

Students' Goal Orientations During a Pedagogical Innovation Process

A Study in Craft, Design and Technology Teacher Education

Eila Lindfors, Anna Lundberg and Saija Kuusisto

Learning goal orientation profiles are used to describe an individual's general attitudes and expectations of their performance. Students with strong goal orientation focus on the task itself, rather than on how their performance will affect themselves or their surroundings. This study aims to understand factors linked to students' goal orientation during a pedagogical innovation process (PIP). The research material was gathered in the Craft, Design and Technology (CDT) education teacher training programme of a Finnish university. The data consisted of learning diaries (N=22) written by student teachers who, in their learning assignment, had to find a solution to an authentic problem: to design and manufacture an artefact aimed at assisting the teaching of CDT. The results of this study indicate that the students with a high level of goal orientation experienced many beneficial factors whereas students with a low level of goal orientation experienced many disadvantageous factors during the PIP. According to the results, factors lowering goal orientation seem to be linked to students' attitudes and study skills or to their experience of unclear instructions. The factors improving goal orientation were the possibility of learning new things and an opportunity to influence their work. The theory-driven content analysis opened up a new way of categorising the factors for students' personal work and group work, as well as the factors related to learning assignments and teaching arrangements. According to this study, education should be organised in way that students find explicit and interesting. By understanding the factors behind the formation of learning goal orientation, teachers will be able to influence students in a way that benefits learning.

Keywords: Goal orientation; Pedagogical innovation process; Teacher education; Higher education; Craft, Design and Technology education; Qualitative.

Introduction

Goal orientation describes an individual's attitudes towards and expectations of their performance. Identical learning situations can be perceived differently by different students according to the students' motivational factors, desired learning outcomes and interpretations of various situations. Students with a strong goal orientation focus on the task itself, rather than on how their performance will affect themselves or their surroundings. Specific goal orientation profiles can be generated according to specific, qualitatively different characteristics. Individual differences in goal orientation are associated with academic performance and well-being (Lerang et al., 2018; Niemivirta et al., 2019; Tuominen-Soini et al., 2012; Volet et al., 2019).

Studies on goal orientation give insights into why it is that certain circumstances and methods have varying impacts on students. In their study Volet, Jones and Vauras (2019) conclude that students' favourable attitudes towards learning are more important than whether students have prior knowledge of the subject or not. They also point out that if some students in a group setting are determined to learn, they influence their peers to be proactive learners too (Volet et al., 2019).

Students with different goal orientations benefit from different kinds of learning assignments and methods of instruction. Recognising students' goal orientations is a key factor for teachers when they

use open learning assignments. These seem to be beneficial for students with a strong goal orientation while students with an avoidance orientation would need a lot of support (Lindfors et al., 2018). Modifying the learning environment in such a way that it develops and maintains a high level of goal orientation may improve motivation, attitude and performance among students (Kaplan & Maehr, 2007; Tapola & Niemivirta 2008; Tuominen-Soini et al., 2008, 2012). Understanding the factors behind goal orientations thus gives teachers the opportunity to enhance students' learning.

Because one goal of pedagogy is for students to learn creative problem-solving, open problems and challenges are used to enhance design thinking and the invention of solutions. In a pedagogical innovation process (PIP) (Lindfors & Hilmola, 2016) one of more students implement creative and reflective problem-solving, as well as design, manufacturing and testing skills, in order to invent and master new solutions for a real-world problem. The process involves several tasks to be managed to create an innovation within a pedagogical context: the user needs analysis, a problem definition, ideation, critical testing of options based on ideas, usability development, prototyping, planning, making, fabrication and usability evaluations conducted through self-reflection and process and solution assessment (Jaatinen & Lindfors, 2019; Lindfors, 2010). While the inventions are facilitated in the context of education, we use the term PIP. To experience the PIP, students have to manage an innovation project that, as a social phenomenon, brings the competence of several individuals together through social processes in which a novel idea is turned into a practical reality (Taatila et al., 2006). Open learning assignments in PIP seem to be managed well by young students with mastery goal orientation while students with avoidance orientation have difficulties (Lindfors et al., 2018).

Since PIP offers the possibility of studying goal orientations according to an open learning assignment and student teachers are used to reflect on their learning, this research was conducted in a teacher education context. The general aim was to gain an understanding of the factors connected to students' goal orientation during a PIP. The following research question was posed: What are the factors connected to goal orientations in an open learning assignment during a PIP?

Theoretical background

Goal orientation theory describes how our needs and goals direct our behaviour. The theory was developed on the basis of research on achievement motivation (Kaplan & Maehr, 2007; Pintrich, 2000). There are several goal orientation models, with varying kinds of orientation. Originally, the first two main orientations were mastery orientation and performance orientation. Later, the descriptions were specified, and different orientations were added to include components of approach and avoidance (Kaplan & Maehr, 2007; Lerang et al., 2018; Tuominen-Soini et al., 2008, 2012).

According to Niemivirta, Pulkka, Tapola and Tuominen (2019), students' goal orientation can be identified and described according to five different orientation profiles: mastery-intrinsic orientation, mastery-extrinsic orientation, performance-approach orientation, performance-avoidance orientation and avoidance orientation. Students' goal orientation is relatively stable over time as well as similar across studies (Niemivirta et al., 2019; Tuominen-Soini et al., 2008.)

Students with mastery-intrinsic orientation or mastery-extrinsic orientation engage in learning, have a strong inner motivation, high self-efficacy and positive self-perceptions. Mastery-intrinsic students emphasise personal development and growth, whereas students with mastery-extrinsic orientation concentrate more on good grades and outperforming peers. Whereas mastery-oriented students concentrate on mastering a certain skill, performance-oriented students concentrate on the performance itself, not so much on mastering the skill. Students with a performance-approach orientation long to succeed but they have relatively low self-efficacy and high fear of failure. Students with a performance-avoidance orientation tend to avoid tasks in general because they want to avoid failure altogether. Students with an avoidance goal orientation have low self-efficacy. They aim to escape all effort and minimise the time spent studying altogether. They do not engage in working nor are they interested in it (Niemivirta et al., 2019).

In his study, Pulkka (2014) found distinct groups of university students representing different goal orientations. Goal orientations were associated with the academic performance of the students. Mastery-oriented students typically had high course evaluations whereas the avoidance-oriented students scored lower points in course evaluations. Pulkka suggests that students' differing perceptions of their learning and the learning environment should be taken into consideration by educators. Ketonen (2017) reports that the academic success and the engagement of university students is linked to their motivation and commitment to studying. The level of engagement is connected to students' academic performance: Disengaged students have less favourable outcomes than the engaged ones (Ketonen, 2017). In addition to being a hindrance for learning, negative feelings and low self-efficacy can also be important factors in leading students to high levels of engagement and performance as they gradually learn to take more responsibility for their learning (Bieg, 2017; Litmanen, 2015).

In light of earlier research (Ketola, 2017; Niemivirta et al., 2019; Pulkka, 2014), it can be concluded that mastery-intrinsic orientation is preferable for good learning outcomes. Students with a mastery-intrinsic goal orientation are willing to push themselves to learn. Performance-oriented students are worried about social comparison with their peers, so their focus tends to be on performing well, not essentially on learning. PIP combines authentic, situational learning with the learner's ability to think and create novelty. In this sense, a PIP offers an interesting environment in which to study students' goal orientations.

Methods

The data of this qualitative case study (Yin, 2014) were gathered in one course in teacher education for CDT at a Finnish university. The target group consisted of student teachers taking part in a course in which they carried out a PIP by designing and manufacturing an artefact – a solution to a real-world problem that was given as a learning assignment (Figures 1 and 2). The artefact was aimed to assist the teaching of CDT in early childhood, pre-primary education and/or grades 1–2 basic education; in other words, children aged 5 to 9 years. This was intended to be an interesting learning assignment for the student teachers.

To find a 3D-solution to the learning assignment, the student teachers were made familiar with design and engineering process models such as user-centred design. They investigated the market to get ideas for product improvement and interviewed teachers and daycare workers to facilitate user orientation in the project. The learning assignment was performed in groups of 4–5 students. After the preliminary ideation phase, three of the groups were joined to form a bigger group to design and manufacture one artefact together. The other groups manufactured one artefact each.

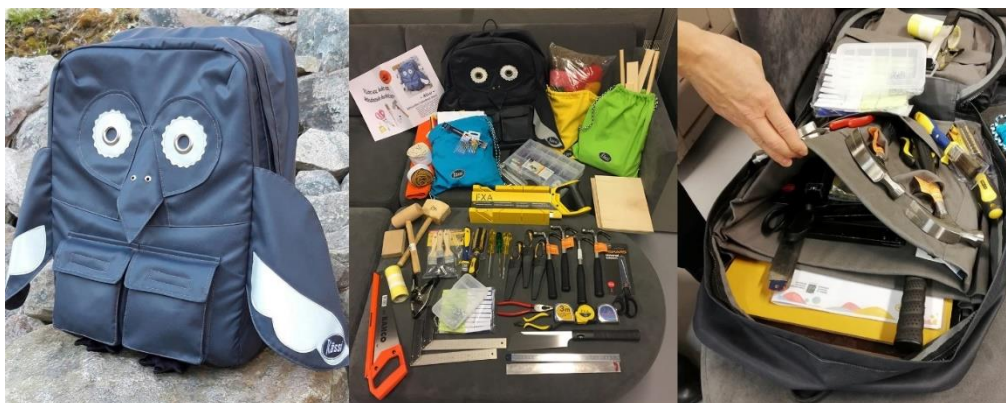


Figure 1. One product out of six from the PIPs. The function of the product is to facilitate CDT learning in daycare centres and preschools in changing learning environments.



Figure 2. One product out of six from the PIPs. A movable CDT workstation facilitates working with hand tools in different, changing learning environments.

A learning diary was an obligatory part of the learning assignment. However, taking part in the study was voluntary. Altogether, 22 student teachers out of 29 who completed the assignment in time gave permission to use their learning diary as document data. All the subjects were adults and gave their consent to participate in writing. In the diaries, they reported every occasion of working on the project, specifying the amount of time used and the content of the work. The subjects determined their own experienced goal orientation on each named occasion and ticked it in a table. In addition, they described their goal orientation in writing. While reporting their work, the students had an opportunity to describe learning in their own words in open questions and to focus on points they found significant. The learning diaries were anonymised by numbering.

The learning diaries were analysed (Boven, 2009) by implementing theory-driven content analysis (Krippendorff, 2019). First, an overview of the student teachers’ goal orientations during the research period was made by tabulating the working occasions and the named goal orientation per every 30 minutes. Then, all the original phrases were collected and grouped by the named goal orientation. The original phrases were compressed and categorised into subcategories. The subcategories were thematically grouped into categories. On the basis of the themes found, four categories were formed: personal work, group work, learning assignment and teaching arrangements. The categories were further grouped into two main categories: factors related to students and factors related to the education provider. An example of the content analysis is shown in Table 1.

Table 1. An example of the theory-driven content analysis (N=22).

<i>Original phrase</i>	<i>Subcategory (simplified phrase)</i>	<i>Category</i>	<i>Main category</i>
Student 2: ‘Another course was pressing on and my thoughts were already in a workshop of that other course’	Thoughts off the task	Personal work	Factors related to students
Student 7: ‘I was already tired from the past day, and I wasn’t able to concentrate all the time.’	Fatigue		
Student 4: ‘It would be nice to efficiently take part in the manufacturing ... too many cooks spoil the broth.’	Group too big	Group work	
Student 6: ‘I wanted to make progress in the assignment, but the group’s low motivation slowed down the work.’	Non-functioning group		

Student 13: ‘The unclear instructions of the learning assignment confused the planning process.’	Unclear learning assignment	Learning assignment	Factors related to the education provider
Student 4: ‘Motivation is based on obligation – it is not internal.’	Lack of enthusiasm towards learning assignment		
Student 7: ‘The presentations took a great amount of time – time that we could have made better use of by continuing our own assignment.’	Disappointment in the contents of teaching	Teaching arrangements	
Student 15: ‘Busy schedule, too late announcement of the assignment.’	Unexpectedly given learning assignment		

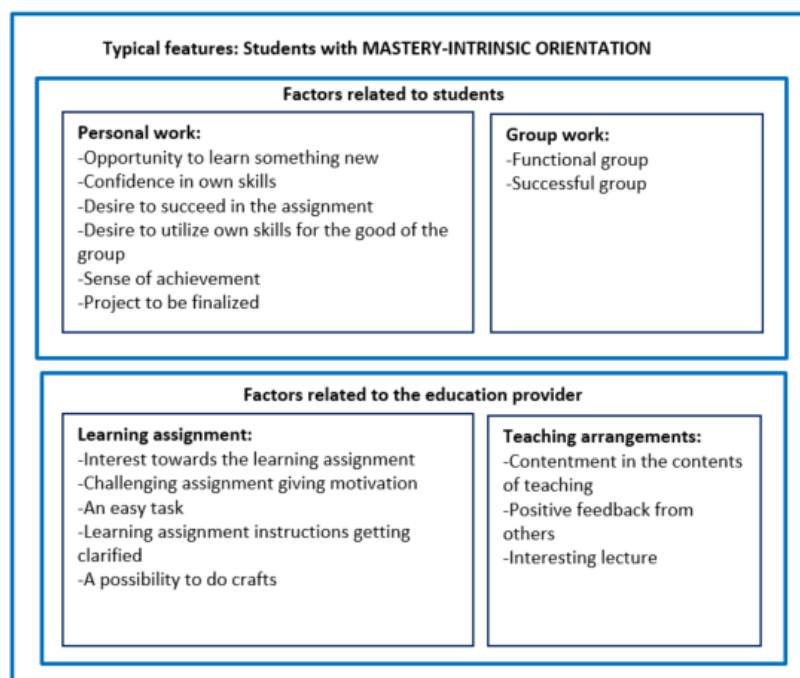
Results

This study aspired to understand the factors related to students’ learning goal orientations during a PIP. Simplified phrases, discovered from the original phrases used in the learning diaries of students working with the various goal orientations, are presented in Tables 2–6. Factors related to students’ experiences were divided into two categories (personal work and group work), as were factors related to the education provider (learning assignment and teaching arrangements) (Table 1).

Typical features of the mastery-intrinsic orientation

Simplified phrases of the students who had mastery-extrinsic orientation experiences while working in the PIP are featured in Table 2. Factors related to students’ personal work in mastery-intrinsic orientation included the opportunity to learn something new, confidence in one’s own skills, a desire to succeed in the assignment, a desire to utilise one’s own skills for the good of the group, a sense of achievement and a fast-approaching deadline. Group work factors included a functional group and successful group work. The analysis revealed that the students with the mastery-intrinsic orientation enjoyed working in the innovation project while advancing the process by utilising their skills and learning new things within the challenges of a successful group work.

Table 2. Typical features of the mastery-intrinsic orientation in the PIP.



Factors related to the education provider’s given learning assignment included interest in the learning assignment, a challenging assignment giving motivation, an easy task, learning assignment instructions being clarified and the possibility of doing crafts. Teaching arrangement factors included contentment with the contents of teaching, positive feedback from others and interesting lectures. The students experienced an appropriately challenging assignment as motivating and they were eager to develop a solution. They were interested in the contents of teaching, and feedback from peers and teachers inspired them.

Examples from the original phrasing in the learning diaries:

Student 22: *‘I performed the task well because I wanted to succeed in it and develop my skills.’* (Factors related to students → Personal work → Desire to succeed in the assignment)

Student 7: *‘The group found “a mutual tune” and my motivation rose. We advanced the task.’* (Factors related to students → Group work → Successful group work)

Typical features of the mastery-extrinsic orientation

Simplified phrases of students who had mastery-extrinsic orientation experiences during PIP are shown in Table 3. In mastery-extrinsic-oriented working, the factors related to students’ personal work included experiencing a feeling of being rushed and group work included a non-functioning group. However, the students considered working to be pleasant and they wanted to succeed in the task. On the other hand, they were uncertain about their own skills. For some students, the group work was non-functioning, but some trusted the collective work to be productive.

Table 3. Typical features of the mastery-extrinsic orientation in the PIP.

Typical features: Students with MASTERY-EXTRINSIC ORIENTATION	
Factors related to students	
<p>Personal work:</p> <ul style="list-style-type: none"> -Desire to succeed in the assignment -Commitment to performing the task -Confidence in own skills -Interest towards the course -Sense of achievement -Project to be finalized -Unsuitable point of time for teaching -Pleasant way of working -Experienced feeling of rush -Uncertainty about own skills -Project to be finalized soon 	<p>Group work:</p> <ul style="list-style-type: none"> -Functional group -Unfunctional group -Confidence in the skills of the group
Factors related to the education provider	
<p>Learning assignment:</p> <ul style="list-style-type: none"> -Interest towards the learning assignment -A possibility to do crafts -Challenging assignment giving motivation -Inspiration from the competition aspect of the learning assignment -The amount of study points does not match the amount of work -Unclear learning assignment instruction 	<p>Teaching arrangements:</p> <ul style="list-style-type: none"> -Confidence in the course arrangements -Contentment in the contents of teaching -Functioning learning environment -Chance in the original learning assignment

In factors related to the education providers, the students considered that the given learning assignment included more work than they expected. The factors related to the teaching arrangement included a change in the original learning assignment. The students felt that the learning assignment required too much work and that the given instructions were confusing.

Examples from the original phrasing in the learning diaries:

Student 20: ‘The subject was interesting and engaging. The overall hurry in other studies took a toll on the working.’ (Factors related to students → Personal work → Experienced a feeling of being rushed)

Student 12: ‘It was nice to work in the new group and do design, but at the same time I was annoyed that we had used a lot of time earlier to design a product that we didn’t get to manufacture.’ (Factors related to the education provider → Teaching arrangements → Change in the original learning assignment)

Typical features of the performance-approach orientation

Simplified phrases of students who had performance-approach orientation experiences during the PIP are shown in Table 4. The students with a lower goal orientation found it hard to see positive things during the research period. They felt tired and uncertain of their own skills and struggled to find meaning in the studying. They felt that the education provider failed to arouse their interest or the involvement of the students because the contents of the teaching were experienced as disappointing.

Table 4. Typical features of the performance-approach orientation in the PIP.

Typical features: Students with PERFORMANCE-APPROACH ORIENTATION	
Factors related to students	
Personal work: -The only goal is getting the performance mark -Fatigue -Uncertainty about own skills -Experienced feeling of rush -Taking part when ill -Unsuitable point of time for teaching	Group work: -Unfunctional group
Factors related to the education provider	
Learning assignment: -Lack of interest towards the learning assignment -Unable to develop own skills -Unclear learning assignment -Competition aspect of the learning assignment being unexciting	Teaching arrangements: -Disappointment in the contents of teaching -Unfunctional learning environment -Unexpectedly given learning assignment -Disappointment in the arrangements of the course -Change in the original learning assignment -experienced feeling of being threatened

Examples from the original phrasing in the learning diaries:

Student 3: ‘I was already tired from the passing day, and I wasn’t able to concentrate the whole time.’ (Factors related to students → Personal work → Fatigue)

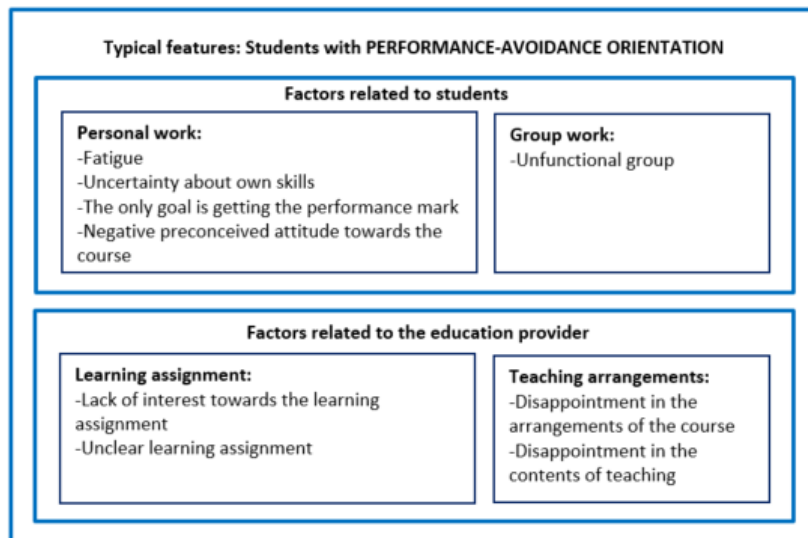
Student 1: ‘The equipment is not up to date, which made working difficult.’ (Factors related to the education provider → Teaching arrangements → Dysfunctional learning environment)

Typical features of the performance-avoidance orientation

The simplified phrases of students who reported in their diaries performance-avoidance orientation experiences during the PIP are presented in Table 5. In performance-avoidance-oriented working, the factors related to students consisted of fatigue and a lack of interest. Non-functioning group work was experienced throughout the group. Factors related to the education provider consisted of the students’ experiences of an uninteresting learning assignment and disappointing teaching arrangements. Students had lot of negative self-perceptions and struggled to find meaning other than getting yet another course

approved. The students considered the learning assignment boring and felt the education provider had failed in constructing the teaching arrangements.

Table 5. Typical features of the performance-avoidance orientation in the PIP.



Examples from the original phrasing in the learning diaries:

Student 17: ‘I am not at all interested in the assignment. I cannot understand what I am supposed to learn in it. Motivation is extrinsic since this is an obligatory assignment.’ (Factors related to the education provider → Learning assignment → Unclear learning assignment)

Student 8: ‘The list of required materials could have been conducted already in the previous lecture. It feels like there is too much time for the designing and not enough time for the manufacturing.’ (Factors related to the education provider → Teaching arrangements → Disappointment in the arrangements of the course)

Typical features of the avoidance orientation

The simplified phrases of students who reported in their diaries avoidance orientation experiences during the PIP are presented in Table 6. In avoidance-oriented working, the factors related to students featured uncertainty about their own skills, fatigue and a lack of interest. Groupwork was described as non-functioning. The factors related to the education provider contained negatively experienced aspects, such as a lack of interest and a feeling of inequality. The teaching arrangements were disappointing for students and described as uninteresting and confusing. The avoidance-oriented students could not find positive aspects in the process. They were not interested in the given learning assignment or learning and could not find a reason to commit to working.

Table 6. Typical features of the avoidance orientation in the PIP.

Typical features: Students with AVOIDANCE ORIENTATION	
Factors related to students	
Personal work: -Thoughts wondering off the task -Uncertainty about own skills -Fatigue -The only goal is getting the attendance mark -The only goal is getting the performance mark -Negative preconceived attitude towards the course	Group work: -Some of the group members not present -Unfunctional group -Too big group
Factors related to the education provider	
Learning assignment: -Lack of interest towards the learning assignment -Unclear learning assignment -Experienced feeling of inequality compared to other groups caused by learning assignment instructions	Teaching arrangements: -Disappointment in the contents of teaching -Disappointment in the arrangements of the course -Change in the original learning assignment -Disappointment in the way the learning assignment is given

Examples from the original phrasing in the learning diaries:

Student 2: ‘Again, it was only me and one other student working, which ate away at our motivation.’
 (Factors related to students → Group work → Some of the group members not present)

Student 13: ‘The unclear instructions of the learning assignment made the design process confusing.’
 (Factors related to the education provider → Learning assignment → Unclear learning assignment)

Discussion and conclusions

The aim of this study was to gain an understanding of the factors connected to students’ goal orientation during a PIP. The study was carried out within a course in teacher education, in which the students had to master an innovation project in groups (Hero et al., 2019; Lindfors & Hilmola, 2016) in order to solve a real-world learning assignment and create an innovative solution for a real problem. The data consisted of documents, namely, the learning diaries that the students wrote on the basis of their experiences, in which they identified and described their learning goal orientations. The research data were rigorously studied by two researchers, and the results emerged robustly throughout the data. Even though the student teachers were used to reflecting on their learning and the data were rich, it is not possible to generalise from the results of this qualitative study with 22 subjects.

Differences in individual learning goal orientation are associated with academic performance and commitment to learning assignments (Niemivirta et al., 2019; Lerang et al., 2018; Tuominen-Soini et al., 2012; Volet et al., 2019). The typical factors related to the various learning goal orientations in this study (Tables 2–6) are in line with those of earlier studies. The students with a high level of goal orientation experienced many beneficial factors, whereas students with a low level of goal orientation experienced many disadvantageous factors. According to the results, factors lowering goal orientation seem to be linked to students’ attitudes and study skills or to their experience of unclear instructions. The factors improving goal orientation were the possibility of learning new things and the opportunity to influence their own work (Tables 2-3; Ketonen, 2017; Pulkka, 2019). However, the theory-driven content analysis (Krippendorff, 2019) opened up a new way of categorising the factors in relation to

students' personal work and group work, as well as the factors related to learning assignments and teaching arrangements.

The group seems to have had an enormous meaning for the students (see also Hero & Lindfors, 2019; Volet et al., 2019). A non-functioning group was mentioned as a factor in performance-approach orientation, performance-avoidance and avoidance orientation (Tables 4–6). The way in which way the group supports goal orientation or weakens it in PIP needs to be studied further. Is it that the grouping itself that should be organised in a certain way? Since all the respondents of this study were CDT education student teachers, the findings give an insight into facilitating innovation processes in higher education (see also Hero & Lindfors, 2019). It seems that teachers should identify the goal orientations of their students to help them plan learning assignments and teaching arrangements to advance students' commitment to learning. As education providers, teachers should support students with different learning goal orientations in different ways, and should recognise the needs of strong and weak goal orientation students (Tables 2–6). Future research is needed on a wider scale of pedagogical innovation projects to get a better view of the relative weight of specific factors affecting the goal orientation of students' performance. One interesting question is why many students who experience the same learning assignments and instructions as others in advancing their PIP find them to be negative for their PIP and, contrary to Bieg (2017), do not take these as challenges. This may be related to timely individual support during PIP (Jaatinen & Lindfors, 2019) and needs to be studied in the future.

Acknowledgements

This study is part of the InnoPlay 2018–2021 project, which aims to develop craft, design and technology teaching and learning in early years among 5- to 8-year-old children and their teachers. The project is financed by the Ministry of Education and Culture in Finland and the University of Turku's Department of Teacher Education.

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