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ORIGINAL PAPER

Designing innovative learning environments to foster communities of learners for students in initial vocational education

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Abstract   In this study, the concept of 'community of learners' was used to improve initial vocational education. The framework of a 'community of learners for vocational orientation' that we present offers both a theoretical understanding of teaching–learning processes in initial vocational education and heuristics for the design of innovative learning environments for optimising these processes. In a design research study, we investigated if, and how, learning environments designed on the basis of these heuristics fostered communities of learners for vocational orientation, in which students experience to learn in a shared, meaningful, reflective and transfer-oriented way. We examined students' perceptions of the learning environment and their learning activities during eight curriculum units specifically designed to foster the communities of learners. During almost all of the units that we designed, students found themselves learning in a more shared, meaningful, reflective and transfer-oriented way than during regular units. We conclude that the proposed heuristics had been useful starting points for the design of innovative learning environments that foster communities of learners for vocational orientation. In addition, we

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show how the heuristics can be elaborated for a particular school, based on practical and pedagogical content knowledge of teachers, as well as students' perceptions of the learning environment and their learning activities.

Introduction

For over two decades, the concept of a 'community of learners' has been much praised in educational discourse. Its popularity could stem from the fact that it is a pedagogical concept that implies both a vision of particular goals of education and the manner in which these goals can and should be realised. This makes the community of learners concept a powerful tool for the design of learning environments. Educational researchers have experimented with different learning environments which draw upon communities of learners to determine which ways of fostering such communities are most effective (Beishuizen 2008; Brown and Campione 1994; Engle 2006; Scardamalia and Bereiter 1994; Shulman and Sherin 2004; Stefanou and Salisbury-Glennon 2002). However, most of this effort has been devoted to general as opposed to vocational education.

European school systems comprise schools of both general education and vocational education. The main objective of the latter is preparation of the student for employment. However, today's knowledge-based economy requires initial vocational education also to provide a broad base of knowledge and skills (Hogarth et al. 2008; Sapir et al. 2004). The initial, preparatory years of secondary vocational education thus include general educational elements and the promotion of a vocational *orientation*. Schools for initial vocational education aim to develop basic vocational knowledge and skills, as well as an initial vocational identity, by providing students with vocational experience. This is supposed to help them to make informed choices with regards to their further education.

In this article, we explore the potential of communities of learners for the design of innovative learning environments in initial vocational education. We first describe our 'community of learners for vocational orientation' with regards to the main goal of initial vocational education. Next, we discuss our theoretical understanding of desired teaching–learning processes and heuristics for the design of innovative learning environments to optimise these processes. We then report the results of a design research study in which teachers and researchers jointly used our 'community of learners' framework to design curriculum units at two Dutch secondary schools for initial vocational education. We examined if, and how, the learning environments designed on the basis of these heuristics fostered communities of learners for vocational orientation, in which students experience to learn in a shared, meaningful, reflective and transfer-oriented way.

Communities of learners for students in initial vocational education

Innovative learning environments should be designed on the basis of a careful analysis of the teaching–learning processes prerequisite to realizing the goals of education. The objectives of Dutch initial vocational education are to stimulate students to develop basic

vocational knowledge and skills, as well as an initial vocational identity. In initial vocational education, most learning environments rely on workplace learning as a means to pursue its goals. However, work as a context for learning neither self-evidently leads to the development of vocational expertise (Tynjälä 2009), nor in all cases appeals to students' affinities and abilities regarding future vocations and associated continued education. In Dutch schools for initial vocational education, for example, competence-based learning has been introduced (Koopman et al. 2011), and this entails workplaces being simulated in the school or students learning and working at workplaces outside the school. Nevertheless, both employers who provide internships and teachers at schools for continued vocational education are generally not satisfied with the starting level of students' knowledge and skills (Neuvel and Van Esch 2010). Moreover, almost half of the students at the end of their initial vocational education have only partially developed a perspective on a future vocation and on the occupational sector for which they had started training (Kuijpers et al. 2011). These students have an increased risk of disappointing learning results and drop out during their future education.

Just introducing workplace learning during initial or later vocational education has other limitations as well. On the one hand, real workplaces provide little distance from the exigencies of the work situation. Such distance is crucial, however, for seeing how theoretical concepts can help one to understand, join and question workplace practices (cf. Guile and Griffiths 2001). On the other hand, simulated workplaces are often based upon an incomplete representation of the essential aspects of the workplace (Boersma et al. 2010). There is a risk of attending only to technical aspects of a particular vocation, thereby limiting critical reflection upon how one relates to that vocational practice.

Our 'community of learners' framework for initial vocational education aims to address the aforementioned issues by integrating work and school as contexts for learning. In previous research (Boersma et al. 2010), we took the concept of communities of learners (Brown and Campione 1994) and the concept of communities of practice (Lave and Wenger 1991; Wenger 1998) as starting points for a better theoretical understanding of the teaching–learning processes intended in initial vocational education. The concept of a community of practice led us to the idea of learning as participating in an increasingly more competent way in vocational practices. The concept of a community of learners focuses on more deliberate learning that offers students opportunities to distance themselves from practical situations and develop an inquisitive stance. We combined the main features of both concepts in a 'community of learners for vocational orientation'. An ideal learning community for vocational orientation stimulates students to participate in vocational practices that are represented in such a way that their essential elements are maintained, but actual peripheral participation by non-skilled participants such as students becomes possible. While participating, students are confronted with the necessity to make action decisions that have both technical and ethical aspects. Their actions are guided and enabled by material and mental 'instruments' that reflect the experiences of the actual vocational community. Critical reflection on the nature of practice and the students' participation in it enable students to explore their affinities, abilities and possibilities regarding the vocational practices to which they are introduced. It enables them to distinguish directions in which they are willing and able to develop themselves in order to become professional workers. From a theoretical perspective, communities of learners for vocational orientation thus contribute to the goal of initial vocational education to support students to develop basic vocational knowledge and skills as well as an initial vocational identity.

Learning environments to foster communities of learners for vocational orientation

Communities of learners can be fostered by learning environments that offer the opportunity and stimulus for people to form such a community. Such learning environments can be viewed as pedagogical contexts for learning that affect the quality of those people's learning—and hence their learning results. In our previous research, we argued that working in a 'community of learners for vocational orientation' ideally leads to learning in a shared, meaningful, reflective and transfer-oriented way (Boersma et al. 2010). Below we discuss the theoretical foundation for each of these interrelated features of learning. In addition, we discuss heuristics for the design of learning environments that, based on literature, we expect to promote shared, meaningful, reflective and transfer-oriented learning. These heuristics can be viewed as starting-points for the design of learning environments. In order to design innovative learning environments at schools, the heuristics need to be elaborated on the basis of teachers' pedagogical content knowledge and practical knowledge on the characteristics of the students, teachers, current subject lessons and school environment of each particular school.

Shared learning (SL)

In a community of learners for vocational orientation, students cooperate with teachers and vocational professionals to accomplish a vocational activity in light of a shared goal. They interact and share their knowledge and experiences and by doing so develop new knowledge and ways of acting both individually and as a group (Rogoff et al. 2001; Wenger 1998). The teachers and professionals act as experienced members of the community while students are regarded as peripheral, but nevertheless legitimate, members of the community (Lave and Wenger 1991).

Heuristics for the design of a shared learning environment can be found in the principles of cooperative learning (SL1) (Johnson and Johnson 2002; Tomcho and Foels 2012): stimulate positive interdependence, individual accountability, and dialogue, and pay explicit attention to the skills needed for successful cooperation and the group process. These heuristics have been found to be operative and effective in instructional methods such as jigsaw and reciprocal teaching aimed at working as a community of learners that fosters students' introduction in academic disciplines (e.g. Brown and Campione 1994; Shulman and Sherin 2004). In a community of learners for vocational orientation, teachers must make sure that the contributions of students as peripheral members of the 'community of practice' are valued and that the expertise provided and developed by the vocational professional community is discussed (SL2).

Meaningful learning (ML)

At school, students are supposed to acquire knowledge and skills which are indispensable for their functioning in society. Nevertheless, students do not always see the significance of such knowledge and skills for their own personal lives and goals. In a community of learners for vocational orientation, students participate in authentic vocational practices which have a particular value and significance for society. Students thereby frequently experience not being able to fully participate in these practices because of faulty or missing competences. The desire and need to join others in the community helps students to realise

that the expertise which they need to develop is required in the vocational practice at stake and thereby makes learning meaningful for the students.

Three design heuristics can foster meaningful learning among students in initial vocational education. Firstly, the students should be asked to engage in real vocational activities and thus practices (ML1). The vocational activities must be constructed in such a manner that essential elements are conserved but peripheral participation by otherwise unskilled students is also called for. Such activities not only make the efforts of the students worthwhile, but they also provide a clear image of the objectives to be achieved (Van Schaik et al. 2010). Secondly, social interaction with people who are normally part of the vocational practice, such as clients and professionals, should be part of the students' education (ML2). Such social interaction requires students to enter into the role of professional and thus provides a natural stepping stone for mastery of the required cultural tools (Van Oers 2010, p. 202). Thirdly, students should be given leeway to explore both established and new ways of doing things (ML3). Such leeway stimulates students to take responsibility and align their personal goals with those of the activity. At the same time, however, the teacher must guarantee successful completion of the activity by taking care of functions which the students cannot yet perform on their own (Van Oers 2010, p. 217).

Reflective learning (RL)

Students should not only participate in vocational activities but also improve their participation via reflection. A community of learners offers opportunities for reflective learning, because students are surrounded by fellow students, their teachers and professionals who, in order to achieve a shared goal, comment upon each other's ideas and actions. Together, they try to find better ways of thinking and behaving. Reflective learning can be defined as engaging in critical dialogue with oneself, while anticipating the comments of others (Wardekker 1998). When students critically discuss their ideas and actions *with each other*, they engage in shared reflective learning and transform their knowledge. They learn to connect theoretical concepts to practical situations and can make explicit their situated knowledge acquired in vocational activities (Eraut 2004). Via reflection, students can also detect how competent they have become and what expertise they must still acquire. Moreover, reflection helps students to 'see' what being a professional in a particular sphere means to them and the importance of that professional sphere for society.

Reflective learning can be stimulated by the following heuristics. Firstly, the engagement of students in increasingly more complex situations can help them to connect theoretical concepts and processes to specific vocational activities (RL1). Secondly, encouraging students, teachers and vocational experts to comment upon each other's ideas and actions can help them to articulate better ways of thinking and acting (RL2) (cf. Van Oers 2010). Verbalisation and commenting can also help make otherwise situated knowledge and skills explicit. Finally, stimulating extended discussion of student experiences with vocational practices can reveal the acquired competences and motives for future participation in a particular vocational practice (RL3) (Kuijpers et al. 2011).

Learning for transfer (TL)

The focus of learning is typically on transferable processes and outcomes. Precisely because the aim of (initial) vocational education is to prepare students for professional activities in

the future, it must equip students with an ability to transfer knowledge and skills from the school setting to other settings in their lives and vice versa (cf. Tuomi-Gröhn and Engeström 2003). In a community of learners for vocational learning, students should be introduced to the 'generative' nature of concepts and processes by recontextualising these in different settings (cf. Campione et al. 1995; Van Oers 1998). Vocational teaching and learning should thus aim not only to socialise students into existing practices but also to enable and allow them to develop new practices (i.e. foster knowledge creation; Paavola et al. 2004). Students must learn not only to participate in a vocational practice but also to take a critical stance on their 'action in the world.' This kind of learning can bring about changes in both the minds and environments of learners (Hager 2004).

Learning for transfer can be stimulated by two heuristics: first, facilitate comparison and contrast of different practices (TL1); second, focus on purposes (TL2) (Barnett and Ceci 2002). By comparing and contrasting accomplishments and the outcomes of—sometimes slightly different—vocational activities, students can be encouraged to construct new and more-generalised knowledge, skills and attitudes. Comparison and contrast also allows them to 'see' what is applicable to different domains of practice. A focus on purposes draws attention not only to the way in which activities can be accomplished but also to student learning: *Why* must students learn certain concepts or ways of doing things and *how* does this information relate to their futures as professionals? Being able to take a critical stance can raise awareness of new knowledge, new identities and new positions in the world, and also of what can be done in and for vocational practices. With such awareness, students themselves can be the bridge between different settings (cf. Beach 1999).

Our 'community of learners' framework for initial vocational education provides heuristics for the design of learning environments as activity settings which stimulate the integration of school and work. It must be noted, however, that such activity settings do not guarantee learning. According to Leontev (1978), any activity refers to a cluster of possible actions to be carried out by an individual at a particular point in time and learning is primarily based on action. Just which actions individuals choose to perform at a particular point in time depends on their perceptions of the learning environment and their characteristics (e.g. self-concept, motives). Teaching–learning processes can thus be conceptualised as transactional processes which are shaped by both teachers *and* students. While teachers stimulate certain actions, students can adapt these actions or even reject them when deemed irrelevant (cf. Roth 2000; Van Oers 1996, 1998; Wardekker et al. 2012). In other words, fostering communities of learners for vocational orientation is not so much an issue of mechanically implementing the aforementioned heuristics but, rather, applying the heuristics in such a manner that they allow the perspectives of the students also to be taken into account.

The present study

The integration of school and work as contexts of learning has been the focus of several models and reforms (Stenström and Tynjälä 2009). Nonetheless, their implementation appears to be hard to realise (Sappa and Aprea 2014). While there are several studies that focused on the integration of learning across different learning sites at the concrete level of teaching and learning in senior secondary or tertiary vocational education (Akkerman and Bakker 2012; Rauner and Smith 2010), comparable studies in initial vocational education are scarce. The present design research was therefore undertaken to examine the potential

of the 'community of learners' framework for optimising student learning at the initial level of vocational education in the Netherlands.

Design research encompasses the systematic study of designing, developing and evaluating educational interventions—such as programs, learning processes, learning environments, teaching–learning materials, products and systems (Plomp 2013). The present design research can be characterised by an iterative and joint process of the design and evaluation of learning environments. Teachers of two innovative initial vocational schools and researchers jointly worked on (re)designing parts of a ninth-grade curriculum for Care and Welfare, based on the heuristics aimed at fostering a community of learners for vocational orientation, and the teachers' pedagogical content knowledge and practical knowledge of characteristics of the students, current subject lessons and school environment of their particular school. This resulted in two units for the first year which were carried out with the ninth grade Care and Welfare students at each school (iteration 1). The units that we developed were evaluated by the teachers and researchers with the opinions of the students also taken into account. More specifically, the researchers encouraged the teachers to examine the learning environments that we jointly developed through the eyes of their students, and improve it accordingly, which appears to be a powerful means of effecting change in student learning (Bell and Aldridge 2014; Fraser 2012). During the second year, the designs of the first-year units were optimised on basis of their evaluation, implemented and evaluated again (iteration 2). A total of eight units were thus designed to foster communities of learners for vocational orientation (see Table 3).

In the design research study, we expected teaching and learning in communities of learners for vocational orientation to contribute to the pursuit of the objectives of Dutch initial vocational education (i.e. stimulate students to develop basic vocational knowledge and skills as well as an initial vocational identity). In this article, we present the formative part of our design research that focused on realising learning environments that foster communities of learners for vocational orientation. We anticipated that the potential of our conceptualisation of a community of learners for vocational orientation would show in the extent to which the students would experience shared, meaningful, reflective and transfer-oriented student learning. Therefore, our research question was if, and how, learning environments designed on the basis of the proposed heuristics foster communities of learners for vocational orientation, in which students learn in a shared, meaningful, reflective and transfer-oriented way.

Methods

Participants

For the conduct of our research, we selected two innovative schools for initial vocational education which were already providing teaching and learning opportunities in simulated workplaces. The teachers in the department of Care and Welfare of these schools agreed with the goal of fostering communities of learners for the education of their students and were willing to actively design and redesign their curriculum units and concomitant learning environments to pursue this goal. Three teachers per school participated in the study.

At each school, two cohorts of students joined our research (see Table 1). Each cohort was investigated by means of four repeated measurements a year through questionnaires,

Table 1 Number of students in participating cohorts

Cohort	Design year 1	Design year 2	Total
School A	28	38	66
School B	40	26	66
Total	68	64	132

lesson observations and interviews. The students were 14–15 years of age and in their penultimate year of initial vocational education.

Curriculum units

Regular units

In the regular vocational subject lessons, the students typically worked in small groups spread across five or six simulated workplaces. For the subject Care and Welfare, the workplaces were Welfare, Housekeeping, General Services, Care Assistance, Beauty Care and Workplace Assistance. During a period of 3 weeks for about 14 hours a week, the students completed theoretical and practical assignments. The theoretical assignments included, among other things, looking up difficult work-related words, studying textbook units which present theory and completing tests. The practical assignments were concerned with what professionals might do in a particular workplace situation and included, among other things, bathing a baby doll (Care Assistance), drawing up a week's menu for an old people's home (Welfare) and doing the laundry (Housekeeping). The students used worksheets which were drawn up by the teachers and provided step-by-step instructions for the completion of the tasks composing the practical assignments. A study guide indicated when a particular assignment should be completed. After 3 weeks, the students moved to the next workplace.

The practical assignments in the regular curriculum units had the following characteristics: they called for small group work; they were prescriptive and therefore did not leave space for students to set their own learning goals; they were performed in simulated workplaces which reflected only the technical and not the social, cultural or historical aspects of vocational practice; and they were performed in isolation (i.e. not in conjunction with other related tasks from vocational practice). While the practical assignments were intended to supplement the theoretical assignments, the students were not explicitly stimulated to relate their practical experiences to their theoretical knowledge or vice versa.

Units we designed

In total, eight units were designed on the basis of the 'community of learners' framework that we developed for initial vocational education. In the design process, the heuristics proposed to stimulate shared, meaningful, reflective and transfer-oriented learning were elaborated based on teachers' practical and pedagogical content knowledge in order to design innovative learning environments at the participating schools (for more information on the process of developing curriculum units, see Boersma et al. 2013).

During one specific unit, the students were preparing for a full morning of activities for 6–8 years-old children at a primary school site. The students took care of the entire event and then evaluated their experiences. As an example, Table 2 shows the assignments for this unit and the heuristics on which they were based. The goal of the unit for the students

Table 2 Assignments for designed unit Activity Morning II

Meet and greet

Students were told at the start of the unit that they would organize an event at a primary school. The students were shown pictures of the children with whom they were going to work, and a video containing fragments of how things went at the primary school. The students also had a meeting with the primary school teachers with who they discussed the characteristics of the primary school children as if they were teaching assistants. (SL2, ML1, ML2)

Planning

Based on a partially drawn up planning the teachers discussed with the students how they could work toward and during an Activity Morning at the primary school. In the planning, several lesson hours, called 'Free hours', were reserved for individual and small group tasks that had to be planned by the small groups. (SL1, ML3, RL2)

Brainstorm

The students had to come up with several activities for the primary school children. In small groups, they had to make a case for a particular activity using explicit criteria provided by the teachers. The teachers stimulated the students to elaborate on any former experiences with young children. The class as a whole then decided on which of the proposed activities would be carried out during the event. (SL1, SL2, ML1, ML3, RL2)

Worksheets

In small groups, the students worked out one of the activities and used a standard, professional, worksheet to do this. The purpose of the worksheets was to allow the small groups to carry out each other's activities. The small groups discussed their activity and initial worksheet with a primary school student teacher. Then they prepared for their activity (collected the necessary materials etcetera). (SL1, SL2, ML1, ML2, ML3, RL2)

Experts

Each small group studied a theoretical topic concerned with the development of primary school children. Next, the students regrouped. Each new group consisted of students who were experts in one of the topics, together covering all topics. These groups conducted the consequential task of adjusting their activities to what they had learned about 6–8 years old children. (SL1, SL2, ML1, RL2)

Role play

The students next role played the responding of a teaching assistant to young children displaying difficult behaviours (e.g. shyness, hyperactivity, clowning). Other students were encouraged to give advice during the role playing process and observe the results. The teacher and students then discussed different manners to work with young school children. (SL1, ML1, ML3, RL2, TL2)

Competences

Halfway through the preparation of the event, just prior to the event and following the conduct of the event, the students were asked to monitor their developing competence by means of a competence list. The competences of the list were also written on cards and distributed to the students before the role plays. Afterwards the teacher and students discussed the competences which the students felt were important during the role play (SL1, M1, RL2, RL3, TL2)

Try-outs

The activities that the students deemed most difficult were practiced by two small groups (one as assistant teachers and one as children) and observed by the others, followed by a discussion. In such a way, they optimized the conduct of their specific activity and manner of guiding primary school children. (SL1, ML1, ML3, RL2)

Event

Students performed the event in a primary school. Students guided 'their' primary school children in all activities—developed in the different small-groups—constituting the event. (SL1, SL2, ML1, ML2, ML3)

Table 2 continued

Evaluation

Small groups created posters with answers to questions like: How did the activity go? Did the young
 children participate enthusiastically? What would you do differently next time? The posters were then
 discussed by the whole class; the reasons for conducting the activities in different ways and interacting
 with the children in different ways were also discussed. (SL1, SL2, ML1, ML3, RL2, RL3, TL1, TL2)

The heuristic RL1 (engaging in increasingly more complex situations) was underlying the design of the
 unit as a whole.

Table 3 Four repeated measurement occasions for each of four cohorts of students

Cohort School A, Year 1		Cohort School A, Year 2	
December/January O_1 X_1	May/June O_2 X_2	December/January O_1 X_1'	May/June O_2 X_2'
Cohort School B, Year 1		Cohort School B, Year 2	
December/January O_1 X_1	May/June O_2 X_2	December/January O_1 X_1'	May/June O_2 X_2'

was to learn about primary school children and orient themselves towards the profession of
teaching assistant.

Data collection

To answer the question about if the learning environments that we designed on the basis of
the proposed heuristics fostered communities of learners for vocational orientation in
which students experience to learn in a shared, meaningful, reflective and transfer-oriented
way, we made a comparison between the students' learning during the curriculum units
that we designed and the same students' learning during regular units. All students of each
cohort were asked to complete a Learning Community questionnaire on four repeated
measurement occasions: right after the regular unit that preceded the first unit we designed
(O_1), after the first unit that we designed (X_1), after the regular unit that preceded the
second unit that we designed (O_2) and after the second unit that we designed (X_2). The first
two measurements took place in December and January, whereas the last two measurements took place in May and June. See Table 3.

To answer the question of how the learning environments designed on the basis of these
heuristics fostered communities of learners for vocational orientation, in which students
experience to learn in a shared, meaningful, reflective and transfer-oriented way, we
zoomed in on two specific units: Activity Mornings I and II. We compared the gain in
shared, meaningful, reflective and transfer-oriented learning during Activity Morning I to
the gain in the four features of learning during the redesigned version of that unit, Activity
Morning II. The reports of teacher-researcher meetings about the design of the units, as
well as the resulting lesson materials, were studied to determine how the heuristics had
been implemented in the design of the units. In addition, all lessons were video recorded to
capture the conduct of the units, particularly the students' behaviour during the units. A
few days following completion of a unit that we designed, eight interviews with pairs of
students were conducted to collect students' perceptions of the learning environment and
their learning activities during that unit.

Measures

Questionnaire

The Learning Community questionnaire, used to assess students' perceptions of their learning during the design versus regular units, was developed on the basis of our theoretical framework of a community of learners for vocational orientation (Boersma et al. 2010). The framework describes the four aspects of learning in ideal forms, and heuristics for the design of learning environments that are expected to optimise students' learning towards these ideal forms. The items were formulated to reflect the ideal forms of shared, meaningful, reflective and transfer-oriented learning. A pilot study with 62 students of the participating schools, who were in their ultimate year of initial vocational education and did not join the study, showed that the items were clearly formulated and that the aspects of learning could be captured in reliable scales if some items were left out. The refined questionnaire consists of four scales that measure shared learning (8 items), meaningful learning (11 items), reflective learning (10 items) and transfer-oriented learning (7 items), respectively. Students could indicate along a five-point Likert scale the extent to which a feature of learning manifested itself during a unit. Table 4 shows a sample item for each of the scales and the reliabilities for the four scales (Cronbach's alpha coefficients).

Lesson observations

All lessons of Activity Morning unit I and Activity Morning unit II were video recorded to capture the conduct of the units, particularly the students' behaviour during the units. During small-group or individual work, we videotaped the ways of doing things for four small groups of each cohort. These small groups were selected by the teachers as representative of all the small groups in the cohort. In dialogue with the teachers, we selected for each assignment of Activity Morning I and II video fragments that in all probability displayed one or more of the features of learning in a community of learners for vocational orientation. We directed our search for those so-called 'critical incidents' (Angelides 2001) based on the intended implementation of the heuristics in the assignments and unit as a whole. The critical incidents were used during the stimulated recall interviews.

Table 4 Sample item, number of items, means, standard deviations and reliabilities for the scales of the Learning Community Questionnaire

Scale	Sample item	Number of items	Mean	SD	α
Shared learning	If one of us was good at something or knew something, we made use of that	8	3.78	0.62	0.86
Meaningful learning	In this unit, we learned things which are of use to us	11	3.16	0.69	0.77
Reflective learning	The assignments made me wonder whether I have qualities which are needed for working in Care and Welfare	10	3.02	0.77	0.86
Learning for transfer	We thought about why we had to carry out actions in a certain way	7	2.84	0.67	0.70

For the first designed unit in both schools

Interviews

We held interviews with eight pairs of students. Four of these pairs were selected from the small groups that had been video recorded during the Activity Morning unit. The eight pairs were designated by the teachers as representative of the students in their cohorts. An interview scheme was developed on the basis of the theoretical framework of a community of learners for vocational orientation. After an introductory part that asked after students' opinions of the unit that we designed in general, we addressed all assignments of the unit. For every assignment, the scheme comprised questions regarding the features of learning of the theoretical framework (did the students learn in a shared way, how did they learn that way, did they learn during the unit that we designed more or less in a shared way than during a regular unit, and what in the unit made them learn in a shared way?), followed by the same questions about meaningful, reflective and transfer-oriented learning. Then, for every assignment, the students were shown a critical incident that in half of the cases displayed the particular students' ways of doing—or not doing—things during the assignment. The students were asked about their perceptions of the assignment, and to evaluate their actions in light of the assignment and the learning which they associated with these actions. The video fragments helped the students to recall their experiences and thereby enhanced the validity of the data gathered (Calderhead 1981). The interview ended with a question after suggestions for improvement of the unit. As we tried to collect the students' own stories, we tried to formulate the questions in an open, value-neutral and understandable way. The interviews were audiotaped and fully transcribed.

Analyses

Statistical analyses

We calculated gain scores based on the difference between the students' scores on the Learning Community questionnaire for a unit that we designed and the regular unit preceding it. Then, we conducted an analysis of variance for a mixed design, with the cohort of students and unit that we designed as independent variables, and the gain in shared, meaningful, reflective and transfer-oriented learning as dependent variables. The assumption of normally distributed gain scores was satisfied. Initially, we analysed the units that we designed altogether. Thereafter, separate analyses were conducted for the Activity Morning I and Activity Morning II. In addition, independent *t*-tests were calculated to be sure that the students of Activity Morning I and the students of Activity Morning II did perceive no differences in learning between the regular units which preceded the Activity Mornings. Cohen's *f* was calculated to indicate the size of any effects ($f = 0.10, 0.25$ and 0.40, implying small, medium and large effects, respectively).

Content analyses

For Activity Mornings I and II, the 8 interview transcripts in total were systematically analysed using matrix-display techniques (Miles and Huberman 1994). *Atlas.ti 6* was used to reduce and display the data. Firstly, the first author coded all of the transcripts using a coding scheme to indicate the four features of learning of interest in this study. The coding scheme was developed on the basis of the theoretical framework of a community of learners for vocational orientation (see Table 5).

Table 5 Coding scheme for the four features of learning in a communities of learners for vocational orientation

Feature of learning	Description	Code
Shared learning (SL)	Students reported the need to cooperate and to contribute to the group work in light of a shared goal. They reported discussion on their small group's cooperation and the group process	SL1
	Students felt that their contributions, as well as those of fellow students, teachers and vocational professionals, were valued and discussed. They felt treated as valued members of the whole community, including teachers and vocational professionals	SL2
Meaningful learning (ML)	The students felt they could understand the goal of a vocational activity by participating in that vocational activity for real	ML1
	The students felt encouraged to take up the role of a professional and master vocational tools in order to anticipate social interaction with people like clients and professionals	ML2
	Students felt leeway and support to explore both their own and established ways of doing things, and combine the pursuit of their personal goals with those of the vocational activity	ML3
Reflective learning (RL)	Students mentioned that all community members comment upon each other's ideas and actions to help them articulate better ways of thinking and acting, and make otherwise situated knowledge and skills explicit	RL1
	Students described that they had connected theoretical concepts and processes to specific vocational activities	RL2
	Students mentioned realising how far they feel competent and interested in (future) participation in the vocational practice	RL3
Learning for transfer (TL)	The students felt they had acquired new, more generalised knowledge, skills and attitudes applicable to different domains of practice, as a result of comparing and contrasting different practices	TL1
	Students mentioned having thought about or discussed the reasons why vocational and learning activities or tasks have to be done in a certain way, and demonstrated a critical stance	TL2

A research assistant coded 20 % of the transcripts also, which led to satisfactory interrater reliability [Cohen's kappa of 0.86 (0.78–0.94)]. Secondly, we summarised the data in the form of a matrix with the features of learning along one axis and the assignments along the other axis. Thirdly, we verified our assumptions regarding the role of the heuristics provided in the stimulation of student learning by interpreting the ordered data: did the associated student actions lead to the features of learning we intended? We were particularly interested in student perceptions of the learning environment which might have influenced their actions and thereby their learning. The data for each Activity Morning were analysed separately and then compared to each other. We looked for patterns and significant contrasts. We also looked for clear examples and counterexamples. Unexpected responses from the students were followed up in order to gain new insights to help us optimise teaching–learning processes in the context of initial vocational education. For reasons of validity, we also checked our assumptions against the raw data. Because content analysis is an iterative process, the step of hypothesis verification was therefore repeated on several occasions.

Table 6 Mean gain scores (and standard deviations) for shared, meaningful, reflective and transfer-oriented learning according to designed unit

Type of learning	School A, year 1 n = 18		School A, year 2 n = 25		School B, year 1 n = 29		School B, year 2 n = 24	
	Coffee Morning I	Activity Morning I	Coffee Morning II	Activity Morning II	Steinhagen Family	Young meets Old I	MADD-days	Young meets Old II
Shared	0.09 (.52)	−0.01 (.67)	0.27 (.67)	0.82 (.69)	0.27 (.54)	0.19 (.60)	0.42 (.85)	0.03 (.63)
Meaningful	0.14 (.66)	0.46 (.58)	0.36 (.40)	0.98 (.64)	0.14 (.62)	0.36 (.55)	0.67 (.56)	0.39 (.43)
Reflective	0.16 (.49)	0.47 (.70)	0.26 (.63)	0.82 (.79)	0.39 (.65)	0.33 (.76)	0.54 (.64)	0.28 (.59)
Transfer	0.10 (.72)	0.45 (.76)	0.27 (.56)	0.65 (.64)	0.33 (.66)	0.25 (.70)	0.24 (.63)	0.19 (.56)

Results

Fostering communities of learners for vocational orientation

Our first question was if, relative to regular learning environments, the learning environments designed on the basis of the heuristics fostered communities of learners for vocational orientation, in which students experienced to learn in a more shared, meaningful, reflective and transfer-oriented way. Table 6 presents the mean gain scores and standard deviations for the four features of learning for each unit that we designed separately. The results show significant gains when the units that we designed are compared to the preceding regular units. There were large effect sizes for meaningful and reflective learning [$F(1,92) = 92.86$, $p < 0.01$, $f = 0.58$ and $F(1,92) = 40.45$, $p < 0.01$, $f = 0.45$, respectively]. There were medium effect sizes for shared learning and learning for transfer [$F(1,92) = 27.84$, $p < 0.01$, $f = 0.24$, and $F(1,92) = 40.45$, $p < 0.01$, $f = 0.32$, respectively]. The gains in shared, meaningful, reflective, and transfer-oriented learning and concomittant effect sizes are in line with our expectations.

Each of the units that we designed corresponded to a particular configuration of the heuristics for the arrangement of a learning environment. This means that whether all four features of learning were realised and the extent to which this occurred could differ for different units. The redesigns, however, only differed in the extent to which the heuristics were put into practice. Figure 1 displays the gain scores in the four features of learning for the Activity Mornings I and II. Regarding Activity Morning I, the students reported significant increases in meaningful learning [$F(1,22) = 13.29$, $p < 0.01$, $f = 0.41$], reflective learning [$F(1,22) = 8.68$, $p < 0.01$, $f = 0.30$] and learning for transfer [$F(1,22) = 5.94$, $p < 0.05$, $f = 0.22$], but no more and no less shared learning than during the preceding regular unit. Those students who participated in the redesigned Activity Morning II reported significant increases with regard to all four features of learning with even larger effect sizes than those found for the unit we initially designed [shared: $F(1,31) = 24,90$, $p < 0.01$, $f = 0.50$; meaningful: $F(1,31) = 76,64$, $p < 0.01$, $f = 1.01$; reflective: $F(1,31) = 28,39$, $p < 0.01$, $f = 0.42$; transfer: $F(1,31) = 25,60$, $p < 0.01$, $f = 0.51$]. Because the different groups of students did not differ in their perceptions of the regular units which preceded their Activity Morning [shared: $t(37) = 0.82$, $p = 0.42$; meaningful: $t(57) = 0.16$, $p = 0.87$; reflective: $t(57) = 0.32$, $p = 0.75$; transfer: $t(57) = -0.14$, $p = 0.89$], the gains in the four features of learning probably can be attributed to the heuristics followed and particularly their configuration during Activity Morning II.
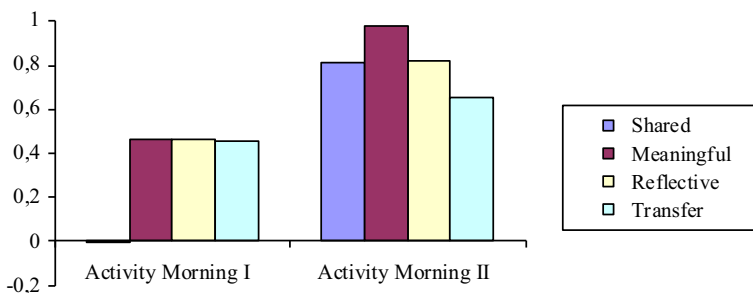

Fig. 1 Gain scores for types of learning during Activity Mornings I and II

The fact that the students did perceive their learning as more shared, meaningful, reflective and transfer-oriented indicates that, at least part of, the heuristics from our community of learners framework were functional, and elaborated and implemented in the way in which we intended.

In the sections below, we show how the results presented above can or cannot be explained by the way in which the heuristics were elaborated and applied, as well as by the ways in which the assignments were shaped by student actions and influenced by their perceptions of the learning environment.

Experiencing communities of learners for vocational orientation

How did the learning environments designed on the basis of the heuristics foster communities of learners for vocational orientation in which students experience to learn in a shared, meaningful, reflective and transfer-oriented way? Inspection of student perceptions of the learning environments provided by Activity Mornings I and II and student learning during these units shows us how these perceptions shaped their actions and learning.

Shared learning

The students participating in the first Activity Morning (year 1) reported as much shared learning as during the regular unit prior to undertaking the unit we designed. This could be due in part to the assignments in the regular units already being designed for small-group work and thereby stimulating shared learning. While the unit that we designed added forms of cooperation in which students were regarded as legitimate peripheral participants and thus *expected* to share their knowledge and experiences with each other, teachers and professionals in order to achieve a common goal, this was not yet fully realised during Activity Morning I. The principles of cooperative learning appeared to receive only partial realisation. For example, the students, in small groups, thought up an activity for the primary school children, worked this out on a worksheet and also studied a relevant theoretical topic. They did not, however, see a need to involve others in the further planning of their activity:

> We had to make a worksheet, so we did. Just an assignment, and then as good and clearly as you can. But not that I really thought like: "It is for another small group that needs to understand it" or something like that. I did not think of that.

The above situation can be attributed to the teachers telling the class exactly how to conduct each activity and not stimulating them to share their knowledge and experiences as members of a community with the same goal, namely, preparing a primary school event. They took over students' responsibility for the event. The students understandably stuck to simply 'doing the assignment' and not much more. Something similar happened with the sharing of the theoretical expertise acquired in the different small groups for understanding children's development (Expert module). Instead of the students sharing and combining their knowledge to optimise the organisation of the target activity, they simply copied the topics summaries provided by the various small groups to complete the assignment.

The shortcomings of Activity Morning I were successfully dealt with in its successor: students reported significantly more shared learning during Activity Morning II (year 2) than during the regular lessons. In the unit that we redesigned, teachers activated the students more to contribute and gave the students more opportunities to discuss their activities. For example, during the Brainstorm assignment, the whole class had to decide on

which of all the activities, proposed by the small groups, would be carried out by all small groups during the event:

> We [the class] really prepared it together, everyone [small group] his own activity. I was interested in what the others had thought up. Now I could say that I didn't like it or something. Otherwise you get there (at the primary school) and you don't even know what you are gonna do.

Now the students engaged in a dialogue to jointly pursue a common goal. During the revised Expert module, the teachers had each of the small groups present the theoretical knowledge which they had acquired to the other groups. By asking the students to relate their own and fellow students' presentations to their primary school children's activities, the teachers scaffolded the students to perceive the goal of the assignment as preparing for the event at the primary school. Now the students felt that they had really shared their knowledge with each other:

> During our theory presentation, it was kind of nice to hear that they found it useful. That was what it was about, actually, that it made sense to the class, they learned something from it, and learned to put it to use during the activity morning so to say.

The teachers also forced themselves to let the students prepare for their activity in their own way and according to their own planning. During so-called 'free hours', the teachers were nevertheless present to inspire, facilitate and help the students when asked to do so, but without rigidly prescribing what they should do:

> Now, you learned to work independently and cooperatively with your small group. Not all the time with the teacher, listening to what she has to say, but just only if you needed help.

The teachers successfully broadened the students' perceptions of the activity setting and particularly the goal of the activities from being individual, school-related and mostly concerned with 'getting the assignment done' to the shared, professional goal of 'organising a smoothly-running event'.

Meaningful learning

According to the students, meaningful learning was more prevalent during Activity Mornings I and II than during the regular units which preceded these. Probably the biggest difference from the regular units was that the students in the Activity Mornings worked with real children and teachers at an actual primary school rather than simulating the activity with classmates in their own school. The students' learning thus became meaningful because the students clearly wanted to live up to the expectations of the school children:

> You see, now we did not work for our teacher, but for real. You do it for the children, and they really expect something from you. Normally it is just for your exam…

Actual interaction with the primary school children also helped the students to enter into the role of assistant teacher:

> We felt like real primary school teaching assistants. In fact, we are just older children…But, for the children, we were a sort of teacher. They really looked up to us.

Nevertheless, the students rarely engaged in the actual stimulation of young children's development or—in other words—the main goal of primary education. While the students

were aware of this goal, their objective appeared to be no more than to offer the children an enjoyable day:

> It was just…you think up something fun and then, as a teacher, you really teach them. For example, to do sums. But now it was only the fun things and all.

This occurrence can be explained by the Activity Mornings not representing actual primary school teaching practice. The focus of the unit's activity was indeed on more broadly working with young children. This was also reflected in the minimum number of professional tools that the teachers suggested that students use (e.g. professional worksheets, but no explicit methods).

Besides working with real children in a real school, a big difference between the design lessons and the regular lessons was the leeway given to the students for the preparation and conduct of both Activity Morning I and II. The teachers showed the students essential and culturally-established ways to prepare for something like an Activity Morning using—for example—an action plan; but then they left the students' room to further accomplish the activity in their own manner:

> We really learned something because we experienced it for real. We were really busy with the practice…We also had to do it ourselves. The teacher did not provide so much help. Well, of course she helped us, but we had to *do* it ourselves.

With scaffolding from teachers, who offered a balance between freedom and support, the students were able to act within their zones of proximal development.

Reflective learning

Students reported more reflective learning during both of the Activity Mornings than during the regular units which preceded these; Activity Morning II showed even more reflective learning gain than Activity Morning I. The students had to engage in increasingly more complex situations when preparing for the morning. During the morning at the primary school, the students thus encountered situations like the ones discussed during the presentations of theory and practised during role playing. They recognised the situations and could thus use what they learned during preparation:

> We taught the others [during the theory presentations] that school children can be quite competitive. We noticed that, too, during the activity morning. That one child with his seven cards!

> The role playing made me see things like … how you can do things. For example, with an over-active child, you need to stay calm and patiently tell him to sit down because, when you stay calm, he will become calm too … and, when you get angry, he'll become angry too. At a certain point, one kid was really over-active, he went too far. So then I said, to bring it in a kind manner: 'I'll put you over my lap if you continue like this.' 'Oh no, no, no,' he said. So I thought: 'I'll keep on pressing that upon him to keep him quiet.'

In addition, the students were encouraged to comment upon each other's ideas and actions, such as during the evaluation of the mornings at the primary school (see "Units we designed" section). By doing this, they articulated useful ways of thinking and doing things (i.e. they explicated their situated knowledge, skills and attitudes):

> The other groups told us how they would have organised our activity [decorating cupcakes]. One group said: "Don't use Smarties because the children might choke." Then you think: "That's true." And then [next time] you take something else.

Most of the students contributed to the evaluation of the mornings and got something out of it:

> It was very useful for us. People told you what they might have done, and that opened up opportunities.

During Activity Morning II, an actual primary school student teacher, Remy, was invited to comment on the activity that was led by each small group. This provided an opportunity to consider professional ways of thinking and acting, but also the students' ways of thinking and acting. And for some of the students, this was exactly how things worked out:

> Remy gave us tips and tricks. He told us that many children at that age do not know the difference between right and left and that we might wanna practise this with the children. That made us think about our activity more thoroughly.

Furthermore, the students were explicitly asked to reflect on their abilities as a teaching assistant by completing a competencies list. This was expected to stimulate them to reflect upon whether working with young children in the future would suit them and whether they had the capacity to do this or needed to develop this further. For many of the students, completing the competence list tool worked exactly as it was intended to:

> The competence list made me realise that I had to speak more properly at the primary school. Among friends, you talk differently. Sometimes you call each other names but, should you do that during the activity morning, the children will repeat them over and over again.

> I realised that I'm not so patient yet. Yeah, I can be patient … but, with those kids, you really need a whole lot of patience. I don't think this is it for me. I would go nuts.

For other students, however, completing the competencies list led to little or no reflection upon their capabilities. And the students did not use the list to steer their learning.

> I thought more like: "Wow, I'm good at that!" I wanted to pay attention to some weaker things but, when we were at the primary school, I totally forgot.

It thus appears that some of the students perceived the competencies list as a test instead of a tool.

Discussion of the students' vocational abilities sometimes arose spontaneously between assignments and particularly after the event. For example, the teachers communicated their surprise at times and said things like: "You are a real talent! You really should consider working with kids." Finally, discussion of their experiences also clearly made the students aware of how they relate to working with children:

> I liked it. I like working with children, but I'm not sure if I want to make my profession out of it because you'll be surrounded by these busy kids all day.

> I thought: "This could become my future work" because I liked doing it and it went quite well. I found that I was good at keeping the children quiet, keeping them engaged and enthusiastic. I thought beforehand that I would not be patient enough, but that could have been worse.

Learning for transfer

The students perceived that Activity Morning I and II stimulated learning for transfer more than the regular units which preceded them. This was even more the case for Activity Morning II than for Activity Morning I. It was striking how well the students were able to link prior experiences with—working with—children to the actual Activity Mornings and beyond. By comparing and contrasting the conduct and outcomes of an activity to those of other—often slightly different—vocational activities, the students appeared to construct knowledge and skills which were new and more generally applicable and develop their attitudes towards future work:

> It's hard to invent activities. That is even tougher for children [than for older people]. You have to take their abilities into consideration … and their interests. But, if they don't like it, they are not gonna do it and, when they find it too easy—boring— they'll stop after a few minutes. Older people are usually kind enough to join in anyway.

Furthermore, and especially during Activity Morning II, the teachers seized upon every opportunity to make the students aware of their former experiences with—working with— children. This reflection functioned as a kind of priming. During the morning at the actual primary school, the students could then experience what approaches worked well with the children. Moreover, this enabled them to recognise the more-general principles behind these approaches:

> In this television program, The Nanny, you also saw the parents get angry there and then the children too…. So they are taught to do it right, to stay calm, and then the children become quiet too. It's just how you act.

In the lessons following the event, the teachers expressed their surprise at what the students were capable of and also that they were proud of them. This gave the students self-confidence for working with children. Explicit discussion of what the students learned and what this helped them do further stimulated the students to look *beyond* the Activity Morning and to think about other situations in which they could also bring their newly-developed competences into play:

> I babysit a child every week. Now I do things differently. If he is really annoying, for example, then I'll try a nice way first. So not immediately "Go to your bedroom!" but something like: "If you do this quickly, then we can do something fun after-wards." Now I know how to put something forward in a nice way, which works better.

In this way, the students developed new knowledge, new skills and a new awareness of their affinities and capabilities regarding working with young children in primary education in the future.

Conclusion and discussion

We have argued that the concept of a community of learners has potential for the design of learning environments in initial vocational education. Such learning environments should allow students to engage in life-like vocational activities with the space and tools for critical reflection on the nature of the associated vocational practices. Also the way in

which students personally relate to these practices should be open for reflection. School and work as contexts for learning would thus become integrated and contribute to the pursuit of the goals of initial vocational education, (i.e. students' development of basic vocational competencies and vocational orientation).

We presented a framework of a 'community of learners for vocational orientation', consisting of a theoretical foundation and heuristics for the design of learning environments. We also described a design research study in which teachers and researchers jointly designed curriculum units based on the proposed heuristics. We anticipated that the potential of our conceptualisation of a community of learners for vocational orientation would manifest itself in the extent to which the students would experience shared, meaningful, reflective and transfer-oriented student learning. Therefore, our research question was if, and how, learning environments designed on the basis of the proposed heuristics foster communities of learners for vocational orientation in which students experience to learn in a shared, meaningful, reflective and transfer-oriented way.

In line with our expectations during almost all of the units that we designed, students found themselves learning in a more shared, meaningful, reflective and transfer-oriented way than during the regular units. In depth analyses of students' perceptions of the learning environment and their learning for one unit, and particularly its redesign, showed the perspectives of students to be crucial for application of the design heuristics. By making use of students' responses during the units that we designed in the first year (for example, the fact that they kept considering the assignments as mere school tasks), the units could be improved in such a way that they realised learning which was more shared, meaningful, reflective and transfer-oriented in the second year. The analyses of the students' perceptions of the learning environment and how the students explained their actions and learning processes allowed us to fine-tune the heuristics for the design of the initial vocational learning environments in their particular schools.

Shared learning was shown to be promoted by adherence to cooperative learning principles. However, students did not seem to become legitimate peripheral members (Lave and Wenger 1991) of the vocational community as a matter of course. This only appeared to happen in the unit that we redesigned (Activity Morning II in year 2) in which the students reported feeling jointly responsible for the event being organised. In the first unit that we designed, the students tended to adhere to a traditional student role. In our view, presenting the goal of the assignments in terms of a clear professional goal and allowing students to share in the pursuit of this goal effectively fostered a shared sense of responsibility (cf. Van Schaik et al. 2011).

Our analyses indicated that *meaningful learning* was stimulated by engaging students in activities which call for real vocational practices. Also, social interaction with people during vocational activities and being given leeway and support in carrying out the activities appeared to contribute to the perceived significance of the learning for the students. What exactly the students learned seemed, among other factors, to be dependent on the choice of the vocational activity. Our analyses showed that a vocational activity which does not fully represent all aspects of the vocational practice concerned, in all probability, leads to different learning outcomes than expected. In our study, the vocational activity of organising an event for primary school children unintentionally focused more broadly on working with children, instead of on the profession of an assistant teacher in particular. As a result, the students learned about how to offer primary school children an enjoyable day instead of how to stimulate children to learn.

The heuristic of engaging students in increasingly more complex situations in order to foster *reflective learning* appeared to prove useful. During that process, students seemed to

recognise when and where the use of specific concepts and processes could have advanced the performance of an activity (cf. Edwards 2005). However, a pre-condition for adequate application of this heuristic appeared to be that students adopt the goal of 'doing a professional job' and not just an assignment. Finally, in our interpretation, joint reflection on the students' experiences with a specific vocational practice added to their awareness of their abilities and affinities, which is in contrast to the effects of just individual reflection on experiences (cf. Van Schaik et al. 2010).

With regard to *learning for transfer*, comparing and contrasting different practices together with a focus on the aim of the activity appeared to be heuristics which fostered the integration of students into existing vocational practices. However, the students did not seem to develop a critical stance of 'action to the world.' A reason for this might be that little explicit attention was paid to this by the teachers. The way in which vocational practices (i.e. primary schools) are shaped by people was not emphasised in our design. This implies that we left it up to the students to understand that they too are able to shape these practices. Critical participation was thus not stimulated. Griffiths and Guile (2003) put forth an activity theoretical framework for continued vocational education in which students and professionals collaboratively discuss and innovate workplaces. Further elaboration of this approach could highlight additional ways in which students, even in initial vocational education, can be stimulated to develop critical participation in vocational practices.

The finding that the students did perceive their learning as more shared, meaningful, reflective and transfer-oriented during the units that we designed, relative to the regular units, indicates that the heuristics indeed enabled us to improve the quality of student learning. Thus the concept of a community of learners for vocational orientation is a viable one for initial vocational education. It must be noted, however, that this conclusion is based on our study in two Dutch schools for initial vocational education. In order to generalise this conclusion, the framework of 'communities of learners for vocational orientation' should be shown to have potential for initial vocational education at other schools in The Netherlands and in other countries.

Our analysis of students' perceptions of the learning environment and how the students explained their actions and learning processes during one specific unit and its optimised version showed how the learning environments fostered communities of learners for vocational orientation in which students experienced more shared, meaningful, reflective and transfer-oriented learning. This allowed us to contribute to knowledge on the heuristics for design (i.e. specifications of and pre-conditions for adequate use of the heuristics). It also allowed us to fine-tune the heuristics for the design of the learning environments in the participating schools. The fine-tuned heuristics are specific for the particular schools that participated in our study. As such, our results could serve as an example of how to elaborate and apply the heuristics of our framework of communities of learners for vocational orientation in other schools in such a manner that they allow the perspectives of the students also to be taken into account.

Several important questions remain to be answered. One question addresses students' learning results. In this article, based on literature, we argued that teaching and learning in communities of learners for vocational orientation would contribute to the pursuit of the objectives of Dutch initial vocational education (i.e. to stimulate students to develop basic vocational knowledge and skills as well as an initial vocational identity. We discussed the formative part of our design study that focused on realising learning environments that foster communities of learners for vocational orientation. Future research should

empirically determine if teaching and learning in the proposed learning communities indeed positively affects students' learning results.

Another question concerns individual differences between students. Personal characteristics and values of students presumably influence their perceptions of learning environments, activities and learning of vocational practices (Wardekker et al. 2012). Depending on their initial capacities and position within the community of learners, their experiences with working with children and future perspectives, students could have experienced the learning environment differently. This possibly influenced their learning activities. The way in which the transactional processes that occurred in our community of learners play out differently for individual students should be investigated more thoroughly.

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