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Students' Preferred Characteristics of Learning Environments in Vocational Secondary Education

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Abstract: If teachers and teacher educators are willing to support the learning of students, it is important for them to learn what motivates students to engage in learning. Students have their own preferences on design characteristics of powerful learning environments in vocational education. We developed an instrument - the Inventory Powerful Learning Environments in Vocational Education - to measure students' preferences on characteristics of powerful learning environments in vocational education. We investigated whether student preferences on the design of their learning environments are in line with what is described in the literature as beneficial for learning. Data of 544 students show that the preferences of students support most characteristics of PLEs in vocational education. Looking through the eyes of students, teachers have to challenge their students and encourage them to take their learning in their own hands. Adaptive learning support is needed. Remarkable, students do not prefer having reflective dialogues with teachers or peers.

Keywords: secondary vocational education, characteristics of powerful learning environments, student perceptions and preferences, survey

1 Introduction

In the PISA (Programme for International Student Assessment) report entitled *Excellence Through Equity: Giving Every Student the Chance to Succeed* (2012), the OECD defines equity in education as “providing all students, regardless of gender, family background or socio-economic status, with opportunities to benefit from education (p.13).” Internationally, schools are not meeting the needs of growing numbers of students in secondary education. Especially for those students whose backgrounds have placed them at ‘disadvantage’, the statistics are disturbing (Smyth and Fasoli, 2007). Considering the strong relation between social background and the extent to which students engage in educational activities, aligning education with the needs of students is an enormous challenge in most countries, especially for vocational education because most of the students with a disadvantaged background follow vocational pathways. Educational engagement could be both an important predictor of achievement at school, and a key preventive factor for underachievement (Walsh and Black, 2009). While disengagement is affected by social background, it is also strongly influenced by school-based factors including instructional strategies, pedagogy, and curriculum (Fullarton, 2002; Marks, 2000; Shernoff, 2014; Walsh and Black, 2009; Willms, 2003). Disengagement hinders growth in literacy and numeracy, and causes passivity or limited investment of effort, underachievement, disruptive behaviour, poor attendance and leaving school (Cole, 2006; Fredricks et al., 2004). These problems tend to be more present in schools with many students from a low socioeconomic status background (OESO, 2012; Smyth and Fasoli, 2007). Shernoff (2014) states that nearly one third of the students say they are bored because they are not sufficiently challenged by education. Meanwhile, teachers have a tendency to lower their expectations in response to student disengagement, resulting in a vicious cycle (Yazzie-Mintz, 2007).

There is strong evidence that a solution to disengagement lies in student-centred learning environments (Smyth and Fasoli, 2007). Internationally, relatively few schools manage to combine a high number of disadvantaged students and high achievement (Walsh and Black, 2009). These schools do focus on student-centred learning and have a challenging curriculum that connects to the students’ lives and the community in which students live. As such, they provide authentic tasks requiring complex thinking and allowing time for exploration, while taking individual differences into account, developing cooperation, communication, negotiation and social competencies, and emphasizing deep understanding and self-regulated learning (Centre for Applied Educational Research, 2002; Kannapel and Clements, 2005; Smyth and Fasoli, 2007). Learning in these environments often takes place in the context of thematic learning communities with high achievement expectations (Shefford, 2014). In a student-centred learning environment student voices regarding their preferences need to be heard. Therefore, the aim of this study is to investigate what students prefer with regard to the design of the learning environment in secondary vocational education. Especially preferences of characteristics of powerful learning environments will be studied.

1.1 Model for Powerful Learning Environments in Vocational Education

Student-centred learning environments that emphasize the integration of domain-specific knowledge, and cognitive and emotional self-regulation skills for tackling

problems and handling situations in everyday life, are usually based on a constructivist epistemology and resort under so-called powerful learning environments (PLEs) (De Corte, 1990). Placklé et al. (2013) have described the characteristics of PLEs in Secondary Vocational Education, with a focus on a newly developed multidisciplinary and integrated course, Project General Subjects (PGS). In PGS functional math, language, and information processing skills are integrated in a course that has a curricular emphasis on life, social, and/or vocational problems, and wherein social resilience and social responsibility are developed at the same time. Characteristics are based on the available literature and endorsed by teacher educators, teachers and students. Figure 1, the Model for Powerful Learning Environments in Vocational Education (PoLEVE; Placklé et al., 2013) gives an overview of these characteristics. The student is situated at the middle, as the centre of teaching and learning.

Characteristics refer to:

- Authentic learning tasks organized in challenging learning pathways
- Opportunities for the development of key competences
- Adaptive learning support
- A positive and safe learning community

We will describe these characteristics in more detail below.



Figure 1: Model for Powerful Learning Environments in Vocational Education (Placklé et al., 2013)

1.1.1 Authentic Learning Tasks organized in Challenging Pathways

Attractive education is not ‘easy’ education, but has to be challenging and meaningful (De Bruijn, 2010). Authentic tasks, preferably performed in realistic contexts can be very challenging and meaningful. Authentic tasks are assignments or problems from daily life and/or from vocational practice. These assignments might need to be redesigned to be applicable in education, but the complexity of the real-world should remain an essential feature of the tasks (van Merriënboer and Paas, 2012). Challenging pathways connect to students’ lives (Rumberger, 2012). They present authentic tasks, requiring challenging thought and allowing time for exploration (Smyth and Fasoli, 2007). Authentic tasks, performed in realistic contexts are challenging and meaningful. To design authentic tasks, close cooperation with society and professionals is necessary (De Bruijn, 2012). Students themselves become actively involved in the design of the learning process (Könings et al., 2014; Smith and Blake, 2006). When students are actively involved in learning activities, it is more likely that learning will be meaningful (2012; Van Beek et al., 2014). In this way, the design of these learning environments becomes a shared responsibility of teachers and students.

1.1.2 Opportunities for the Development of Key Competences

Self-regulated learning, collaborative learning and problem solving are characteristics of effective learning processes at the heart of PLEs (De Corte, 2003; Könings et al. 2005). Self-regulated learning implies that students take control over their own learning, including the stipulation of their own personal learning goals -within the framework of their curriculum-, the choice of appropriate learning activities to work on these goals, and reflection on their learning (Boeckaerts et al., 2000; Cleary and Zimmerman, 2004; Kicken et al., 2009). Learning is facilitated when students are engaged in a problem-centred instructional design in which skills are taught in the context of real-world problems. Working in small groups can enhance problem-solving performance and learning (Sears and Reagin, 2013). Nelson (1999) explicitly stipulated the importance of “collaborative problem solving”. Working in small groups and within reciprocal relationships, each student has opportunities to participate and learn from his peers (Cohen 1994; Johnson and Johnson, 2009).

Characteristics of a learning environment should enable students to develop self-regulated learning, problem solving and collaborative learning. In particular, at the end of secondary vocational education students have to be able to solve problems out of their daily (vocational) life in a self-regulated way, individually and with support of each other.

1.1.3 Adaptive Learning Support

Vocational education is characterized by an ever more heterogeneous population of students. They differ in cultural background, language, interests, values, socio-economic status, and academic readiness. To meet the needs of these diverse students, the curriculum must adapt to the background, strengths, and interests of the individual student (De Bruijn and Leeman, 2011; Gardner, 2006; Tomlinson and Germundson 2007). This implies that there is a need for an adaptive learning environment that is supportive, varied, meets preferences and needs of students, and at the same time offers learning tasks that are challenging and attractive both on an individual and a collective level.

Strategies of adapting education to meet individual needs are an integral part of an educational approach that tries to improve the learning of all students (Tomlinson and Javius, 2012). Tomlinson’s definition of *differentiation* clarifies its integral approach: “... an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunities for each student in a classroom” (1999, p. 121). This also implies *assessment for learning* throughout the learning process, contributing to the improvement of the learning processes in a continuous way (Brown, 2004; Tomlinson, 1999).

The integral part of adaptive learning support is clear when we consider the link with the key competences self-regulated learning, problem solving and collaborative learning. Teachers must be able to provide the kind of coaching that offers appropriate structure and trust, that stimulates students to self-regulate their own learning by providing differentiated help, communicating clear expectations and offering appropriate guidance (Jang et al., 2010; Kirschner et al., 2006; Mouratidisa et al., 2013; Sierens et al., 2009; van Merriënboer and Kirschner, 2013; Vansteenkiste et al., 2012). Self-assessment, as an important student skill in

order to become a self-regulated learner, focusses on the improvement of the learning process. Self-assessment skills for learning require appropriate guidance and need to be explicitly taught as well (Boud et al., 1999; Brown and Harris, 2014; Harris and Brown, 2013). Winters (2012) highlighted that the most suitable guidance conversation must be dialogical, which implies that it stimulates and supports students to reflect on their own performance and learning. This is in line with perceptions of teachers and teacher educators in vocational education who emphasized the importance of setting up reflective dialogues with their students in order to build up self-regulation competences (Placklé et al., 2013). Reflective dialogue with peers is related to student engagement and the development of reflective consciousness (Richards and Richards, 2013).

1.1.4 A Positive and Safe Learning Community

The circle around the characteristics described above, visualizes a positive and safe learning culture as a prerequisite for learning (Hattie, 2009; Rubin, 2006). An optimal classroom culture is characterized by warm and supportive teacher-student and peer relationships, appropriate expressions of emotion, respectful communication and problem solving, strong interest and focus on tasks, building on students' strengths, abilities and needs, within a culture where individual differences are negotiable and common (Jennings and Greenberg, 2008; La Paro and Pianta, 2003). Such a culture is not a coincidental occurrence, but is intentionally built up and embedded in the structure of teaching and learning in every way (Shernoff, 2014).

The PoLEVE model visualizes interdependence of the various characteristics that together, and in interaction with each other, aim to improve learning, including engagement for learning, of every student to its maximum.

1.2 Preferences in Vocational Education

This research focusses on the voices of students, as they are the major stakeholders in the educational process. If teachers and teacher educators are willing to support the learning of students they must first hear what these students have to say about learning (Cook-Sather et al., 2014; Dahl, 1995; Könings et al., 2011b). Even more, when students are heard and their voices are taken seriously, they feel engaged to collaborate constructively in their education (Cook-Sather, 2006; Shernoff, 2014). This study gives students an opportunity to express their educational preferences. With a newly developed questionnaire student preferences on the design of learning environments in secondary vocational education will be measured. This instrument is new compared with previous instruments as it is based on a recently developed holistic model for PLEs in vocational education, based on literature and corroborated by students, teachers and teacher educators (Placklé et al., 2013).

In this study the following research question will be addressed: How do students in vocational education prefer their learning environment to look like and is this in agreement with the characteristics of powerful learning environment in vocational education?

Based on previous research in other educational contexts (Könings, 2007), we hypothesize that students' preferences are mostly in line with guidelines described in the literature as beneficial for learning. In a previous qualitative study in secondary vocational education (Placklé et al., 2013) students strongly favoured authentic and challenging learning pathways. Students also preferred a stronger student

voice. They preferred opportunities to practice self-regulated learning, problem solving and collaborative learning. The desirability of “dialogue” was highlighted. The desirability of differentiation was ambiguous. In other studies differentiation was not a preferable characteristic (Könings, 2007).

2 Method

2.1 Participants

Nine schools with vocational secondary education were invited to participate in this study. These schools had varied interests in PGS and varied in their innovative capacities (e.g., being involved in innovative projects) in general. One school dropped out because of a heavy workload. Three schools only offered vocational and technical education; the other schools also offered general education. The specific contexts of the schools varied widely. The schools varied in size (from 197 to 940 students) and in location. The schools represented a range of neighbourhoods (from province capitals to rural municipalities), public and private schools, both state and catholic. Student demographics also varied between schools, although all showed an extremely high percentage of students with low socio-economic status (mean= 66%, min. 52%, max. 76%).

The questionnaire was filled out by 544 students in the fifth, sixth and seventh year of secondary vocational education. Students were between 16 and 20 years old. The survey was completed during their regular lesson schedule, so the participation degree was 100% of the present students at that day. Schools had an option for a survey on paper (n = 205) or an online version (n = 339).

2.1.1 Development of the IPoLEVE

The IPoLEVE (Inventory on Powerful Learning Environments in Vocational Education) was developed in order to measure the students’ perspective on PLEs in vocational education. Student-report data are most proximal to students’ experiences of the class (Fulmer and Liang, 2013). In developing the IPoLEVE, we sought to measure eight dimensions of the model for PLEs in vocational education:

(1) Authentic and challenging content, (2) Self-regulated learning, (3) Collaborative Problem Solving, (4) Assessment for learning, (5) Differentiation, (6) and Coaching with subscales Structure and Trust, (7) Reflective dialogue teachers, and (8) Reflective dialogue peers.

We consider a positive and safe learning environment as a prerequisite of a PLE, which has to be built up in such a way that it intentionally supports teaching and learning in every way (Shernoff, 2014). Therefore, we did not measure this construct on a separate scale. A positive and safe learning environment refers to the quality of the relationships students have with their teachers and peers. The scale Coaching with its subscales Dialogue Teachers, Dialogue Peers and Trust refers to the importance of different kinds of supportive relationships in which students participate in a mutually caring, social arrangement with willing adults and peers, resulting in a positive and safe learning environment. Characteristics of a broader positive and safe learning environment were thus integrated within the different scales, e.g. “a culture where differences can be discussed” is placed under the scale “differentiation”.

For the operationalization of the dimensions, we started by examining existing instruments and the data of our qualitative research (Placklé et al., 2013). The IPoLEVE contains 53 items: 24 items originate from the IPSEE (Könings et al., 2011a), 8 originate from the TSCQ (Belmont et al., 1988), 6 items from the VaSCoA-VI (Brown, 2008), and 3 items from the observation instrument of PLE in vocational education (de Bruijn et al., 2006). Based on our theoretical framework and our previous qualitative research (Placklé et al., 2013), we developed another 12 items in order to measure the characteristics of powerful learning environments in vocational education more completely.

For every item, students rate their preference ('I would like this to happen') on a five point Likert scale ranging from 1 (always) to 5 (almost never or never), except for the scales "Dialogue", where a four-point scale (from "often" to "almost never or never") was used, because of content reasons (the category "always" was not applicable here). For uniform interpretation of all scale scores, we recoded the scores to a proportional score from 0 to 1. Data were gathered in Spring 2013.

Confirmatory Factor Analysis (CFA) and Cronbach's Alpha were used to test the reliability of the instrument. We conducted Confirmatory Factor Analyses (CFA) using the program Lavaan in -R.

After the final data collection was complete, we tested the reliability of all the scales. Descriptive statistics were conducted on what students' preferences on characteristics of the PoLEVE were.

The CFA results suggested that the model was a good fit for all scales, if three negatively formulated items were removed. When we removed the Scale Differentiation, we had a significant difference on the model (RMSEA = .044, CI RMSEA = [.036, 0.048], CFI = .90, SRMR = .061).

Table 1: Scales IPoLEVE

Model	(Sub)scale	Description	Sample items "In a PGS course,..."
Learning tasks	Authentic and challenging (8 items)	Extent to which the learning environment is meaningful, authentic and challenging.	"..., we explore real-life problems out of daily life or vocational practice". "..., I learn how to make connections between what I learn in PGS and my daily life."
Key competences	Self-regulated learning (8 items)	Extent to which students get opportunities to take control over their own learning.	"..., I have a voice in what I want to learn.' '..., I am given a lot of responsibility.'
	Collaborative problem solving (6 items)	Extent to which students get opportunities to solve problems together.	'..., we solve problems together.' '..., we discuss the strategy to complete the learning tasks.'
Adaptive learning	Assessment for learning	Extent to which evaluation	'..., the teacher gives me a lot of feedback on

support	(6 items)	contributes to the improvement of learning in a continuous way.	my learning tasks and tests' '..., I use the feedback to improve my learning'
	Differentiation (6 items)	Extent to which students get opportunities to perform learning tasks that address their needs to maximize learning.	'..., my learning tasks are adapted to my needs, interest or talents.' '..., I work with own learning goals.'
	Coaching / Structure (4 items)	Extent to which students get appropriate structure to support their self-regulated learning.	'..., the expectations are clear.' '..., the teacher shows me how I can solve problems on my own.'
		Extent to which the relationship with their teacher is built on trust.	'My teacher believes in me' 'My teacher takes care of me.'
	Coaching / Trust (4 items)	Extent to which a reflective dialogue with peers is part of the learning and (vocational) identity development process.	'I talk with my teachers, about what I have learned of experiences during lessons' 'I talk with my teachers about 'what kind of person I am (my talents, my interests, my needs)'
	Coaching/ Reflective dialogue teachers (5 items)	Extent to which a reflective dialogue with peers is part of the learning and (vocational) identity development process.	'I talk with my peers, about what I have learned of experiences during the lessons.' 'I talk with my peers, about what kind of person I am (my talents, my interests, my needs).'
Coaching/ Reflective dialogue peers (5 items)			

The model, without Differentiation, fits good to very good, depending on the index. When we add the Scale Differentiation, the model stays suitable (RMSEA = .046, CI RMSEA = [.042, .049], CFI = .87, SRMR = .071). We decided to keep the scale Differentiation without the reversed items.

Reliability analyses were performed on each of the scales. The internal consistencies of the scales were generally high. The IPoLEVE scale Authentic and Challenging shows an internal consistency of .79, Self-regulation of .83, Collaborative problem-solving of .90, Evaluation for learning of .90, Differentiation of .79, Coaching Structure / Trust of .95, Coaching Reflective Dialogue Teachers of .90, and Coaching Reflective Dialogue Peers of .92.

2.2 Data Analyses

Missing data occur between 3% and 6% in the final data. If students did not respond on an item, the online tool gave them a reminder. So, missing data only occur in the written version, where some items were skipped by the students. For the learning environment characteristics a limited amount of data was missing ranging from 2.8% missing values for the scale measuring self-regulated learning, up to 5.6% for the differentiation scale. In order to reduce the biasing impact that these missing data can have on the results, we used multiple imputation techniques (James et al., 2004). Multiple imputation, as an appropriate model that incorporates random variation, was used on scales to take advantage of the existing correlations and increased testing power. Through multiple imputation, ten datasets without missing data were generated. Descriptive statistics were conducted to address what student preferences towards their learning environments are. In order to test whether preferences were significantly different from the neutral score of .50, we could not use one sample t-tests because of the multiple-imputation. Analyses were therefore performed separately on the ten datasets, resulting in an average value across the sets (Little and Rubin, 2002) and variance estimate $V\beta$ reflecting variation within and between imputations. The normality approximation is valid due to the big sample size.

3 Results

How do students in vocational education prefer their learning environment in PGS courses, and is this in line with the characteristics of powerful learning environments in vocational education as described in the literature and in the PoLEVE-model?

Table 2 presents the descriptive results for the preference scores of the different scales of the IPoLEVE. Results show that students prefer challenging and authentic learning tasks, self-regulated learning, collaborative problem solving, assessment for learning, and structure and trust ($p < .01$, $d =$ between .48 and .66). These are medium effect sizes (Cohen, 1988). The preference score referring to 'Differentiation' is less explicit (mean .53) but significant, with a small effect size ($p < .01$, $d = .12$). 'Reflective dialogue with teachers' and 'Reflective dialogue with Peers' was significantly *not* a preferable characteristic of PLEs in vocational education. In sum, the preferences of students are in line with the characteristics of PLEs in vocational education, although with only a small effect size regarding 'differentiation'. Setting up a reflective dialogue, either with teachers or with peers, was not a preferable characteristic.

Table 2: Mean preference scores and standard error of scales IPoLEVE

Scales	Mean	SEM	p	d
Authentic and challenging	.70	.01	.000	0.66*
Self-regulated learning	.71	.01	.000	0.55*
Collaborative problem solving	.70	.01	.000	0.62*
Assessment for learning	.64	.01	.000	0.48*
Differentiation	.53	.01	.002	0.12*
Coaching Structure /Trust	.73	.01	.000	0.61*
Coaching Reflective Dialogue Teachers	.45	.02	.001	0.14*
Coaching Reflective Dialogue Peers	.38	.00	.000	1.00*

Notes. N = 532. Final variance estimate $V\beta$ reflecting variation within and between imputations, neutrality .50, all differences are significant $\alpha < .01$ (Bonferonni corrected).

4 Discussion

Student preferences are in line with most characteristics of the model of PLEs in vocational education. Students themselves are asking for challenging learning pathways; they want to widen their horizons and take their learning into their own hands. They prefer to solve authentic problems with each other's support. The desirability of differentiation was significant, but only with a small effect size. In our qualitative research (Placklé et al., 2013), students were struggling with the "fairness" of differentiation and their attitudes towards differentiation were ambiguous. The operationalisation of differentiation in positive items, for example - my learning tasks are adapted to my needs, interest or talents - could be an explanation for the desirability towards the characteristic. Students expressed their preference for characteristics related to adaptive learning support as well: Evaluation for learning, and Coaching that offers structure and trust. Teachers accepting differences between students more often tend to consider differences as an integral part of learning (Hattie, 2005). Building on a class climate where differences are common and are discussible, could improve the students' perception of differentiation as well.

Remarkably, setting up a reflective dialogue with teachers is not a preferred characteristic, although it is a key element of coaching. High-quality student guidance, through a reflective dialogue between teachers and students, requires competences of teachers to talk *with* their students instead of talking *to* them. This implies a dialogical shift towards student-centered positioning. Because many students do not have these experiences yet (Winters et al., 2011), they might not appreciate the characteristic at this moment.

In this study, the researchers have given a voice to vocational students about their education. In this way, it contributes to the conceptualization of teaching and learning as a collaborative process (Corbett and Wilson, 1995; Cook-Sather, 2002) *with* students.

Previous studies indicated that the overall learning environment may be the most salient variable influencing engagement (Shernoff, 2010). Almost all research on teaching and learning conceptualizes learning as a property of the individual learner. However, characteristics of the learning environment seem to be an even more important factor in the propensity to engage in learning than characteristics of the individual (Shernoff, 2010). It is up to teachers and teacher educators to further

develop teachers' competences for creating learning environments that take into account students' preferences on teaching in learning in vocational education (Cook-Sather et al., 2014). Teachers are challenged to redesign vocational learning pathways in order to raise students' engagement substantially. Sharing this responsibility with students might help to make this process more effective.

4.1 Suggestions for further research

In this study we found evidence that students prefer most characteristics of PLEs in vocational education. The ultimate aim is to improve student engagement and achievement. A future study would be beneficial to investigate the extent to which the characteristics of powerful learning environments are implemented in relation to student engagement and student achievement.

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