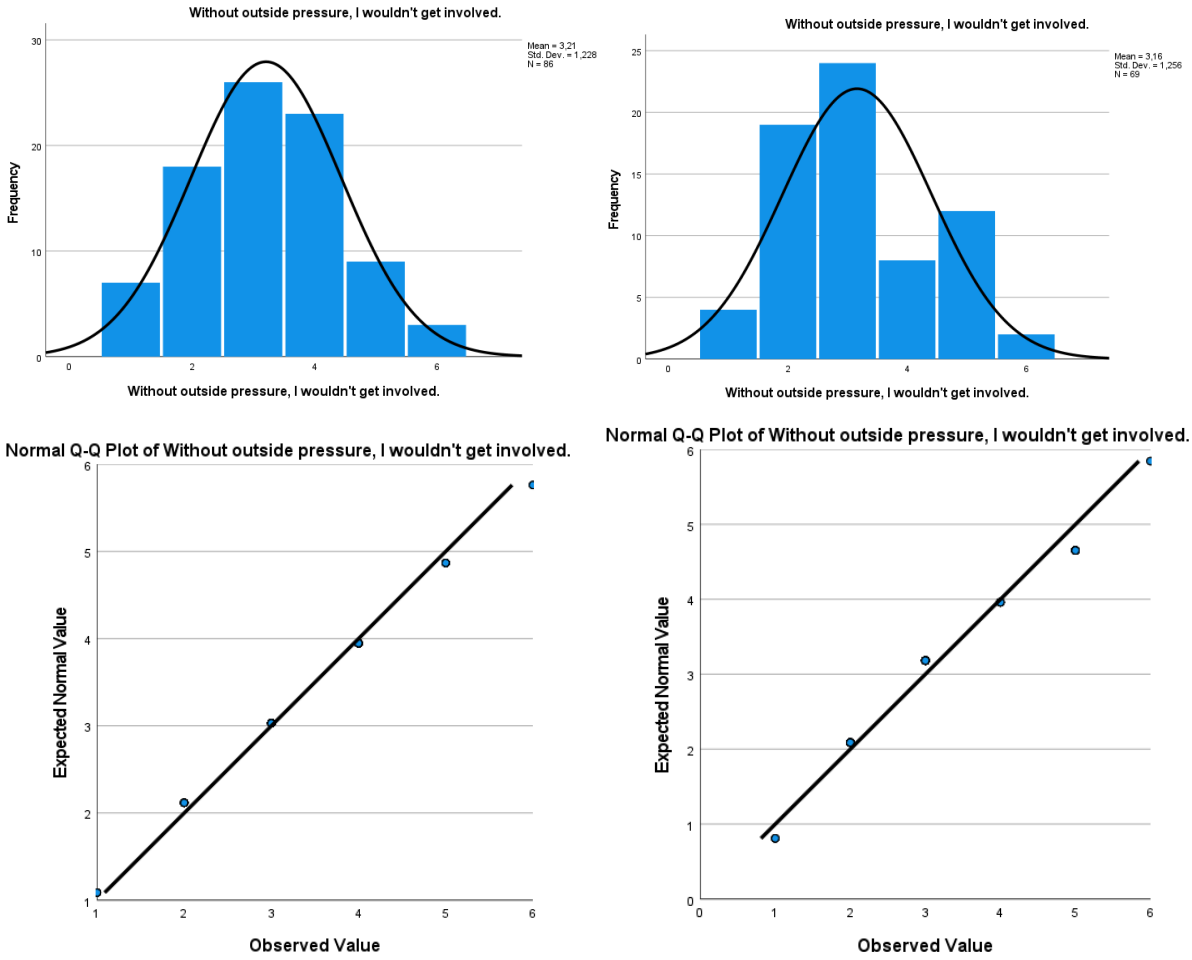


Figure B. 5

Histograms and Q-Q Plots for the Item "I'm only doing what's asked of me" in Pre-test and Post-test

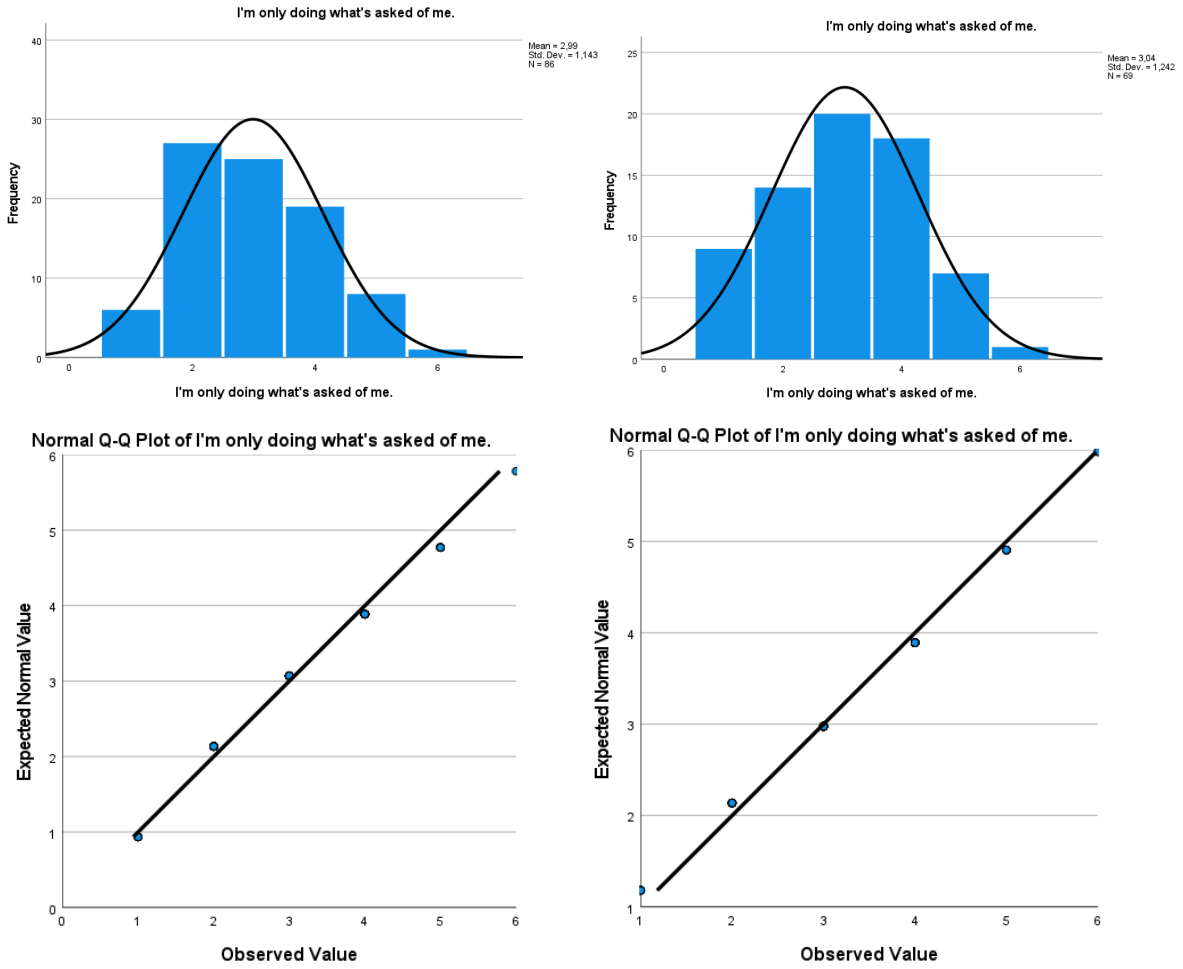


Figure B. 6

Histograms and Q-Q Plots for the Item "I get involved so I don't get in trouble" in Pre-test and Post-test

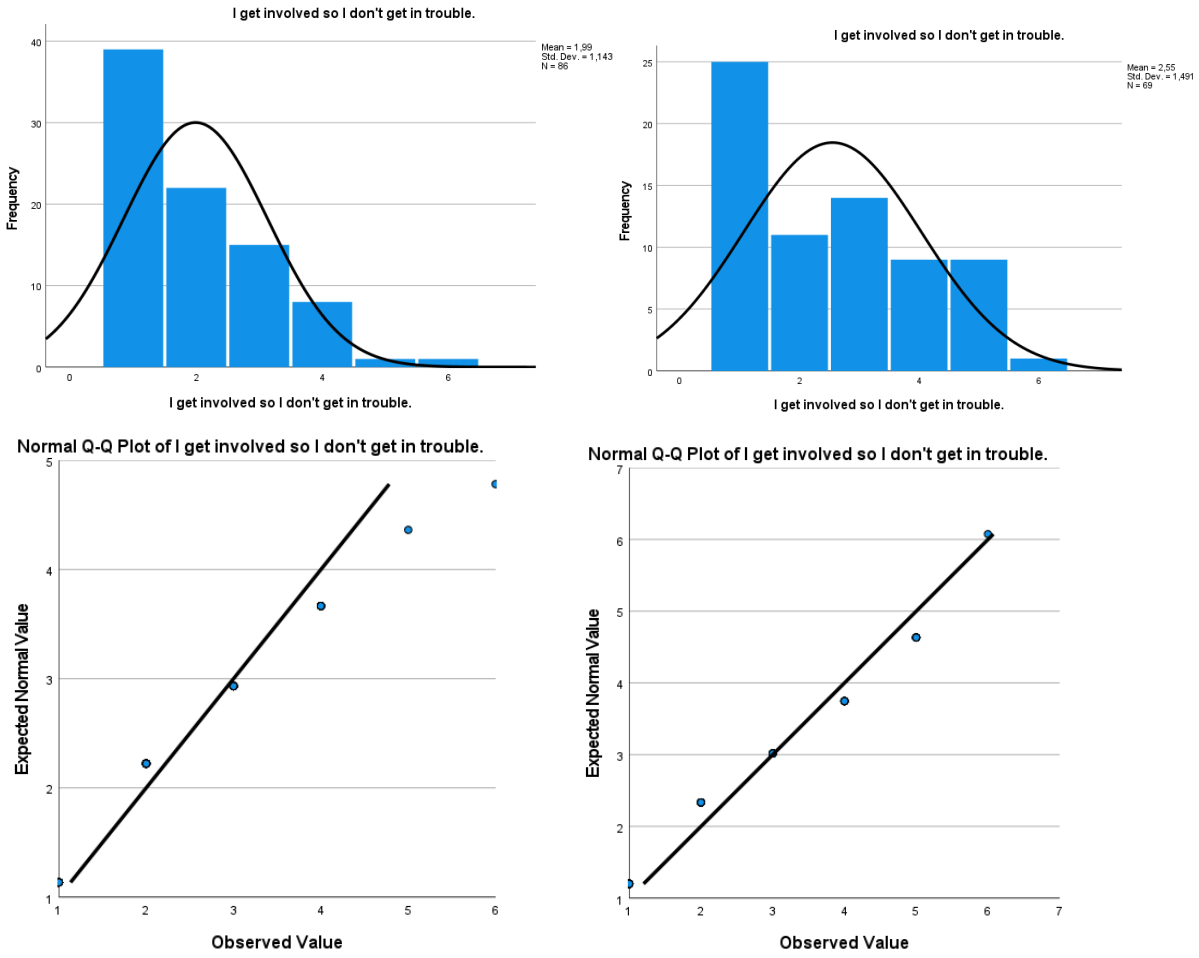


Figure B. 7

Histograms and Q-Q Plots for the Item "My knowledge is so comprehensive that I am well prepared for professional practice" in Pre-test and Post-test

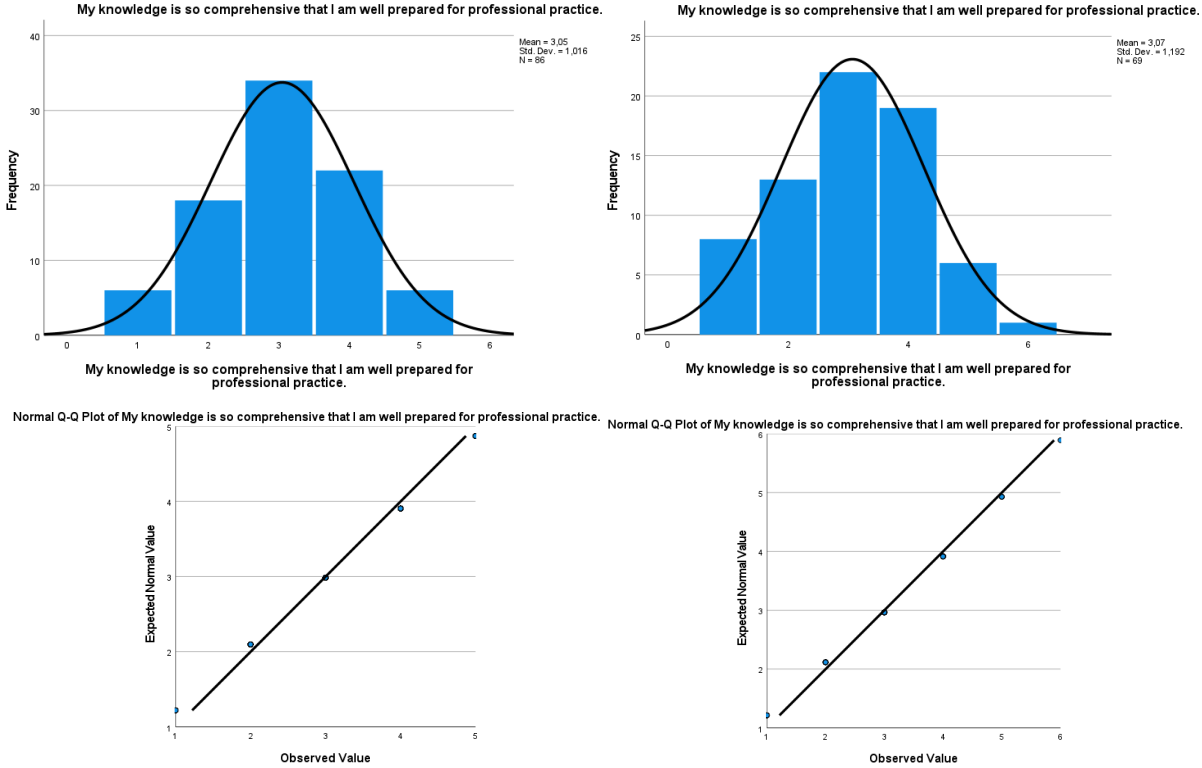


Figure B. 8

Histograms and Q-Q Plots for the Item "I can apply the theory to professional practice" in Pre-test and Post-test

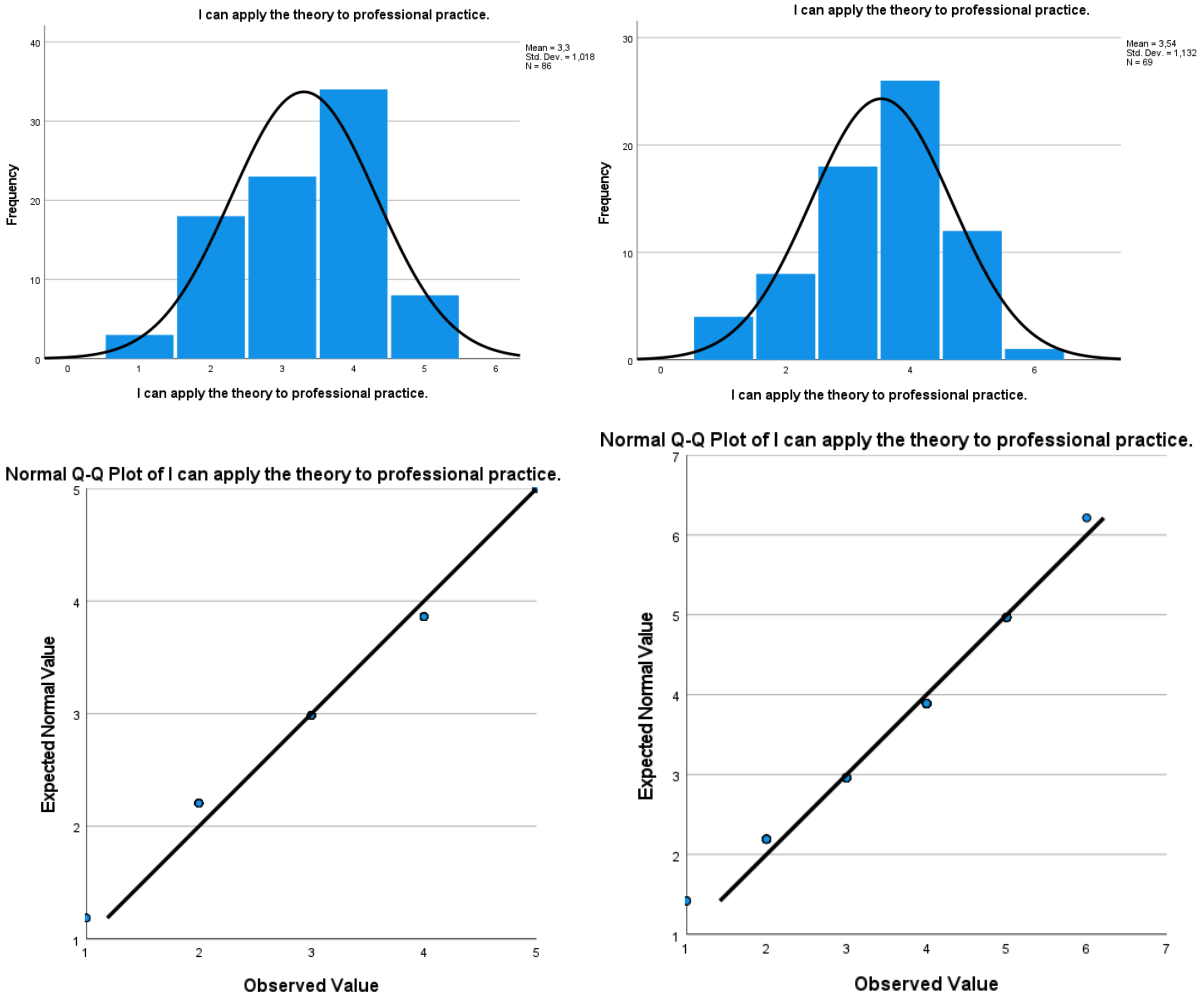


Figure B. 9

Histograms and Q-Q Plots for the Item "I am able to complete most of the tasks of my studies effectively" in Pre-test and Post-test

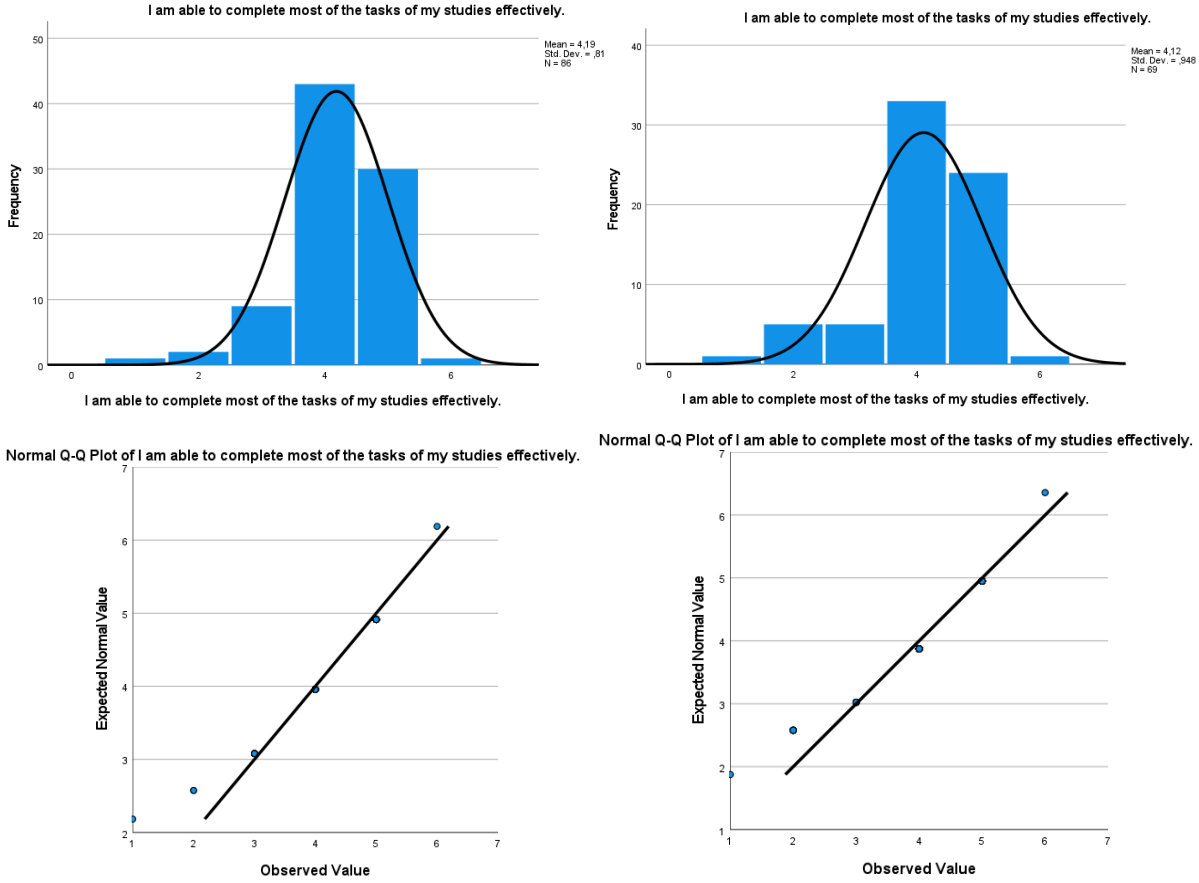


Figure B. 10

Histograms and Q-Q Plots for the Item "I know research methods and procedures" in Pre-test and Post-test

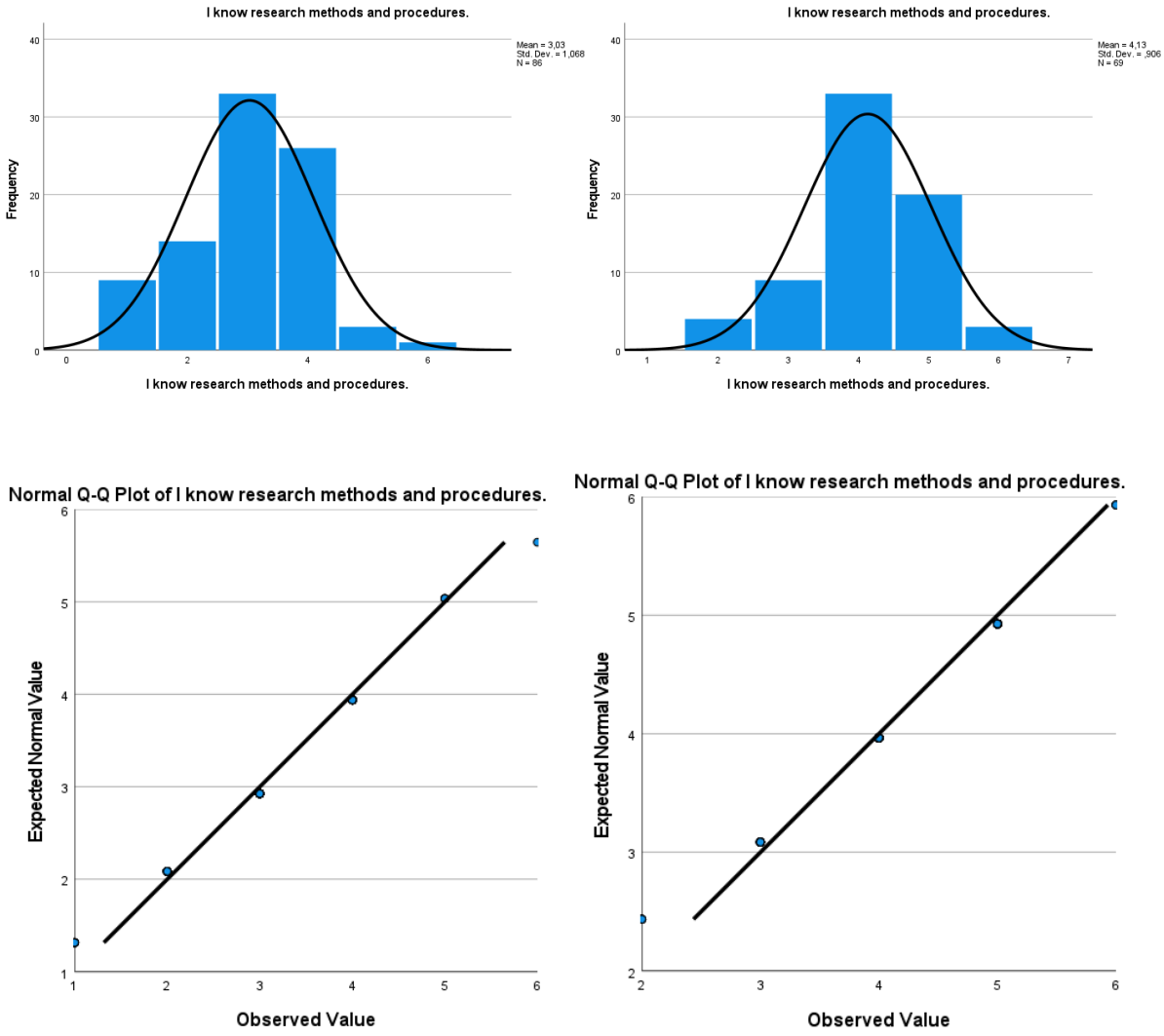


Figure B. 11

Histograms and Q-Q Plots for the Item "I can design and implement research studies myself" in Pre-test and Post-test

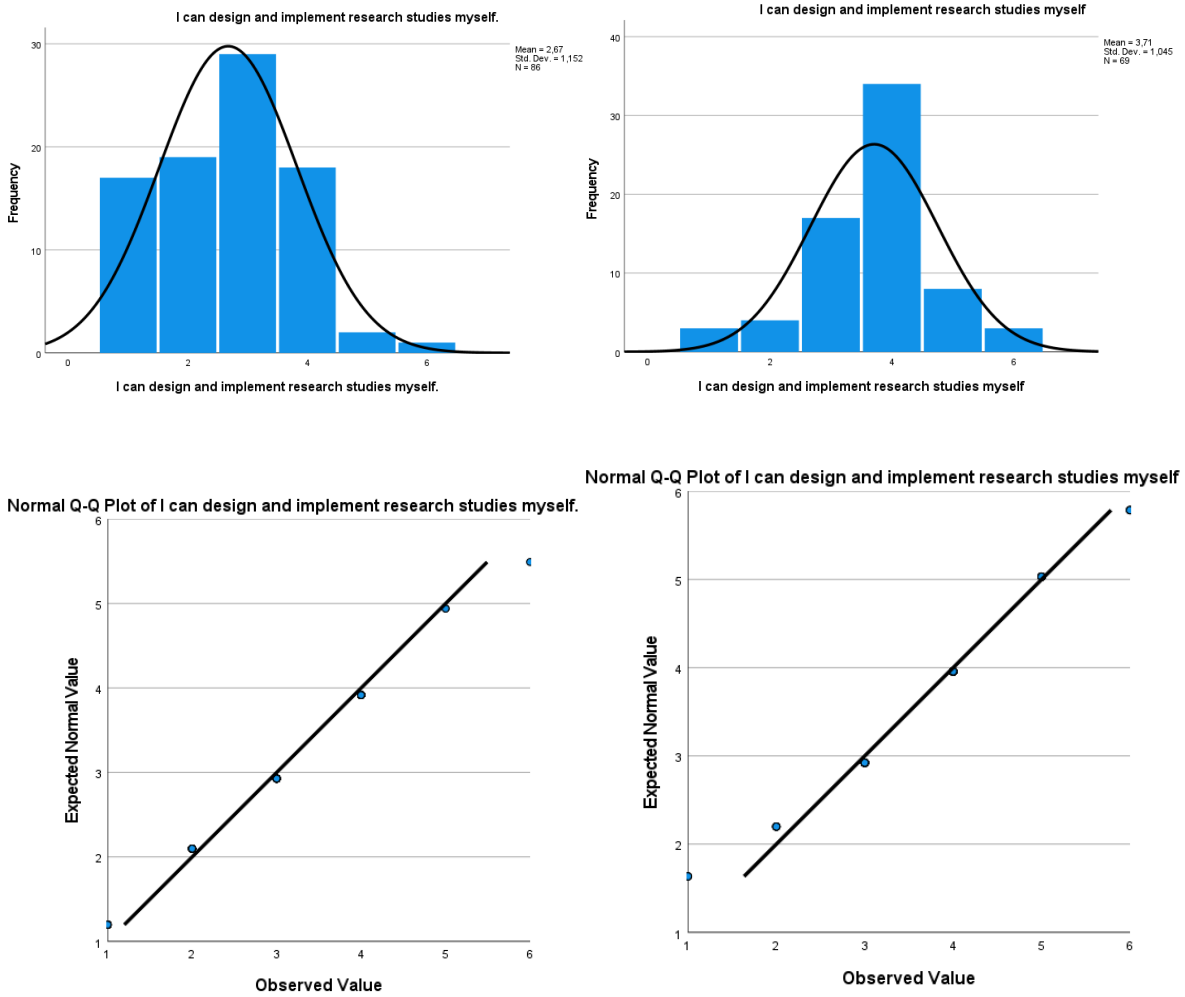


Figure B. 12

Histogram and Q-Q Plot for the Item "The research problems presented are relevant for my personal development" in Post-test

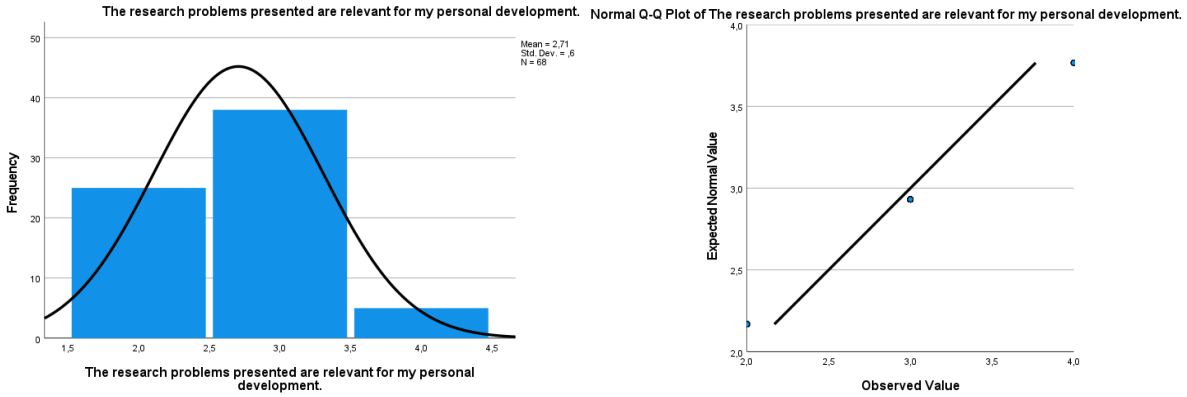


Figure B. 13

Histogram and Q-Q Plot for the Item "I recognize a connection between the topics and further contents of my studies" in Post-test

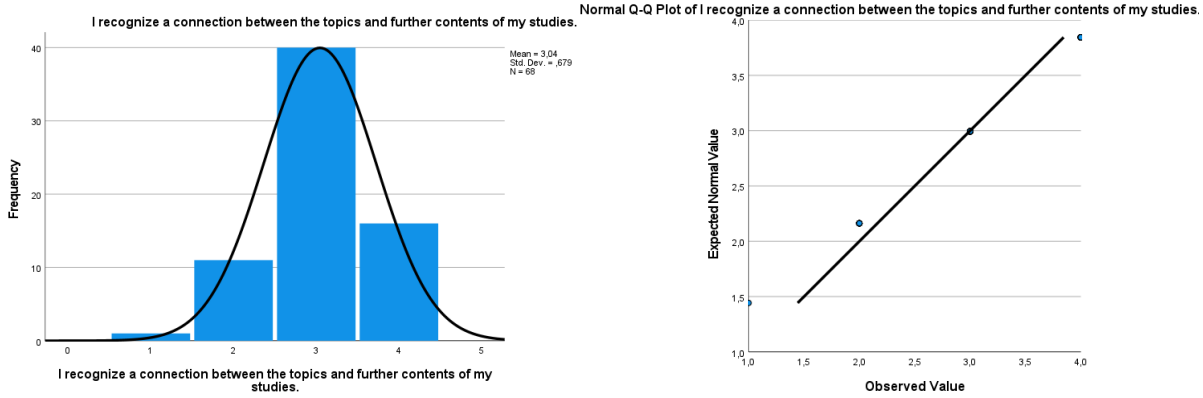


Figure B. 14

Histogram and Q-Q Plot for the Item "I am satisfied with the structure of the course" in Post-test

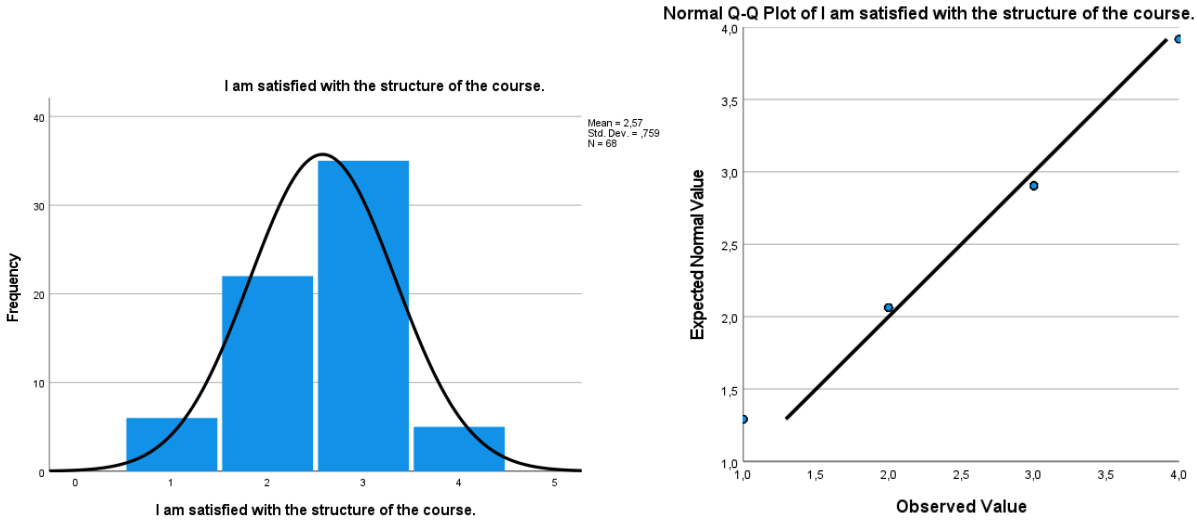


Figure B. 15

Histogram and Q-Q Plot for the Item "The learning environment in the group was good" in Post-test

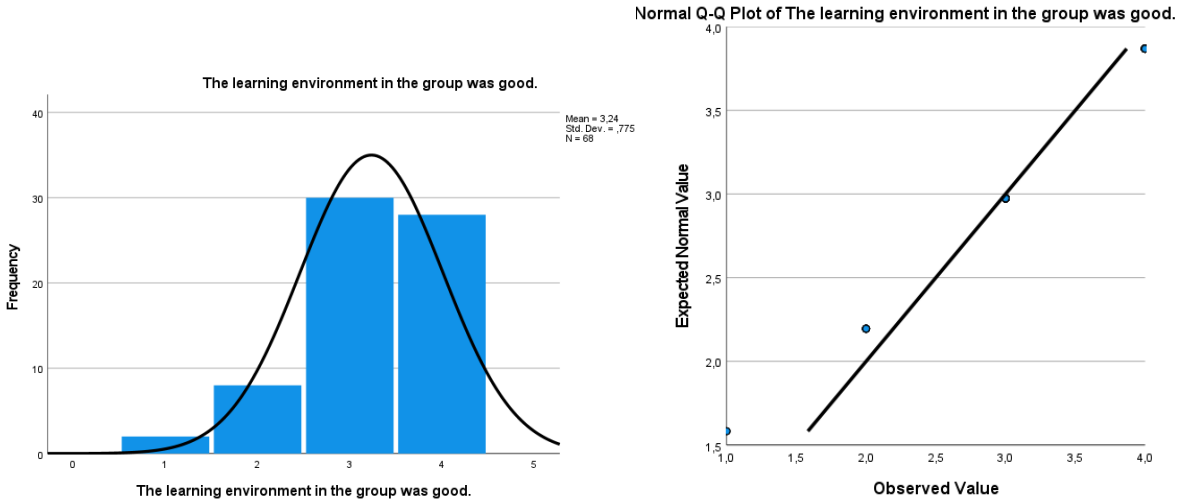


Figure B. 16

Histogram and Q-Q Plot for the Item "The instructor moderated well the discussion" in Post-test

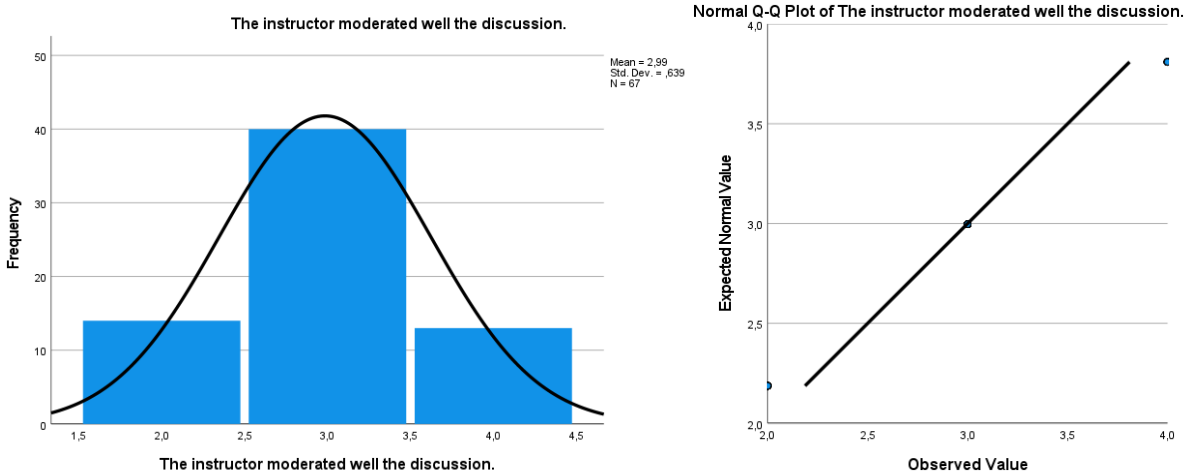


Figure B. 17

Histogram and Q-Q Plot for the Item "I've learned something new" in Post-test

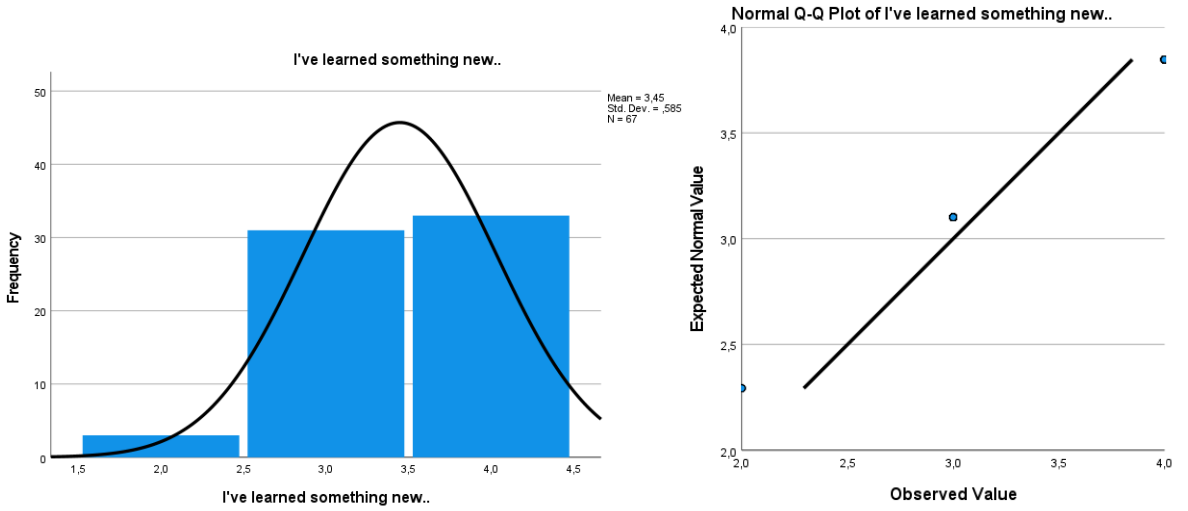
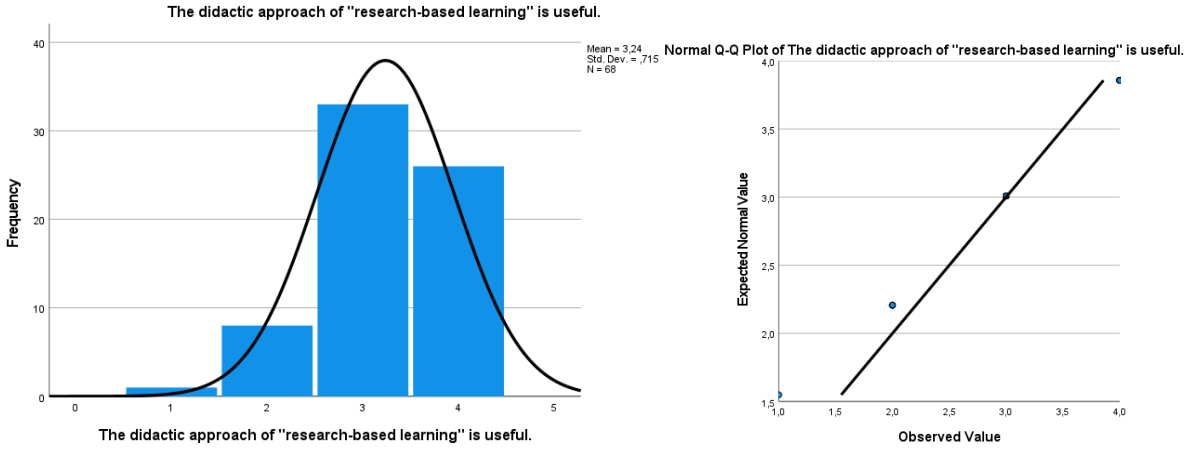


Figure B. 18

Histogram and Q-Q Plot for the Item "The didactic approach of "research -based learning is useful" in Post-test



Histograms and Q-Q Plots by Variable

Figure B. 19

Histogram and Q-Q Plot for Knowledge and Skills in Pre-test

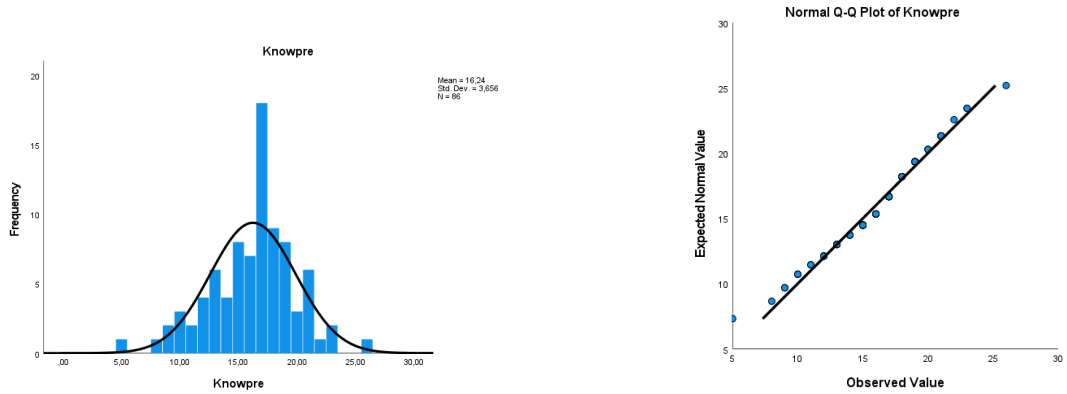


Figure B. 20

Histogram and Q-Q Plot for Intrinsic Motivation in Post-test

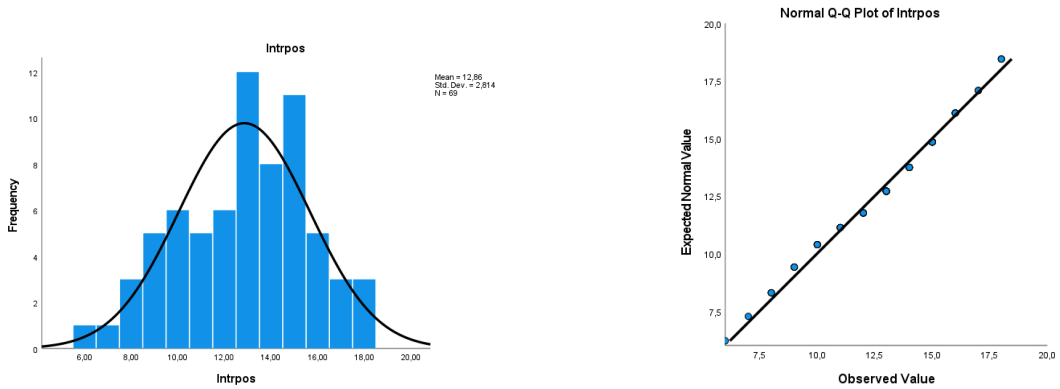
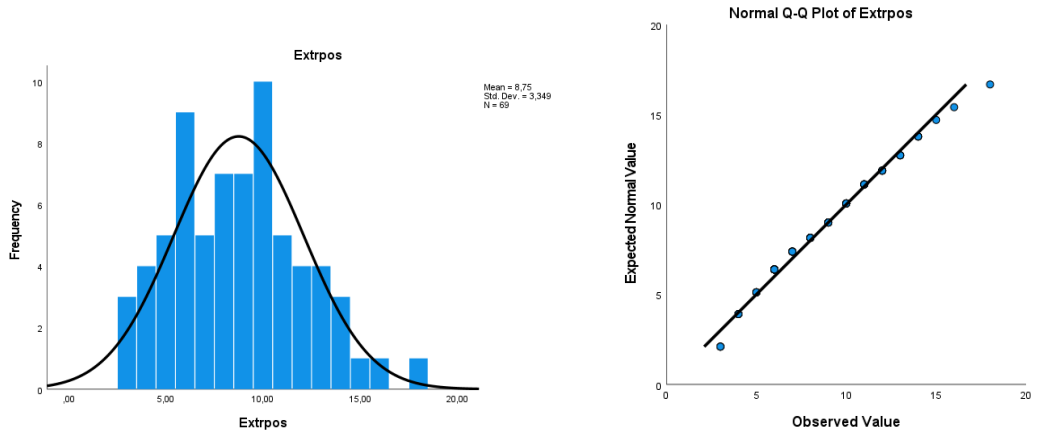


Figure B. 21

Histogram and Q-Q Plot for Extrinsic Motivation in Post-test



Appendix C

Student's Semester by Intrinsic Motivation

Table C. 1

Student's Semester by Intrinsic Motivation in Pre-test and Post-test

		Pre-test			Post-test		
Semester		Negative	Positive	Total	Negative	Positive	Total
2	Count	5	64	69	9	46	55
	%	7.2%	92.8%	100%	16.4%	83.6%	100%
3	Count	0	1	1	-	-	-
	%	-	100%	100%	-	-	-
4	Count	1	6	7	0	5	5
	%	14.3%	85.7%	100%	-	100%	100%
6	Count	1	4	5	0	4	4
	%	20%	80%	100%	-	100%	100%
8	Count	0	1	1	0	1	1
	%	-	100%	100%	-	100%	100%

Note. Pre-test p = .290; Post-test p =.191.

Table C. 2

Semester by Extrinsic Motivation in Pre-test and Post-test

		Pre-test			Post-test		
Semester		Negative	Positive	Total	Negative	Positive	Total
2	Count	51	18	69	33	22	55
	%	73.9%	26.1%	100%	60%	40%	100%
3	Count	0	1	1	-	-	-
	%	-	100%	100%	-	-	-
4	Count	4	3	7	1	4	5
	%	57.1%	42.9%	100%	20%	80%	100%
6	Count	4	1	5	3	1	4
	%	80%	20%	100%	75%	25%	100%
8	Count	0	1	1	1	0	1
	%	-	100%	100%	100%	-	100%

Note. Pre-test p = .493; Post-test p =.277.

Appendix D

Nonparametric Correlations Between the Study's Variables

Table D. 1

Nonparametric Correlations Spearman's rho (bivariate) Between the Study's Variables in Pre-test and Post-test

			1	2	3	4	5	6	7
1.	Intrinsic motivation Pre-test	Corr. Coefficient	1	-.426**	.246*	.637**	-.244	.392**	.482**
		Sig. (2-tailed)		<.001	.022	<.001	.050	.001	<.001
		N	86	86	86	65	65	65	64
2.	Extrinsic motivation Pre-test	Corr. Coefficient	-.426**	1	-0.134	-384**	.524**	-.297*	-.263*
		Sig. (2-tailed)	<.001		0.220	0.002	<.001	0.016	0.036
		N	86	86	86	65	65	65	64
3.	K&S Pre-test	Corr. Coefficient	.246*	-.134	1	.047	-.033	.675**	.055
		Sig. (2-tailed)	.022	.220		.712	.794	<.001	.664
		N	86	86	86	65	65	65	64
4.	Intrinsic motivation post-test	Corr. Coefficient	.637**	-.384**	.047	1	-.342**	.400**	.668**
		Sig. (2-tailed)	<.001	.002	.712		.004	<.001	<.001
		N	65	65	65	69	69	69	67
5.	Extrinsic motivation post-test	Corr. Coefficient	-.244	.524**	-.033	-.342**	1	-.183	-.121
		Sig. (2-tailed)	.050	<.001	.794	.004		.133	.330
		N	65	65	65	69	69	69	67
6.	K&S post-test	Corr. Coefficient	.392**	-.297*	.675**	.400**	-.183	1	.282*
		Sig. (2-tailed)	.001	.016	<.001	<.001	.133		.021
		N	65	65	65	69	69	69	67
7.	Acceptance post-test	Corr. Coefficient	.482**	-.263*	.055	.668**	-.121	.282*	1
		Sig. (2-tailed)	<.001	.036	.664	<.001	.330	.021	
		N	64	64	64	67	67	67	67

Note. K&S= knowledge and skills. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). Significant correlations also with parametric tests are grey highlighted.

Declaration of academic integrity according to § 8 par. 2 (1.)

I hereby declare that I have composed this dissertation myself and without inadmissible outside help, in particular without the help of a doctoral consultant (Promotionsberater). I have used no other sources and aids than those stated. I have indicated all text passages that are incorporated, verbatim or in substance, from published or unpublished writings. I have indicated all data or information that is based on oral communication. All material or services provided by other persons are indicated as such.

Leipzig, 03.01.2023

.....	.....
(Place, date)	Luisa Fernanda Manrique Molina

Declaration of academic integrity according to § 8 par. 2 (2.)

The submitted dissertation has not been submitted in the same or similar form for the purpose of a doctorate or any other examination procedure at an examination authority. Previous unsuccessful attempts at doctoral studies have not taken place.

Leipzig, 03.01.2023

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