WORK-ORIENTED PROJECT LEARNING IN THE CONTEXT OF MASTER'S LEVEL SERVICE DESIGN EDUCATION

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Abstract

The increasing importance of services in the global economy highlights service innovation that is seen vital in the creation of new services, service business models, and service processes in the different sectors of society. In order to identify new opportunities and design service innovations, new capacity building is needed in a rapidly changing service business environment. Hence, there is also a need for the development of novel pedagogical approaches and learning methods in higher education in the context of service design. Work-oriented project learning is a widely adopted pedagogical approach, which seems to be an appropriate method for accumulating new competencies and working life experiences.

The purpose of this paper is to deepen understanding of work-oriented project learning at university of applied sciences, which represent the form of higher education, where working life cooperation and regional development is expected. Thus, the starting point for planning and developing education, as well as for choosing pedagogical approaches, is responding to the future challenges of society and working life. These expectations have also challenged Laurea University of Applied Sciences (Laurea) to find new conceptual and pedagogical solutions. This paper aims at presenting an updated pedagogical model of work-oriented project learning in the context of master's level service design education that is based on synthesis of the project learning approach and pedagogic Learning by Developing (LbD) model by Laurea. Both approaches consider that expertise and experiences are shared between teachers and multidisciplinary students, as well as project partners and other stakeholders. Moreover, the teacher members of the project team take part by providing their expertise to steer the progress of the work and, at the same time, the progress of the learning. The LbD model describes the theoretical pedagogical framework. However, as such, LbD does not provide (conceptual) tools or operational models for planning and analysing project learning. The project learning approach could provide conceptual tools for modelling project learning in higher education in the context of service design.

The development of the pedagogical model of work-oriented project learning in the context of master's level service design education was conducted as a part of a project called The Finnish Design Academy (FDA) that is a joint project of Finnish higher education institutions operating in the field of design. Its goal is to boost the role of higher education in design in the national innovation ecosystem and to develop competence related to design education. Action research was chosen as the research strategy for this development work due to its practical and hands-on nature. Action research aims at changing things, not only at contributing to the academic discussion. It is relevant that the researchers participate in the development process that proceeds in cycles. A cycle of action research consists of four phases: planning, acting, observing and reflecting. This study consists of three cycles. Based on the action research, a new pedagogical model of work-oriented project learning in the context of master's level service design education was created and piloted. The main contribution of this paper is a project-based learning model that is highly suited to integrating the three tasks of universities of applied sciences – education, R&D and regional development.

Keywords: work-oriented project learning, digital service design, digital service, higher education

1 INTRODUCTION

Over the last decades, services have grown to form the leading economic power in the world (World Bank 2018). The enormous and growing importance of services increases the meaning of service innovation that increase economic efficiency, save costs, create new operations and open new export opportunities. Thus, service innovations will be crucial for the success of society in the future. Global societal challenges, such as digitalisation, increasing inequality and ageing have a notable impact on service innovations. On the other hand, consumer behavior has also changed. Services have to be

easily available and accessible in the channels that the customers use. The importance of customers' personal service experiences increases; experiences, ideas and opinions are shared both privately and publicly through different social channels. Modern customers appreciate co-creation and are ready to participate in the collaborative development of the services that they find important. (Rogers 2016). This has led to a significant change in the nature of services. Recent services are multi-channeled, and digital technology plays a central role in them. Approaches, methods and tools used in the field of design are being applied to service development. In other words, service design. Service design is an evolving multidisciplinary field, which has proven to be an extremely appropriate approach when placing the service and customer experience at the focus of service development.

Laurea University of Applied Sciences (Laurea) is one of the pioneering universities in service design education at the Master's level. To ensure the quality level and European comparability the Master's degree programs in Laurea follow the frameworks of EQF7 and NQF7. The European Qualifications Framework (EQF) and The Finnish National Qualifications Framework (NQF) provide the frameworks for competence development offered in the degree programs through eight reference levels and describe the learning outcomes of those levels. Laurea offers two Master's level programs in service design (Service Design and Service Innovation & Design) and one in the context of digital service design (Innovative Digital Services for the Future). The programs approach service design from the theoretical perspective of service marketing and management. In addition to studying service design processes, methods and tools, the expertise is deepened and expanded with business development and management studies. New models of service business and design thinking are applied in the context of service design and management. After the core competence studies, the students can customise their own paths by selecting complementary courses to promote their own learning goals. Education is targeted for persons who work in management, professional or development positions and want to become future-oriented service design leaders.

In order to identify new opportunities and produce service innovations, new capacity building is needed in working life. These expectations have challenged Laurea to find new conceptual and pedagogical solutions. There is a need for novel pedagogical approaches and learning methods in higher education in the context of service design. Work-oriented project learning is a widely adopted pedagogical approach, which seems to be an appropriate method for accumulating new competencies and working life experiences. This paper aims at presenting an updated pedagogical model of work-oriented project learning in the context of master's level service design education that is based on synthesis of the project learning approach and pedagogic Learning by Developing (LbD) model by Laurea. Both approaches consider that expertise and experiences are shared between teachers and multidisciplinary students, as well as project partners and other stakeholders. Moreover, the teacher members of the project team take part by providing their expertise to steer the progress of the work and, at the same time, the progress of the learning. The LbD model describes the theoretical pedagogical framework. However, as such, LbD does not provide (conceptual) tools or operational models for planning and analysing project learning. The project learning approach could provide conceptual tools for modelling project learning in higher education in the context of service design. Hakkarainen and Paavola (2009) contrast the trialogical framework with prevailing monological (cognitive) and dialogical (situated cognition) approaches to learning. This ''trialogical'' approach, that refers to learning as a process of knowledge creation which concentrates on mediated processes where common objects of activity are developed collaboratively. The trialogical approach that promotes elicit and helps to understand the processes of knowledge progression that are important in the information society may be useful in developing work-oriented project learning in the context of master's degree education.

The structure of this paper is as follows. First, it introduces service design in higher education. Second, in the theoretical background, a work-oriented project learning model is discussed and expanded with trialogical learning Third, it describes the progress and methods of the action research. Fourth, the paper presents the results of the study and finally, it discusses the main contributions.

2 SERVICE DESIGN IN HIGHER EDUCATION

Service design is a rapidly evolving field with a holistic and creative approach to service innovation (Blomkvist et al. 2010). In more detail, Stickdorn et al. (2018) identify six service design characteristics that are: (1) human-centered: understanding the user and other stakeholders by doing qualitative research; (2) collaborative: involving all relevant stakeholders in the design process; (3) iterative:

experimenting and learning about failure; (4) sequencing: partitioning a complex service into separate processes; (5) real: service design takes place in authentic service environment; (6) holistic: considering touchpoints in a network of interactions and users. Service design incorporates multiple contributions from service marketing, operations, and information technology, all integrated through design-based methods and tools (Patrício & Fisk 2013, Ostrom 2015) in order to give rise to services that are useful, usable, and desirable from the user perspective, and efficient, effective and different from the provider perspective (Mager & Sung 2011). Service design can be seen as a multidisciplinary approach aiming at achieving consensus among all the participants with different backgrounds and interests. Thus, it provides a practical set of methods and tools to involve users and other stakeholders to co-create in the service innovation process, encourages them to surpass their own limits, as well as examine the current issue from alternative perspectives. The literature describes quite a few service design process models, consisting of three to six phases (see e.g. IDEO 2018, The British Design Council 2019, Tschimmel 2015), but fundamentally all models share the same logic and mind-set.

The aim of the Master's degree programs in service design at Laurea is to provide students with multidisciplinary competencies in service innovation and design through the advanced study of international research results and their implications for service innovation and design practice and management. The Master's degree education brings students to the forefront of recent service innovation and design practises by including supervised development training as a part of their studies. Another important objective is to improve students' competences in combining academic rigour with managerial relevance when working on independent projects.

3 THEORETICAL BACKGROUND

Project learning is a widely used pedagogical approach aimed at enhancing collaboration between education and working life in universities of applied sciences. It can be seen as a teaching and learning method as well as a tool for developing the content of education. Previous studies have noted that studying in a project promotes the student's professional development and also maintains motivation to study (Eteläpelto & Rasku-Puttonen 1999). However, project learning has been approached from different perspectives in the literature and it lacks a widely accepted and unified theoretical basis. Vesterinen (2001) states that the theoretical background of project learning is often connected with constructivist learning theories, cognitive psychology and motivational psychology. Project learning applies functional pedagogical approaches like cooperative and collaborative (Vesterinen 2001, Upola 2019), experience-based (Vesterinen 2001, Upola 2019), problem-based-learning (Vesterinen 2001, Upola 2019), exploratory learning (Upola 2019), and contextual learning. Thus, social interaction, experientialism, action, experimentation and challenges are emphasized in the students' competence building (Upola 2019). Indeed, similar elements can be identified in service design and co-creation and therefore we consider that that project learning approach would support appropriate learning and education of service design in universities of applied sciences.

3.1 Work-oriented learning at Laurea UAS

Universities of applied sciences are multi-field institutions of professional higher education, where working regional development and life cooperation is expected. Universities of applied sciences engage in applied research and development. Thus, the premise of education is to respond to the future challenges of society and working life. These standpoints have also challenged Laurea University of Applied Sciences to develop new pedagogical solutions.

Learning by Development (LbD) is a pedagogical strategy and model in Laurea. LbD based learning is focused on constructing and applying knowledge during research and development projects together with working life. Underlying this model is exploring learning (Hakkarainen & Lonka & Lipponen 2004) and Dewey's pragmatism (Dewey 1980; Dewey 1982; Dewey 1981). Previous evaluation has shown the strengths of this model include working with real-life problems, increased independent thinking skills and self-confidence, building contacts with companies and organisations during the early stages of studies as well as improving employment opportunities. (Luojus 2019).

Learning is seen at Laurea as a process to achieve relevant knowledge and skills to self-development as well as practical information for fulfilling the future expectations in working life. Moreover, the primary goal of teaching is not to present, repeat, and manage knowledge, but instead a process that

includes progressive problem-solving and constant learning, as well as improving and surpassing oneself. The aim of the education is to achieve a level of knowledge that is practical in knowledge-intensive service organizations. Indeed, creativity is increasingly emphasized in today's working life, and managers are required to have the ability to create a responsible and results-oriented management culture that supports the individual's creativity. Knowledge is constructed in dialogue with a community of shared expertise, in which the role of the learner is to develop and influence not only to work as an expert. At Laurea, the learner constructs knowledge by interacting with business and the surrounding society. The resources for constructing knowledge are a creative and goal-oriented learning environment, competent guidance and teaching and a learning environment that encourages learning. The guidance of competence building is participatory. Teachers support the learner's competence building by strengthening it by their own expertise and experience. As a whole, the learning environment constitutes the network of knowledge, the innovation environment, the basis for building knowledge and structures supporting learning. (Luojus 2019).

The LbD model involves different actors from both the private and public sectors, allowing exploratory co-creation in real encounters with working life. During the cooperation project, students, partners and experts co-create new ideas or develop existing products and services. Laurea's cooperation network includes companies, municipalities, towns, other research institutes as well as citizens and consumers. Moreover, Laurea's research, development and innovation (RDI) activity provides a platform for research, planning, testing, evaluation, design, implementation and mobilisation of the service innovation. Joint RDI projects together with different actors increase the knowledge of both the staff and students. Service design as well as inclusive and customer-oriented methods are used during the projects, and new approaches and tools for innovation are developed. The LbD model describes the theoretical pedagogical framework.

3.2 Pedagogical model of the work-oriented project learning

Upola (2019) introduces a pedagogical model of work-oriented project learning. In the model the learning process focuses on the real challenge of working life provided by collaborative client and during the project learners seek to produce solutions to the challenge. The theoretical background is grounded in a socio-cognitive constructivist concept of learning, and the research has been approached in particular from the perspectives of special education, managerial psychology and motivation theory. The Upola model is primarily intended as a learning process for vocational education students.

Upola (2019) recognises nine stages of the pedagogical model of work-oriented project learning, which are divided into four phases on a practical level: 1) receiving the commission, 2) working on the commission, 3) implementing the commission in a real working life environment, and 4) completing the commission. The author argues that work-oriented project learning changes the responsibilities, roles, and tasks of both the learner and the teacher and brings along a working life client. In the model presented in figure 1, the learner is at the centre of the model. Other actors are teacher, client and other actors like subcontractors, staff and customers of the client company. The innermost level around the student describes factors directly linked to the student. Students own their education (autonomy) and they increase their knowledge from their individual starting point. They have their own set of skills (competence) they can utilise in work-oriented project learning. Students can challenge themselves by setting their own learning goals (assertiveness). Student is motivated (motivation) to work on projects. Due to the resources of projects, students are required to have longevity (resilience) to work on their goals. During the projects, they also help and encourage others (benevolence). (Upola 2019).

Another layer of the model describes group perspective, collegial learning (collegiality), where the group has a shared goal (volatility) and are affected by the current social mood (atmosphere) that varies during the project. Students working in a group have a sense of shared responsibility. The group utilises shared expertise and metacognitive skills as well as divergent thinking while working on the project. This kind of creative problem-solving as a way of constructing new knowledge can enhance the development of metacognitive and divergent thinking skills of the students. Socially shared learning experience supports the development of socio-emotional skills like working in a group, self-regulation and emotional intelligence. (Upola 2019).

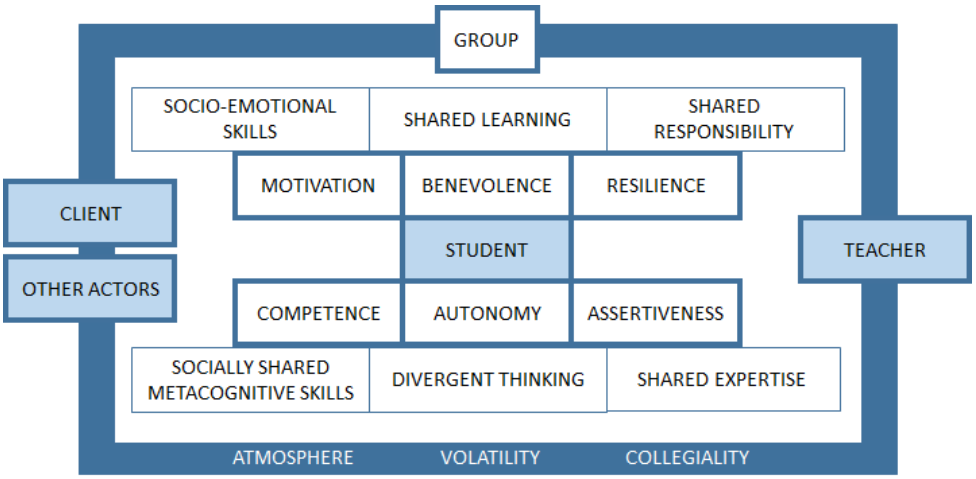

Figure 1. Pedagogical model of the work-oriented project learning by Upola (2019)**.**

3.3 Trialogical Learning

Paavola and Hakkarainen (2005) argue that in addition to the traditional metaphors, according to which "learning is a process of knowledge acquisition by individual learners (a ''monological'' approach) or participation to social interaction (a ''dialogical'' approach)", there is also a third approach. This is a ''trialogical'' approach, that refers to learning as a process of knowledge creation which concentrates on mediated processes where common objects of activity are developed collaboratively. The trialogical approach promotes to elicit and helps to understand the processes of knowledge progression that are important in the information society. ''Trialogical'' is seen as a conscious and systematic endeavor to develop socially shared objects and transcending previous knowledge. These objects are often at the same time both concrete, material objects and information and thoughts that have been drained or objectified into them. These objects are often at the same time concrete, material objects, as well as information and thoughts absorbed or objectified in them. Knowledge creation takes place by organizing a social community to work together with the assistance of mediating tools to develop these common goals. (Paavola & Hakkarainen 2008).

The following six characteristics of trialogical learning are presented and described in by Hakkarainen and Paavola (2009): (1) "Focus on shared objects of activity which are developed collaboratively"; (2) "Sustained and longstanding pursuit of knowledge advancement"; (3) "Knowledge-creation processes taking place in mediated interaction between individual and collective activities"; (4) "Cross-fertilization of knowledge practices between educational, professional, and research communities in terms of bringing cultures of schooling in closer contact with professional cultures and engaging students in expert-like knowledge practices from the very beginning of their studies"; (5) "Technology mediation" that refers to "technologies that help the participants to create and share as well as elaborate and transform knowledge artifacts"; (6) "Development through transformation and reflection" that means emerging "crystallization of evolving ideas in shared practices and routines plays an important role in the process". (Hakkarainen & Paavola 2009).

However, as such, LbD does not provide conceptual tools or operational models for planning and analysing work-oriented project learning. The pedagogical model of work-oriented project learning by Upola (2019) can provide operational models for work-oriented project learning in higher education. The trialogical learning framework by Hakkarainen and Paavola (2009) helps to evaluate and to further develop the pedagogical model of work-oriented project learning in the context of master's level service design education by providing conceptual tools.

4 METHODOLOGY

The research strategy of this study follows action research due to its practical and hands-on nature. Rapoport (1970) states that action research contributes both to the practical concerns of people in an immediate problematic situation as well as to the goals of social science by joint collaboration within a mutually acceptable ethical framework. Moreover, action research has been described an iterative

process that combining theory and practice. Iterative and reflective process enable action (e.g. change, improvement) and research (e.g. understanding, knowledge) achieved simultaneously (Avison 1999, Baskerville 1996). Thus, action research changes things, not just to increase academic knowledge. The action research cycle consists of four basic steps: (1) plan, (2) act, (3) observe and (4) reflect. These steps are repeated in sequence as work progresses, creating an upward spiral of improving practice. The following figure (Fig. 3) illustrates the progress of cyclic action research. This development work consists of three action research cycles, during which the aim is to not only develop educational or pedagogical issues, but also to outline a new open innovation model for developing public services. In the following tables the steps of each three action research cycles, their objectives and partners involved are explained in more detail.

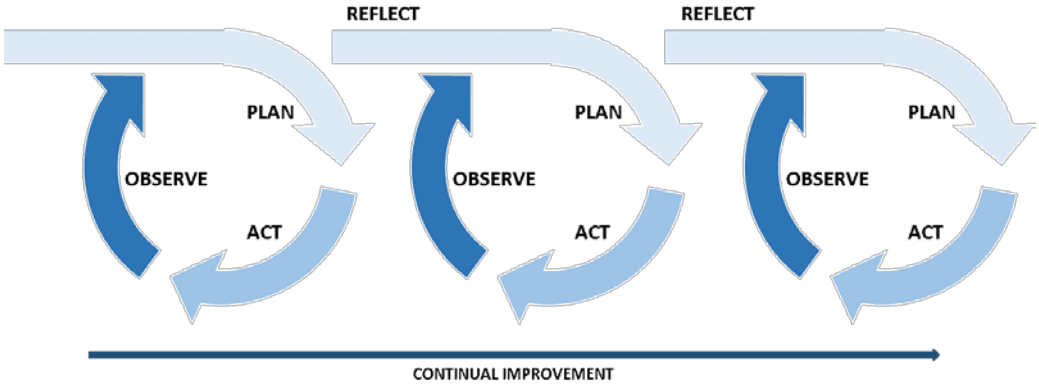

Figure. 1. The four basic steps in the cyclic action research approach.

4.1 The first cycle

The aim of the first cycle was to deepen the understanding of work-oriented project learning in the context of master's level service design education. The research data was collected from two service design cases, which were carried out in two different Master's level courses (Service Design Process and Methods, 10 cr and Agile Methods in Service Design, 10 cr) during The FDA project in spring 2019. 1) The study unit Service Design Process and Methods focuses on digital services, service design and service business. The students were assigned to design a new digital service concept for a Finnish wellness technology company. The assignment had a dual purpose: a) to design a new digital service concept based on user insights and future foresights, and b) to apply and develop with service design methods that support collaboration between users and designers and the formation of common understanding. Student groups (with three members) followed the service innovation process. 2) The study unit Agile Methods in Service Design focuses on digital services, service design and agile methods. The students were assigned to design a digital service concept for the bank's private clients which would provide an overview of their own finances. During the course, students identified, implemented and critically evaluated various alternative design solutions, while developing design solutions based on user information in an agile and iterative manner. The both study units executed in close collaboration with the client companies. Two cases research data consists of the curriculum implementation plan, teacher diaries, students' self-assessment and feedback for client companies, as well as assessment of the study unit. The students also evaluated their own work-oriented project learning. Based on the application of the Upola's model (2019) in the context of higher education and empirical data from the two cases, the initial project leaning model for higher education was created. The evaluation of the project learning model was based on self-assessment of the two groups and comparison of the responses of the groups. In addition, the clients evaluated the model from their own point of view. (Kauppinen et al. 2019).

4.2 The second cycle

In the second cycle, our aim was to clarify and define the roles of different actors in the work-oriented project learning model. For this purpose, we interviewed seven teachers in higher education in autumn 2019. The interviewees have extensive experience in connecting a project to a study course in the context of service design. Qualitative information obtained through interviews was analyzed for content analysis. As a result, a proposal supporting the planning and practical implementation of project learning about the roles and responsibilities of different actors was created (table 1).

Table 1. The planning and practical implementation of project learning about the roles and responsibilities of different actors (Kauppinen et al. 2020).

	1. Preliminary arrangements	2. Working on the commission	3. Implementing the project	4. Finishing the project
Teacher	• Initial negotiations with a potential client • Introduces study unit objectives/structure to the client • Evaluates the applicability of a commission to the study unit (e.g. EQF7) • Checks the suitability of commission to LbD • Establishes frames for co-creation • Defines a preliminary design brief (project assignment must leave room for creativity and service design process) • Co-operation agreement with the client	• Ensures that the requirements of the study unit and EQF7 are fulfilled • Discussions with client about task instructions/project assignment • Informs students about client and study unit project (if possible/seen reasonable) • Maps the expertise and domains of the students	• Presents the learning goals • Creates a social atmosphere • Helps students to get to know each other • Supports cohesion in the design teams • Guides the student towards purposeful work • Guides students to the right level of work • Inspires students to creative problemsolving • Supports the learning process and helps with problemsolving • Provides tasks that encourage interaction • Keeps track of meeting the learning goals • Follows and guides project process	• Responds to the commission together with the student team • Evaluation (study unit qualifications, development processes and results) • Offers feedback to the students and client Receives feedback from the commissioner • Develops study unit according to feedback
Student	• Adopts the idea of LbD • Reflects their own expertise with respect to theory/materials of the study unit • Studies theory of the study unit • Plans own schedule for the study unit	• Students share their know-how and experiences in study group and team	• Team chooses the leader and roles • Conceives of a project plan for the team • Works to the schedule • Solves the design challenge by implementing the plan in accordance with design process • The team leader manages the schedule • Works according to design process • Student construe their learned knowledge	• Responds to the commission and presents the developed concept • Receives feedback and adds finishing touches to the concept • Peer reviews • Submits the documentation for the development work Gives feedback to teacher
Client	• Participates in the initial negotiations to understand the learning goals of the project • Defines preliminary objectives for design brief • Makes co-operation agreement with Laurea	• Presents the demands for development in the organisation • Modifies and defines the assignment • Defines project resources such as task content, time and financial resources	• Presents design brief and design challenges • Provides feedback about ideas/prototypes • Encourager & co-learner • Inspires students with good first impression • Provides space as a learning environment • Offers feedback and comments	• Participates in the presentation of development work • Receives the finished works of student teams and documentations of the development process • Offers feedback and comments on the finished work/process/collaboration
Support service	• Searchers for clients and commissions • Maintains connections with clients • Manages contractual matters • Contracts and signatures (e.g. IPR and NDA) • Potential money transactions (e.g. administrating a cooperative)	• Reserves and allocates finances for the use of the project team • Material and travelling expenses • External outsourcing services • Reserves the necessary working spaces and tools	• Allocates financial revenues for the use of the project team (e.g. through a cooperative • Material and travelling expenses • External outsourcing services • Technical support	• External communication • Compiles statistics on RDI points

4.3 The third cycle

The purpose of the third cycle was to ensure that the model of the work-oriented project learning enables all three levels of learning and knowledge production: monological, dialogical and trialogical learning. Thus, the developed model was analyzed in the trialogical learning framework by Hakkarainen and Paavola (2009). In addition, we interviewed two students who have participated in service design courses that have utilized work-oriented project learning.

5 WORK-ORIENTED PROJECT LEARNING MODEL FROM THE PERSPECTIVE OF TRIALOGICAL LEARNING

While it is important to learn in all three ways of learning (monological, dialogical and trialogical learning) in project learning, the most difficult to reach and facilitate is trialogical learning. The developed model of the work-oriented project learning in the context of master's degree education was guided by the shift from a dialogical approach to a trialogical. The table two presents 2 typical characteristics of the three metaphors of learning and analysis how our work-oriented project learning model changes when it viewed from the perspective of trialogical learning.

Table 2. Typical Characteristics of the Three Metaphors of Learning and analysis our model.

Phases of the work-oriented project learning	**Monological learning**	**Dialogical learning**	**Trialogical learning**
	• "Monological" perspective (within mind) • An individual process of adopting or constructing subject matter knowledge and mental representations	• "Dialogical" perspective (between participants, or towards authentic situations) • A process of participating in social communities • Enculturation, cognitive socialization • Transforming norms, values, and identities	• "Trialogical" perspective (co-evolution of inquirers, communities, and objects of inquiry) • Individuals and groups creating and developing new material and conceptual artefacts • Conscious knowledge advancement, discovery, and innovation
	• Individuals	• Groups, communities, networks, and cultures	• Individuals and groups creating mediating objects and artifacts within cultural settings
1. Preliminary arrangement	• Each student has their own previously acquired educational background	• Students are divided into multidisciplinary design groups	• Students are divided into multidisciplinary design groups
2. Working on the commission	• The student becomes acquainted with the field of the project task • The student deepens his / her own knowledge by getting acquainted with the key concepts, theories of the study course • The student practices the use of methods and tools independently	• Students deepen their own understanding by working together and learning from each other: e.g., by discussing the key concepts and theories of the study course • Students utilize boundary objects to communicate and form a common understanding • Groups of students practice using methods and tools together	• The design brief is finalized in collaboration between the students, the teacher and the client • Multidisciplinary student groups define the goal of their own group work, which forms a "socially shared object" for them • Students from different backgrounds share and develop their competence to achieve a common goal
3. Implementing the project	• The student completes his / her own skills as needed; industry, concepts, theories, methods and tools	• Teacher guides the design group and its performance • Multidisciplinary group share they know-how during the project • Groups use visualizations and prototypes in support of the discussion with teacher and client (i.e. use boundary objects)	• Multidisciplinary design groups share and develop their expertise to achieve a "socially shared object" • Design groups create a whole new thing is together with teacher and client • Knowledge creation takes place by organizing a social community to work together with the assistance of mediating tools to develop these common goals
4. Finishing the project	• Students receive a grade for the development of their learning	• Students peer review their own group's and other group's project outputs	• Students reflect on the learning of their own group from the perspective of jointly defined learning objectives

6 DISCUSSION

The purpose of this article was to deepen understanding of work-oriented project learning at university of applied sciences, where working life cooperation and regional development is expected. The paper presented an updated pedagogical model of work-oriented project learning in the context of master's level service design education that is based on synthesis of the project learning approach and pedagogic Learning by Developing (LbD) model by Laurea. This study followed action research due to its practical and hands-on nature.

The first version of the development of the work-oriented project learning in the context of master's degree education model based on the work-oriented project learning model by Upola (2019) and pedagogical LbD model by Laurea (Kauppinen et al. 2019). Upola's (2019) pedagogical model provided practical action models. While it is important to learn in all three ways of learning in project learning, the most difficult to reach and facilitate is trialogical learning. The developed model of the work-oriented project learning in the context of master's degree education was guided by the shift from a dialogical approach to a trialogical. The overall pedagogical objective of the trialogical approach is to promote the transformation of prevailing educational practices that facilitates the development of skills and competencies of deliberate creation and building of knowledge from the beginning of higher education. The trialogical approach that helps to understand the processes of knowledge progression proved to be a useful frame of reference in the analysis of the model. The trialogical approach is not just a process of storing information within the human mind, but it is connected to social processes of the development of shared objects. These objects can be concrete, material artifacts, but the role of operational processes related to conceptual artifacts is also essential for in-depth learning. (Paavola & Hakkarainen 2008).

The updated model presented in this paper is intended to guide project learning where a multidisciplinary master-level student groups use service design methods to co-create solutions to the design challenges identified by the partner organizations. The project learning takes place during a study unit. The model describes LbD-based project learning during the study unit. Project learning e.g. in the context of R&D projects requires the student to play an active role already at the first stage of the project learning model.

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